ITU Publications

International Telecommunication Union
Development Sector

Pandemic in the Internet age

From second wave to new normal, recovery, adaptation and resilience

Pandemic in the Internet age

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May 2021

Acknowledgements

This report was prepared by ITU expert Scott W. Minehane of Windsor Place Consulting (WPC) with extensive assistance from Simon Molloy and under the supervision of the ITU BDT Regulatory and Market Environment Division and the ITU Radiocommunication Bureau. Extensive input was provided by Sofie Maddens, Carmen Prado-Wagner and Célia Pellet. The author also acknowledges the input provided and research undertaken by his associates and staff at WPC, including Pia Castillo, Michelle Benington and Olga Kerry.

Thanks are due to Opensignal for its assistance in relation to Section 4.5, especially Ceri Howes and Ian Fogg; and, in relation to the case studies in Section 6, to various national regulatory authorities who contributed time and information, especially Charley Lewis of the Independent Communications Authority of South Africa, Amna Al Shamsi of the United Arab Emirates Telecommunications Regulatory Authority, Alejandro Delgado Morena of Colombia's Communications Regulation Commission, Diana Haidee Gomez Gallardo of Mexico's Federal Telecommunications Institute and Vanessa Castillo Mendives of Peru's Supervisory Agency for Private Investment in Telecommunications.

ISBN

978-92-61-33951-7 (Electronic version)
978-92-61-33961-6 (EPUB version)
978-92-61-33971-5 (Mobi version)

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Foreword

As the world adjusts to the new normal created by the COVID-19 pandemic, ITU is working to mobilize action around the call to "build back better". As the United Nations specialized agency for information and communication technologies, ITU and its stakeholders are more committed than ever to ensuring that people everywhere benefit from the transformative potential of ICTs.

Under the theme: "Connecting the unconnected to achieve sustainable development", the upcoming World Telecommunication Development Conference (WTDC) aims to revitalize the connectivity agenda. The COVID-19 pandemic has underscored the importance of connectivity and has demonstrated that connecting every person is more important than ever before. Leveraging ICTs will be a key component of socio-economic recovery, and will be vital in accelerating progress towards the Sustainable Development Goals (SDGs).

Globally, the ICT industry has proved to be integral in reducing the negative impacts of the pandemic. An enormous range of social and economic activities have shifted from face-to-face to online in a remarkably short period of time. Unfortunately, this huge shift has only been possible for those who are connected. This highlights the urgent need to address the global digital divide, and provide accessible and affordable connectivity to all on social, economic and egalitarian grounds.

To that end, this ITU report, *Pandemic in the Internet age: From second wave to new normal, recovery, adaptation and resilience*, recommends actions and regulatory measures aimed at:

- addressing the digital divide;
- driving digital deepening;
- effecting digital transformation; and
- building digital resilience.

Such measures need to be taken globally, regionally and by national governments supported by national regulatory authorities and private sector stakeholders, to help transition to a post-pandemic "normal."

This report also contains the results of a survey on measures taken to keep communities connected, a number of case studies and experiences collected from the ITU Global Network Resiliency Platform (REG4COVID), to consider efforts and initiatives taken worldwide to maintain connectivity during the COVID-19 pandemic. These initiatives helped to save lives and allowed economies to continue operating. In effort to spread knowledge on best practices, the report details solutions and approaches that were taken in various local contexts to harness the full power and potential of ICTs.

I hope that this report will help our members and all stakeholders in the ICT field address challenges brought about by the pandemic, including through digital contact tracing, strengthening the role of digital supply chains in the distribution of COVID-19 vaccines, and, of course, bring the benefits of ICTs to people everywhere.

Doreen Bogdan-Martin
Director, ITU Telecommunication Development Bureau

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Abbreviations

ASEAN	Association of Southeast Asian Nations
CDR	call detail record
EU	European Union
FTTH	fibre-to-the-home
ICT	information and communication technology
IoT	Internet of Things
IMT	international mobile telecommunications
MNO	mobile network operator
OECD	Organisation for Economic Co-operation and Development
PPE	personal protective equipment
NGO	non-governmental organization
SFH	school from home
SME	small and medium-sized enterprise
TTT	test track trace
USO	universal service obligations
WFH	work from home
WHO	World Health Organization
WPC	Windsor Place Consulting

1 Executive summary

1.1 Overview

The world has now passed an unfortunate anniversary – more than 12 months have elapsed since the onset of the global COVID-19 pandemic. This means that the need for continued investigation of the actual and potential responses of the telecommunication sector to the pandemic is unabated. Globally, the ICT industry has played a vital part in reducing the economic and social impacts of the pandemic, which has nonetheless caused the greatest worldwide economic and social disruption since the Second World War.

This report builds on earlier work by ITU and a range of international institutions. It investigates the national, regional and global responses of the regulatory community and industry stakeholders (policy-makers, national regulatory authorities, network operators/service providers, equipment manufacturers, digital players, governments, academics, international and regional agencies and civil society). It considers the critical actions and initiatives undertaken early in the pandemic and examines their efficacy and sustainability in the medium and longer term. It also considers the long-term adaptation of the telecommunication industry to the uncertain and still emerging "new normal".

Governments and other stakeholders are all coming to understand that the COVID-19 crisis will not be short-lived. It is increasingly clear that COVID-19 has been a uniquely powerful game-changer, with digital connectivity now at the top of every nation's agenda. The crisis has acted as both catalyst, upending legacy processes and effecting cultural change, and accelerator, driving online trends that may otherwise have taken a decade to emerge. There is also clear recognition of a greater need for cooperation and collaboration at regional and global level, as long advocated by ITU.

ICTs have an enormous role to play in helping society adapt to the dislocations caused by the pandemic. This enhanced role comes in addition to the already central part that digital technologies have assumed in driving innovation, digital disruption and economic growth and development, particularly in emerging economies. It is critical, then, that national governments, regional cooperative organizations and NGOs collaborate with industry stakeholders to ensure that digital technologies are used as effectively as possible to soften the economic burden of the pandemic and ease, to the maximum extent possible, the social dislocations associated with it.

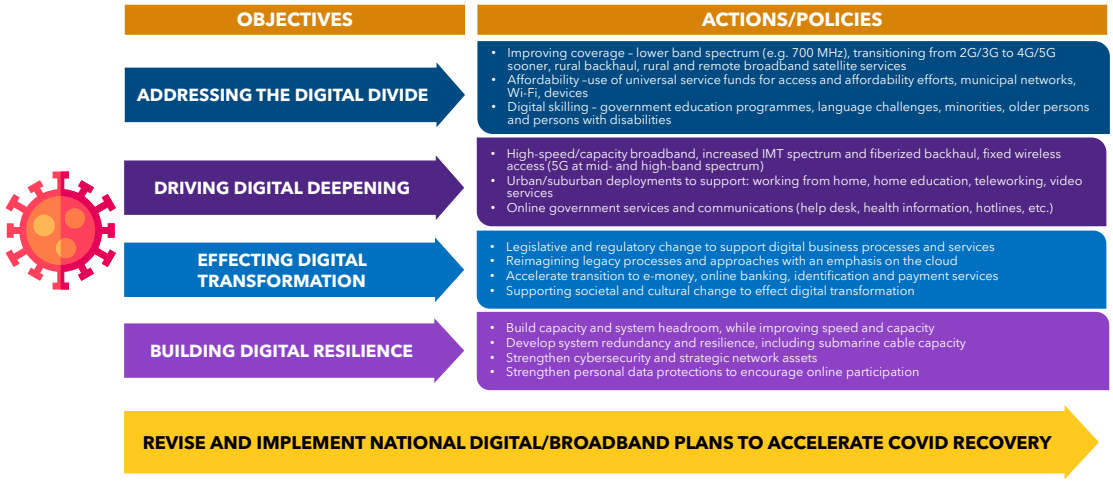
This report identifies four main themes that should be addressed globally by regional and national governments supported by national regulatory authorities and industry stakeholders: (i) addressing the digital divide; (ii) driving digital deepening; (iii) effecting digital transformation; and (iv) building digital resilience. These are explored further below and in **Figure 9**.

Addressing the digital divide

The huge shift to online activity means that social groups without affordable connectivity are now more disadvantaged than before the pandemic. The ability to participate socially and economically, to obtain education, medical and other government services, to communicate and to access e-commerce services is completely dependent on affordable connectivity.

Addressing the digital divide has important consequences in terms of economic efficiency and development, but it is primarily driven by considerations of equity, that is, providing equal access to opportunities to participate in the digital economy and society.

Exhibit 1: Digital responses to COVID-19



Source: ITU-WPC, March 2021

Driving digital deepening

As businesses and governments shift their activities online, they will require faster and higher-capacity data services. Although there may be fewer people in central business districts for some time, the demand for data will likely stay high and continue to grow strongly. Particularly in emerging economies, it will be crucial rapidly to deploy 4G/5G coverage in urban and suburban areas, in order to support pandemic-driven data demand. In contrast to addressing the digital divide, digital deepening is primarily driven by economic objectives of increased efficiency, productivity, competitiveness and growth. It is not limited to access networks; backhaul, cloud infrastructure and international submarine/satellite capacity must also be properly dimensioned for the additional load and more.

Effecting digital transformation

The shift to digital processes requires a broad digital transformation in institutions and in business and government processes, including access to health care, financial services and government services. A critical component of this shift is to improve the digital literacy of less capable groups so that they are comfortable accessing services online. More difficult, but just as important, is cultural change in societies, government and companies.

Building digital resilience

The rapid increase in demand for services experienced at the onset of the COVID-19 pandemic means that additional capacity and resilience have to be built into telecommunication infrastructure systems and services. In a period of uncertainty, the returns for building additional "headroom" are increased. Again, building digital resilience it not limited to access networks; backhaul, cloud infrastructure, international submarine/satellite capacity and ICT systems must be properly dimensioned for present and future crises and disasters.

Specifically in the short to medium term, as ICTs have a great capacity to facilitate the move to the new normal, government and national regulatory authorities should endorse and support, as part of the ICT sector response to COVID-19:

- enhanced digital contact tracing (via smartphone) with public campaigns to promote public buy-in;
- strong digital supply chains for COVID-19 vaccines and their distribution;
- digital vaccine certificates and vaccine passports – where possible, utilizing digital IDs – to facilitate domestic and international travel and trade.

1.2 Checklist of actions and regulatory measures

Exhibit 2 contains a checklist of government and national regulatory authority actions and regulatory measures recommended by this report and broadly consistent with the REG4COVID survey responses.

Exhibit 2. Checklist of actions and regulatory measures

No.	Checklist of actions and regulatory measures	2021	2022	2023+
1.	Together with the Ministry of Health, provide support for **digital contact tracing and efficient vaccine distribution via digital supply chains.**	Yes	Yes	
2.	In conjunction with the Ministry of Education and all industry stakeholders, review support for **online education in terms of connectivity and curriculum support materials,** including online classes in domestic languages and materials to support COVID-19 education catch-up.	Yes	Yes	
3.	In conjunction with the Ministries of Health and Home Affairs, support **internationally portable digital vaccine certificates and vaccine passports utilizing digital ID,** in order to promote international travel/trade and family reunions/social interaction.	Yes	Yes	Yes
4.	Address **the digital divide in order to secure ubiquitous broadband access,** including by: • preparing revised national broadband targets and implementation plans to promptly address coverage and affordability issues; and • implementing plans to address the digital divide by reducing the costs of smartphones and other consumer devices.	Yes Yes	Yes	Yes
5.	Revise **national digital/broadband plans taking into account the impacts and lessons of the pandemic, to accelerate recovery and move to the new normal**, thereby ensuring digital deepening and digital resilience with regard *inter alia* to: • the transition to 4G/5G services; • the deployment of backhaul capacity; and • international and cloud connectivity.		Yes by mid-2022	

(continued)

No.	Checklist of actions and regulatory measures	2021	2022	2023+
6.	**Review IMT spectrum management in order to support delivery of the broadband and online services needed for digital transformation,** prioritizing: • the temporary assignment of unused spectrum if required during the pandemic; • the release of sub-1 GHz spectrum to provide greater coverage and thereby narrow the digital divide; • endorsement of an overall target/roadmap for the assignment of at least 840 MHz IMT spectrum plus mmWave spectrum, so as to facilitate digital deepening, plus release of unlicensed spectrum where practicable; • support for fair and reasonable spectrum prices, to ensure an adequate return on capital for licensees and thereby facilitate investment in capacity and new technologies, including 4G and 5G services.	Yes Yes Yes	Yes	Yes
7.	**Review cybersecurity protections and legislative frameworks for cybersecurity, data privacy and protection**, in order to build increased digital resilience, encourage online participation, etc.		Yes	
8.	In conjunction with industry stakeholders, undertake **stress testing** (of networks, transmissions, cloud infrastructure, etc.) **encompassing additional WFH/SFH pandemic and disaster loads, in accordance with ITU recommendations, in order to drive digital deepening and build digital resilience**.		Yes	
9.	**Review regulations and regulatory frameworks (especially outdated legacy rules) that inhibit or foreclose on the ability of industry licensees/stakeholders to utilize new technologies** (e.g. IP interconnection rather than time-division multiplexing) **and undertake network planning and deployments that have a high degree of resilience and nimbleness.**		Yes	
10.	In conjunction with other government ministries, undertake the second-order **review of processes and laws/regulations allowing the public and industry to engage in the digital transformation of processes and to support societal and cultural change to effect that transformation** utilizing digital IDs and similar.		Yes	Yes

2 Introduction

2.1 The pandemic and the digital drive for recovery

The world has now passed an unfortunate anniversary – more than 12 months have elapsed since the onset of the global COVID-19 pandemic. This means that the need for continued investigation of the actual and potential responses of the telecommunication sector to the pandemic is unabated. Globally, the ICT industry has played a vital part in reducing the economic and social impacts of the pandemic,[1] which has nonetheless caused the greatest worldwide economic and social disruption since the Second World War.

This report builds on earlier work by ITU[2] and a range of international institutions. It investigates the national, regional and global responses of the regulatory community and industry stakeholders (policy-makers, national regulatory authorities, network operators/service providers, equipment manufacturers, digital players, governments, academics, international and regional agencies and civil society). It considers the critical actions and initiatives undertaken early in the pandemic and examines their efficacy and sustainability in the medium and longer term. It also considers the long-term adaptation of the telecommunication industry to the uncertain and still emerging "new normal".

Governments and other stakeholders are all coming to understand that the COVID-19 crisis will not be short-lived, despite the arrival of vaccines. It is increasingly clear that COVID-19 has been a uniquely powerful game-changer, with digital connectivity now at the top of every nation's agenda. The crisis has acted as both catalyst, upending legacy processes and effecting cultural change, and accelerator, driving online trends that may otherwise have taken a decade to emerge. There is also clear recognition of a greater need for cooperation and collaboration at regional and global level, as long advocated by ITU.

Generally, connectivity providers – including but not limited to fixed operators, MNOs, satellite providers, municipal networks and Internet service providers – have done an excellent job in the pandemic. Networks have held together; outages have been few and far between. Broadband speeds may have decreased for a time in the face of certain market features and the pre-emptive measures adopted by operators to ensure continuity of service on their networks, but overall connectivity providers have offered resilient services during a challenging 2020.

Having said that, the gaps that existed before the pandemic in terms of coverage, broadband speed, quality of service, accessibility and affordability were accentuated. Those that had service had good service. Those without service in a world functioning increasing online were literally and figuratively disconnected. Absent participation in the digital economy, access to health

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1 Raúl Katz, Juan Jung and Fernando Callorda, Can digitization mitigate the economic damage of a pandemic? Evidence from SARS, *Telecommunications Policy,* 44(10): 102044 (November 2020). In particular, "this study provides rigorous analysis to support that a reliable telecommunications infrastructure and a high level of digitization is crucial to keep the economy running under pandemic conditions".

2 See, for example, ITU, *Pandemic in the Internet age: communications industry responses,* GSR Discussion Paper on ensuring connectivity and business continuity – key lessons learned (Geneva, 15 June 2020); ITU, *Economic impact of COVID-19 on digital infrastructure*, Report of an Economic Experts Roundtable organized by ITU (Geneva, 2020); and ITU, *Last Mile Connectivity in the Context of COVID-19*, REG4COVID Discussion Paper (Geneva, November 2020).

services and advice, and to the latest COVID-19 information, was either limited or not available. In those circumstances, governments globally have recognized that there is an urgent need to extend connectivity to unconnected and vulnerable populations, with a view to addressing inequality, providing universal access and meeting broadband connectivity/digitization goals.

The pressure on countries, society and sector stakeholders is relentless: as much of Europe closed in 2020, the United States of America, parts of Latin America and South Africa were in the middle of a second wave. Even countries that had largely escaped the first wave (e.g. Japan, the Republic of Korea, Thailand) were battling outbreaks at the end of 2020. The consequent development and authorization, in record time, of the first COVID-19 vaccines and anti-virals raise both the promise of an effective way to combat the pandemic and an entirely new set of challenges for countries and the ICT sector.

The availability of these first vaccines is far from being a silver bullet. Complex logistical challenges, supply issues and vaccine scepticism in some countries will affect the roll-out of the vaccine, which is expected to reduce the number of COVID-related deaths and hospitalizations worldwide. Vaccine prioritization and limited availability could conceivably result in people having to wait another two or more years to be inoculated, particularly in emerging nations where remoteness, administrative weaknesses or lack of supporting infrastructure could impede distribution.

In this environment, the telecommunication/ICT sector can greatly contribute to the pandemic response by moving from connectivity, broadband services and productivity-increasing apps to facilitating contact tracing and helping to build high-quality digital supply chains using the IoT and GPS to distribute vaccines and critical medicines. In addition, there has been considerable sector investment in apps for vaccine prioritization and scheduling/follow-up (for example, many but not all vaccines require two shots, with the interval between the two ranging from 21 to 90 days), digital health credentials, digital ID and the like. The credentials involved, which may be linked to biometric technologies and are offered by companies such as Clear/Health Pass and CommonPass, offer the promise of restarting international business travel, family reunions and tourism. After that, artificial intelligence and big data will be used to compare vaccine performance, generally and regionally, between genders, age groups, etc.

Taken together, all of the above highlight the critical role played by ICT services and connectivity in helping all countries move to the new normal in the most efficient and timely manner possible.

It is in this context that this second ITU report, *Pandemic in the Internet Age: From second wave to new normal, recovery, adaptation and resilience,* attempts to identify – using the results of a global survey and desk research – long-term regulatory and policy trends for the different groups of stakeholders. It looks at both immediate and longer-term responses, examines what has or has not worked, and considers what measures need to be improved. It identifies good practices to include in national emergency plans, highlighting differences that may occur owing to market maturity and economic development, and the innovative regulatory measures needed to mitigate the risks for operators, businesses, governments and end users, including the most vulnerable populations.

The report also contains a checklist of the actions and regulatory measures (see Exhibit 2) required for better preparedness, to complement the ITU emergency telecommunication guidelines.[3]Global economic and sector responses to the COVID-19 pandemic

In addition to the work undertaken by ITU under the Global Network Resilience Platform (REG4COVID)[4] and through its regional offices, many other global and regional organizations have published research, held roundtables and prepared guidelines or plans in relation to the COVID-19 pandemic. They include:

- the *ITU Guidelines for national emergency telecommunication plans* (see note 6);
- the *ITU Guide to develop a telecommunications/ICT contingency plan for a pandemic response*;
- material produced by the ITU/UNESCO Broadband Commission for Sustainable Development (Agenda for Action; The Broadband Commission Community responds to COVID-19; *The State of Broadband Report 2020*; the Broadband Commission Manifesto; case studies);
- ITU-D Study Group webinar results related to COVID-19 response;
- the Chairman's report on the Global Symposium for Regulators, September 2020;
- the ITU report, *Economic Impact of COVID-19 on Digital Infrastructure* (see note 3);
- the UN75 Global Governance Forum Partnership Dialogue for Connectivity – Accelerating Digital Connectivity in the Wake of COVID-19;
- AI for Good webinar series episodes related to the COVID-19 outbreak;
- the Coronavirus (COVID-19) Response – ICT Case Repository;
- the ITU/World BANK/World Economic Forum/GSMA call for action;
- the African Telecommunications Union call for harmonized action and other related material produced by ICT regulatory associations.

It would be impossible to summarize all of this valuable work in this report , but it is important to examine the key policy, regulatory, economic, technical, commercial and societal issues relating to the telecommunication/ICT sector and its broader economic/societal significance. Such an examination brings to light a positive aspect of the pandemic: the fact that it fostered national, regional and international cooperation and collaboration within the sector and from the sector more broadly to address the complex interdisciplinary challenges posed by the COVID-19 pandemic. In the wake of the pandemic, that cooperation and collaboration will need to be nurtured and well supported.

3 ITU, *ITU Guidelines for national emergency telecommunication plans* (Geneva, 2020).
4 The REG4COVID platform, available at https://reg4covid.itu.int/.

3 2020: The year of the pandemic

3.1 Early ITU analysis: summary of *Pandemic in the Internet age*

In June 2020, the ITU published *Pandemic in the Internet Age* (hereafter the ITU COVID 1.0 paper), an analysis of the initial telecommunication sector response to the COVID-19 pandemic issued as a discussion paper for the twentieth edition of the Global Symposium of Regulators (GSR-20), the first to be held virtually. The paper was divided into three sections: immediate responses to the pandemic; initiatives deemed to have helped facilitate global recovery; and speculation about what the "new normal" would be. It suggested timelines for each phase, although, with the emergence of the second wave, many countries have been unable to progress past the emergency phase. **Figure 1** below has been updated to reflect new developments, including in terms of contact tracing applications and the emergence of vaccines.

Figure 1. COVID-19 response timeline

COVID-19: UPDATED RESPONSE TIMELINE

	EMERGENCY (0 to 6 months)	RECOVERY (6 to 18 months)	NEW NORMAL (from 18 months)
INDIVIDUALS	• social distancing and masks mandated • move to online work, education, socializing, commerce and retailing	• embed social distancing practices • adapt to new work, education, social practices	• social distancing as new normal • wearing masks becomes fashionable • online proficiency improvement
BUSINESS/CORPORATE SECTOR	• implement work from home • adapt on-site work practices to minimize contact • pivot business to online models	• design and embed COVID-safe workplans • redesign workplaces for reduced contact and crowding • utilize QR codes and other systems for check-in	• what is better online stays online • ongoing economic weakness • new logistics and supply chains • reduced business travel
TELECOMMUNICATION OPERATORS	• manage immediate demand • provide immediate relief to customers • expand data caps • expand available spectrum and capacity	• expand infrastructure and total capacity • adapt network capacity for video content • develop superior video technologies • increase network resilience/flexibility • support vaccine distribution	• continue to build capacity and extend coverage; build extra backhaul • adapt networks to increased video traffic, improve quality and reliability • accelerate 4G/5G deployments
GOVERNMENT	• require social distancing • impose lockdowns • limit international/domestic travel • testing and contact tracing/mandate QR codes • expand medical capacity • source scarce Personal protective equipment (PPE)/vaccines • enhance social safety net/social housing • short-term fiscal stimulus • Identify gaps/affordability in mobile coverage	• cautiously adjust lockdown parameters • embed ongoing testing and tracing • assess post-emergency phase COVID-19 and need for sovereign strategic production capabilities • focus on economic efficiency • longer-term fiscal stimulus emphasizing productive infrastructure • promote collaboration among sectors • effect transformation of legacy processes	• promote economy-wide efficiency measures • embed "surge capacity" healthcare systems • accelerate action to bridge the digital divide • find efficient policy to support strategic production and storage (e.g. PPE, fuel, critical medical equipment and reagents) • focus on debt reduction
TECHNOLOGY SECTOR	• offer productivity and remote education/ working tools • track, trace outbreaks • help businesses move online rapidly • support efficient vaccine distribution	• address COVID-19 fake news • big data responses/data processing • Improve remote cybersecurity • new tools for safe public transport, workplaces, education, health	• build services on newly deployed digital infrastructure • digital ID becomes ubiquitous • mobile payments replacing money • innovation driving digital markets

Source: ITU/WPC, May 2020, updated December 2020

COVID-19 Emergency responses

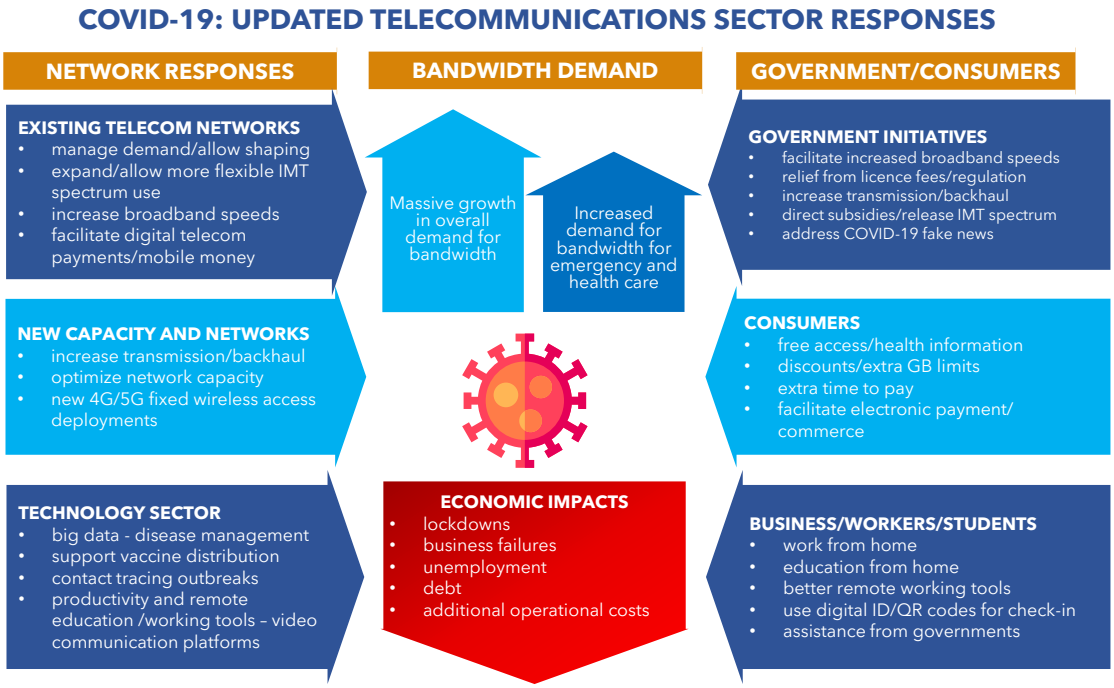
The ITU COVID-19 1.0 paper highlighted the rapid and myriad ways in which stakeholders such as governments, regulators and operators had responded to the onset of the pandemic. With nation-wide lockdowns and a dramatic increase in working from home, a key focus in the telecommunication/ICT sector was to manage increased demand for Internet services. Many operators upgraded their broadband speeds and provided free additional data allowances as people transitioned to work from home. Governments in countries such as South Africa, Ghana and Jordan released additional, temporary spectrum to MNOs, while digital platforms such as Netflix and YouTube (Google) lowered the resolution of their video content to help

manage peak network demand. Many of those strategies continue to be implemented. Some governments have extended network operators' temporary access to additional spectrum, but in the case of South Africa, for example, that spectrum will be auctioned in 2021 and not given indefinitely to operators, alleviating one of the risks raised in the paper.

Another initiative taken by operators and governments was to provide assistance to consumers so as to ensure continued access to digital services. In some countries (for example, Thailand), governments provided subsidies to consumers working from home; other governments subsidized the provision of free data allowances or other discounted benefits to ensure that people remained connected. The telecommunication sector offered discounted pricing or payment plans to consumers who had been financially affected by the pandemic, and access to free services. Microsoft, Google, LogMeIn and others provided free services or expanded time or person limits on video calls.

Figure 2 provides a summary updated to March 2021 of the key emergency responses undertaken by sector stakeholders in relation to the COVID-19 pandemic.

Figure 2. Updated COVID-19 response timeline (updated to March 2021



Source: ITU- WPC, May 2020, updated March 2021

Recovery phase

After considering different responses by stakeholders to the pandemic, the ITU COVID 1.0 paper outlined eight initiatives likely to facilitate recovery from the pandemic. Each initiative is briefly outlined below. Since the release of the paper, however, many parts of the world have been hit by a second or even third wave of COVID-19, negatively affecting the ability of governments, fixed operators, MNOs and other sector stakeholders to implement any of the initiatives.

1. Develop contact tracing apps

Although governments continue to develop tracing apps – they have now been launched in over 40 countries[5] – the apps' widespread adoption continues to be undermined by the issues of privacy outlined in the ITU COVID 1.0 paper, namely the sharing of location tracking information. For example, privacy concerns delayed the release of California's tracing app, CA Notify, developed by Google and Apple and finally launched on 7 December 2020. Its success will depend on how many people download it, which has been a challenge in other states.[6] In other countries, too, concerns about privacy and data protection have often resulted in lower-than-expected uptake of such apps, which have proven to be less than ideal in providing robust electronic support to traditional public health contact tracing.

2. Accelerate the assignment of available globally harmonized IMT spectrum

The pandemic has resulted in many people being more homebound than ever before, and this has created new demands to allocate IMT spectrum to support higher bandwidth, greater speed and capacity, and improved quality of service and quality of experience. The counties that have allocated more IMT spectrum are arguably better prepared to minimize the adverse impacts of the pandemic and its associated social distancing rules.

3. Accelerate 4G/5G deployment and the transition from legacy 2G/3G networks

To further support the demand for online services created by the pandemic, the transition from legacy 2G/3G to 4G/5G services needs to be accelerated. The transition should receive governmental and regulatory support, as it will provide significant additional wireless broadband capacity and bandwidth, but the industry is already in a position to take the requisite action.

4. Deploy fixed wireless access and complimentary/substitute broadband networks

This measure was recommended in the ITU COVID 1.0 paper to augment coverage and capacity in cities and urban areas subject to social distancing measures. Fixed wireless access services are valuable not only because they ensure quick delivery, shared costs and affordability, but also because they support multi-modal sector competition. This benefits consumers and businesses in both developed and emerging markets. Large, rapidly growing urban areas in developing countries typically have congested bandwidth. Fixed wireless access services are a way of responding to the emergency demands created by the pandemic and of bringing forward the much-needed expansion of broadband capacity in these high-traffic areas.

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5 Data Protection Report [blog], Norton Rose Fulbright.
6 Rachel Sandler, California Launches Covid-19 Tracing App from Apple, Google, *Forbes* (7 December 2020).

5. Facilitate innovative and future technologies to bridge the digital divide

The pandemic has focused attention on the digital divide, because of the essential nature of fixed and mobile broadband service coverage when shelter-in-place or other rules are imposed. As a result of the pandemic and its resurgence in many parts of the world, schools have shut down, students are learning from home, parents are teleworking and even medical consultations have moved online.

6. Combat misinformation and COVID-19

Misinformation, false reporting and conspiracy theories continue to be of concern. Conspiracy theories linking COVID-19 and 5G, while false, are nonetheless prevalent online. Governments and operators must work to ensure that accurate and authoritative information is made available and shared to combat misinformation.

7. Cybersecurity mechanisms

As highlighted in the ITU COVID 1.0 paper, working from home comes with cybersecurity risks such as malware infections, unauthorized access, data security breaches and the use of insecure devices. In 2020, this resulted in an increase in phishing and other cyberattacks.[7] As discussed below, it will be critical going forward to put in place robust cybersecurity mechanisms. With businesses in certain countries returning to the office, new security concerns will arise. For example, there may be new faces in the office, so it is important that people can tell staff apart from unauthorized personnel.[8]

Big data responses/data processing

The ITU COVID-19 1.0 paper suggested that big data be used to discover patterns in virus outbreaks and the relationship between individual behaviour and the probability of infection. To say that COVID-related work in this field is ongoing is an understatement.

The new normal

The third section of the ITU COVID 1.0 paper made a series of predictions about the trends and technologies that might help societies adapt to the new normal. In many countries, however, the transition to the new normal has been hampered by the resurgence of the virus after the initial restrictions were lifted. A review of the key factors listed in Section 4.1 of the ITU COVID 1.0 paper prompts the following observations:

- The resurgence of the virus has meant that working from home, webinars and online shopping remain commonplace and will likely persist until a vaccine is administered to a large majority of the population.
- Contact tracing apps are far from ubiquitous: the issues of privacy outlined in the ITU COVID 1.0 paper continue to hinder their widespread adoption. Neither Canada nor the United States, for example, has a nationwide tracing app, which undermines effectiveness and gives rise to interoperability issues.
- As predicted, the digital divide has received increased attention, particularly when students returned to remote learning during second lockdowns. For example, a December 2020

[7] INTERPOL, INTERPOL report shows alarming rate of cyberattacks during COVID-19 [webpage] (4 August 2020).

[8] The ITU CYB4COVID webpage provides useful information on cybersecurity initiatives and the measures applied by different stakeholders

Microsoft survey of 5 000 teachers in the United Kingdom found that only 1 per cent of primary state schools were able to provide devices that pupils could take home, compared with 38 per cent of their private counterparts.[9] Figures in developing markets are even more concerning.[10]

The ITU COVID 1.0 paper also discussed the facilitation of more advanced smart city initiatives as a means of creating new jobs and more efficient, inclusive cities that could help mitigate the impact of the pandemic. IoT applications and smart sensors can transform various aspects of city management, while blockchain and artificial intelligence can be used to encourage the creation of new small and medium-sized enterprises and increase employment. Over 100 cities are currently implementing the United 4 Smart Sustainable Cities key performance indicators worldwide, including Riyadh, Moscow, Aalesund, Valencia and Dubai.[11] The ASEAN Smart Cities Network, which was launched in 2018, has been given new impetus as a result of the COVID-19 pandemic.[12]

Section 4.3 of the ITU COVID-19 1.0 paper noted that the move to a digital economy, which had already been a priority for many governments, would continue to accelerate, with increased investments in digital infrastructure as a way to mitigate the economic losses that resulted from lockdowns. Lastly, the paper noted the potential impact of the pandemic on competition in the telecommunication and digital sectors. In 2020, digital platforms grew dramatically in terms of market share and profitability, shifting the balance of market power between telecommunication operators and over-the-top services. The full impact of this shift, and the regulatory responses to it, are still to be seen. However, it is reasonable to say that 2020 marked a turning point, with almost all national governments in the developed world having reached a largely bipartisan consensus that a range of regulatory interventions are necessary. While other jurisdictions, particularly the EU, but also Australia, have taken various measures in the past few years, the United States has only recently appeared to reach a bipartisan position that change is needed.

3.2 Assessment of new emergency and other initiatives on REG4COVID and beyond

While the great majority of new COVID-19 emergency and other initiatives notified on the REG4COVID website since May/June 2020 mirror earlier COVID-19-related ICT initiatives (e.g. providing additional bandwidth, increasing data limits, allowing more flexible IMT spectrum use, more flexible network management, etc. – see Appendix A), new categories have been notified. They include the following:

- **Assistance with COVID-19 contact tracing.** Although the ITU COVID 1.0 paper identified contact tracing as a likely part of the recovery phase, the rolling waves of the pandemic have made it more critical in many countries, where it now forms part of the emergency response.
- **Support for online education initiatives** to accelerate remote learning and minimize disruption to students, while also addressing the digital divide (see Appendix B). Efforts in this area have been lent greater urgency as the pandemic continues for much longer

[9] Microsoft, New report spotlights "inadequate" access to technology in English schools [blog post] (4 December 2020).
[10] See section 6.6 below.
[11] ITU, Fourth Meeting of the United for Smart Sustainability Cities Initiative [webpage] (3 October 2019).
[12] Deepakshi Rawat, Has COVID-19 accelerated smart city initiatives in Indonesia? *The Jakarta Post* (23 July 2020) and ASEAN Smart Cities Network [webpage], ASEAN.

than originally expected. The risk of harm to children and young people is rising and the impact on the current cohort of students could be long-lasting.

- **The adoption by markets worldwide of more ambitious digital strategies and plans** covering a wider range of digital policies, local ICT innovations, civil society issues such as human rights and COVID-19-related laws.

What is not stated in the REG4COVID database but is critical to acknowledge is that, while some countries have made temporary IMT spectrum available to help meet immediate demand for mobile bandwidth, many (with some exceptions such as France) have continued or accelerated their release/auction of IMT spectrum even during the pandemic. As a result, at the end of 2020, 300 5G licences had been issued globally. Likewise, between November 2019 and December 2020, the number of operational 5G networks launched worldwide more than doubled, from 51 networks in 27 countries/territories to 135 networks in 58 countries/territories. A total of 238 MNOs now hold licences issued for 5G bands worldwide.[13]

Fixed operators and MNOs in developed country markets, and now more globally, have acknowledged the need for additional bandwidth and the importance of more efficient spectrum use; they have brought forward plans to variously deploy more fibre and accelerate the move to 4G/5G.[14]While a number of operators are facing short-term negative pressure on revenues in the current economic conditions,[15] in parallel with an increase in costs (due to additional traffic volumes) as a result of COVID-19, they also have growing confidence in positive structural change in the long-term demand for broadband services post-2021.

Importantly, their investment plans have been accelerated by structural change in the sector, where the capital needs of new deployments are being met from non-operator sources. As recently stated by Analysys Mason:

> Non-traditional players will increasingly own telecoms infrastructure**.** There will be more structural separation in fixed networks, with many operators divesting fibre assets and with private equity investors piecing together wholesale FTTH networks. At the same time, web-scale companies [digital platforms] will expand their investments in international data centre interconnect, including undersea cables. Finally, owners of passive infrastructure such as telecoms towers will be looking to move up the value chain, including into interconnect and edge computing.[16]

Arguably it goes further, with companies like Digital Colony now becoming one of the world's largest digital infrastructure investment firms. Digital Colony concentrates its investment efforts on the four key segments of mobile and Internet infrastructure: towers, data centres, small

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13 Global Mobile Suppliers Association, Networks Technology Spectrum database (update November 2019), and End of 2020 [webinar] (December 2020) https://gsacom.com/paper/5g-networks-technology-spectrum-database-update-nov-2019/.

14 See Ian Fogg et al., The Mobile Future: Predictions for 2021 and Beyond, Opensignal, 21 December 2020: "Mobile users' appetite for 5G will cause operators to work with regulators to move towards switching off 3G services on existing spectrum bands to increase the capacity available for more efficient 5G technology... But operators will need to be careful not to open up digital divide issues in markets where mobile users lack modern 4G or better hardware and continue to use older 2G or 3G handsets."

15 Roaming and prepaid revenues in particular were affected, especially in markets dependent on tourism. For example, Thai MNOs are showing a drop of over 7 per cent in revenues (see AIS reports Q3 revenue decline on pandemic, *Bangkok Post* (7 November 2020)). Other markets have rebounded, however. For example, on 27 November 2020 Axiata Group reported third-quarter revenue increases for all operating companies in Bangladesh, Cambodia, Indonesia, Malaysia and Sri Lanka, the only exception being its operating company Ncell in the Republic of Nepal**.**

16 Analysys Mason Research, *Telecoms, media and technology predictions for 2021* (London, United Kingdom, December 2020), p. 3.

cell nodes and fibre. It actively manages 15 portfolio and affiliated companies, comprising around 350 000 tower sites, more than 35 000 small cell nodes, more than 95 data centres and a fibre network of more than 135 000 route miles. Similarly, Asian tower companies such as the edotco Group, headquartered in Kuala Lumpur, Malaysia, are extending the services they provide. For example, edotco recently converted its tower company licence in Pakistan to a telecommunication infrastructure provider licence and is extending its service offerings in Myanmar.

In Europe, MNOs are separating their towers into legally separate business entities that will be listed on exchanges (e.g. the spinning off of Vantage Towers[17] from the Vodafone Group). Although it was announced pre-COVID in 2019, the strategy adopted by the Vodafone Group was actioned in the middle of the pandemic.

3.3 Second-wave analysis: Summary of ITU's recent COVID-19 research and data

ITU maintained a strong focus on global telecommunication/ICT sector responses to the COVID-19 pandemic throughout 2020 and into early 2021. Below are some examples of its research and guidance.

3.3.1 COVID-19 impact on the digital economy: ITU roundtable of economic experts

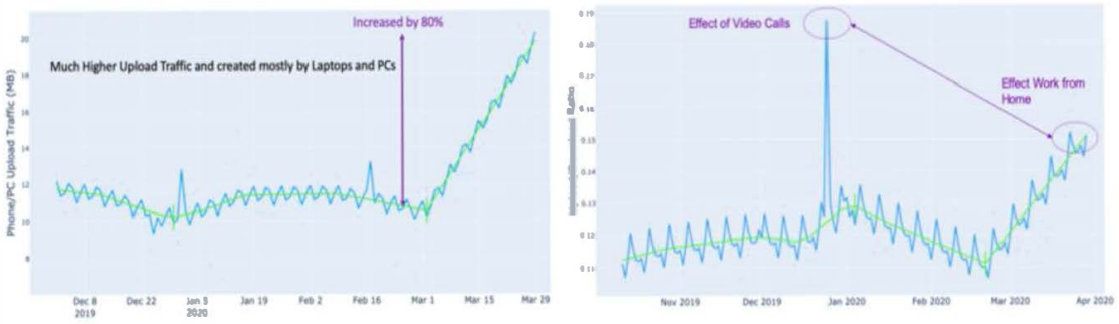
The report entitled *Economic impact of COVID-19 on digital infrastructure*[18] presents the views of a number of economic experts meeting at a roundtable organized by ITU. The experts' views can be summed up as follows:

- The economic recession will continue to exert an impact on industries, such as telecommunications, in the digital economy.
- The pandemic has led to a spike in telecommunication network usage, which telecommunication networks have exhibited resilience to.[19] Accessible ultra-broadband technologies such as FTTH appear better able to respond to these spikes in broadband traffic. It is considered this spike will become a fixture of the future.
- Wi-Fi capacity has been stressed by an 80 per cent increase in uploads to cloud computing platforms, requiring additional spectrum to be assigned for unlicensed use (see **Figure 3**).
- The pandemic has impacted the financial performance of digital infrastructure companies. Telecommunication operators could report annual negative revenue of up to 10 per cent. Some services will require 18 to 24 months to return to pre-COVID-19 levels.[20]
- Increases in traffic have led to accelerated capital expenditure to expand capacity. However, spending related to network modernization has been postponed, especially in emerging countries.
- Looking to the future, alternative sources of funding may fill the gap that could emerge from governments or development finance institutions.
- In terms of industry structure, current conditions in the digital economic sector could lead to industry consolidation, placing particular stress on low-cost carriers. The changes

17 See Vantage Towers press release of 24 July 2020.
18 ITU, op. cit., note 3.
19 Guilio Sinibaldi, *COVID-19 is revolutionizing digital communications and testing providers' reliability and ability to innovate* (Analysys Mason, United Kingdom, April 2020).
20 Delta Partners, *Outlook for telecom operators post COVID-19. Global telecom executives survey* (May 2020), p. 8.

in industry structure pose a risk to the sector's ability to enhance social and economic resilience, leading to a strong need for government protection.

Figure 3. Global growth in Wi-Fi traffic (December 2019–April 2020)



Source: ITU, see note 3.

The capacity of digital infrastructure to enhance social and economic resilience during a pandemic: Social resilience and the digital divide

A core challenge to social resilience in the face of the pandemic is the digital divide, which limits the positive contributions of digitization to social recovery from the pandemic. The underlying premise of the report's analysis is that the digital divide would be narrowed if the issues holding up digital infrastructure investment were resolved. The digital divide results from poor coverage in terms of data services, slow and/or unreliable services, unaffordability of services and digital literacy weaknesses. Overall, the effects of the digital divide will exacerbate the limits to distance learning, telecommuting and social resilience.

Economic resilience

The experts agreed on the capability of digital infrastructure to support the production and distribution of goods and services under economic resilience. While supply chains have been fairly resilient (thanks to digital technologies), the limited digitization of companies, particularly small and medium-sized enterprises in emerging economies, hinders their ability to adapt to digital disruptions. This situation is exacerbated in developing countries, where connectivity, coverage and business digital literacy are higher barriers than elsewhere. While governments have been actively deploying policies to augment the resilience of digital infrastructure, the broader policy tenets of the digital economy need to be more widely and proactively implemented.

Recommendations to policy-makers and regulators for increasing the capacity of digital infrastructure so as to mitigate pandemic disruption

From the policy and regulatory perspective, the roundtable experts made recommendations for increasing the power of digitization to mitigate pandemic disruption by re-examining the basic fundamental premises underpinning the digital sector before COVID-19. The pandemic has highlighted critical existing policy shortfalls, such as the failure to enable critical infrastructure deployment. It has also exposed the importance of digital infrastructure and the costs of the digital divide. The experts recommended that governments use the opportunity provided by the pandemic to digitalize their economies as follows:

- Support the development of a digital economy through short-term measures by addressing immediate sector needs (e.g. release emergency spectrum, defer licence fee payments or issue technology-neutral licences).
- Support development through longer term measures (e.g. new regulatory frameworks, emerging shared ICT infrastructure models and digital resilience plans) to address future pandemic disruptions.
- Governments should take a much broader, holistic view of investment in high-speed broadband networks, given the economic, social and environmental benefits.
- Prioritize bridging the digital divide by, for example, investing in bankable rural business models and broadband connectivity.
- The roundtable experts further viewed COVID-19 as providing a window of opportunity for governments to drive digital transformation in sectors such as production.

3.3.2 Connect2Recover

Connect2Recover is a global ITU initiative that aims to help countries recover from COVID-19 by expanding access to affordable and reliable connectivity (see **Figure 4**). The first webinar, on identifying country-level connectivity gaps and building resilience to future pandemics, was held on 15 March 2021. Further reports will be delivered later in 2021.

Figure 4. The Connect2Recover initiative

The Connect2Recover initiative

The objective of Connect2Recover is to provide the means of utilizing digital technologies such as telework, e-commerce, remote learning and telemedicine to support COVID-19 recovery efforts and preparedness for the "new normal" (and potential future pandemics). It further aims to prevent the spread of COVID-19 infections while maintaining socio-economic activities.

In the words of the ITU Secretary-General, "The ITU, and the wider international community, is transitioning from aiding countries with their immediate response to COVID-19, to helping countries prepare for and adjust to a 'new normal'."

In achieving this, Connect2Recover seeks to improve connectivity by developing resilient broadband networks. The initiative enables ITU to continue reinforcing its core work and mission to extend connectivity to everyone, while simultaneously transitioning to COVID-19-specific response activities to aid countries.

A focus on Africa

The initiative will initially focus on Africa, to help the continent accelerate its digital transformation post COVID-19. Africa is the least connected continent and expected to be the hardest hit by COVID-19 in socio-economic terms. At the launch of the initiative on 9 September 2020, ITU noted that 21 out of the 25 least connected countries in the world are in Africa, with nearly 300 million Africans living more than 50 km from a fibre or cable broadband connection. Access to high-speed Internet thus remains out of reach for many Africans, hindering their ability to fully harness the potential of digital transformation.

Connect2Recover seeks to reinforce the ITU's long-standing efforts to accelerate digital transformation on the African continent and lay the groundwork for the achievement of long-term development goals.

How it works

The Connect2Recover initiative consists of three key elements. It will:

- develop a methodology for identifying gaps and bottlenecks in the use of digital networks and technologies at country level, to respond to and mitigate the consequences of the COVID-19 pandemic, to prepare for any similar future emergencies, and to enable recovery and readiness for the new normal;
- engage this methodology with a view to helping countries assess needs, gaps and bottlenecks, and develop strategies in line with global best practices, to support recovery efforts and the new normal;
- conceptualize and implement pilot projects to test technological solutions in line with national country strategies and policies.

Connect2Recover is expected to reinforce ITU efforts to promote digital transformation in Africa. Where appropriate, Connect2Recover may include other activities aligned with its objectives.

Source: ITU, Connect2Recover Initiative.

3.4 Other notable sector reports focusing on COVID-19 recovery

Among the many high-quality reports on the impact of COVID-19 on the sector, the A4AI Affordability Report 2020 (see **Figure 5**) is notable because its key recommendation on national broadband plans echoes a COVID 1.0 recommendation, namely that:

> The new normal means greater coverage and faster broadband speeds. As such the approximately 164 countries which already have broadband plans as listed by the Broadband Commission should review those plans, say by 2021, in order to assess

whether such plans are compatible with the new normal. As well as country coverage, the minimum broadband speed targets in such broadband plans ought to be adjusted in order to support increased demand for WFH and SFH.[21]

Figure 5. Summary of the A4AI 2020 Affordability Report

The 2020 Affordability Report from the Alliance for the Affordable Internet (A4AI) examines the state of policy progress to bring down the cost of Internet access and points to the importance of effective national broadband plans (NBPs) in providing the conditions for Internet prices to decline. The report argues that COVID-19 has shown that Internet access is not a luxury, but a lifeline. It is therefore critical that the cost of connectivity does not exclude low-income groups. USD 428 billion in additional funding is needed over the next 10 years to ensure that everyone has quality broadband by 2030. Investments must be made in digital skills, content and enabling policy frameworks.

Broadband affordability

The ITU/UNESCO Broadband Commission defines Internet affordability as "1 for 2": 1 GB of mobile broadband should cost no more than 2 per cent of average monthly income. On average, prices in low- and middle-income countries have become more affordable, moving from 7 per cent of average monthly income in 2015 to 3.1 per cent in 2019.

While declining prices can be explained in part by general improvements in technology and other efficiencies, strong government policy is key to reducing costs and making sure that Internet access is affordable for all.

National broadband plans

As of September 2020, 174 countries reported having some kind of NBP, but the quality varies. NBPs should be the result of broad consultation with a wide range of stakeholders, have clear targets (with time-limits) to address a company's most critical gaps, and come with funding commitments and a transparent review process. They can cover a range of issues, such as expanding Internet access, regulating the telecommunication market, guiding e-government services and fostering a digital economy.

NBPs should set ambitious targets for ICT development. Although NBPs focus on different things depending on the context, common objectives are expanding access in rural areas and building out 3G, 4G or 5G networks. NBPs need to balance aspiration and implementation, and are more likely to be effective if they are subject to regular review. NBPs also need to define the roles of the public and private sectors, and create a collaborative relationship between the two. For this reason, broad consultation and strong transparency practices are critical in forming and executing an NBP.

Malaysia, Colombia and Costa Rica have exemplary NBPs that identify transparent and measurable policy targets to create accountability and set out a roadmap to improve performance. One reason for the NBPs' success was that they were the product of consultation. NBPs positively correlate with greater Internet affordability, as they can guide infrastructure and public investment, and generate market competition. NBPs also give the private sector confidence to plan on a longer-term basis and invest in coverage. This certainty also helps to lower Internet costs. Countries with an NBP that identifies clear, time-bound targets and activities for reducing broadband costs and increasing penetration tend to have lower Internet prices relative to average income.

Source: A4AI, 2020 Affordability Report.

[21] ITU, op. cit., note 3, p. 33.

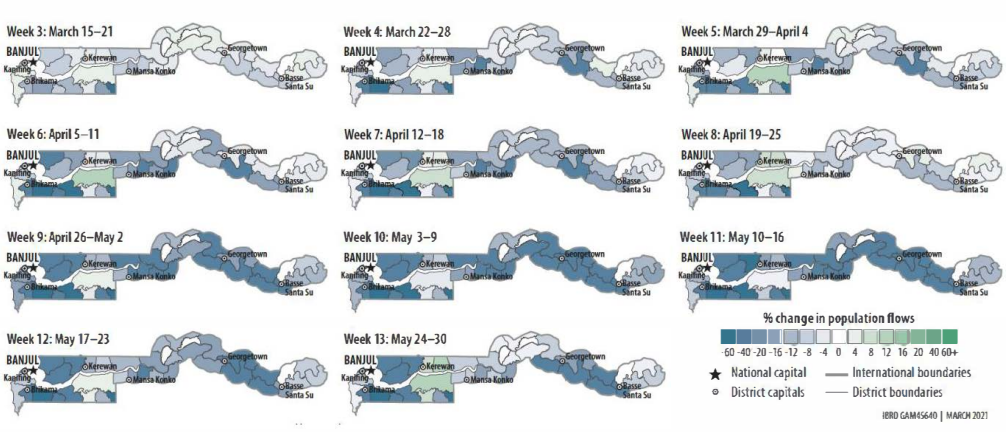
3.5 New developments in the second wave

3.5.1 Summary of initiatives

As the pandemic persisted throughout 2020, governments, regulators, operators and NGOs/non-profits continued to develop and implement initiatives to assist citizens and consumers (see **Figure 6**). Many of the survey responses that were received subsequent to the release of the ITU COVID 1.0 paper described initiatives similar to earlier ones, such as the granting of additional spectrum to operators, increasing broadband capacity, discounting services and providing free access to online health services and e-learning.

Figure 6. Case study in Gambia: use of private intent data in response to the COVID-19 pandemic

Policy-makers in Gambia were able to review maps showing the movement of people across administrative boundaries from March to May 2020, using aggregated CDRs to track mobility week by week during COVID-19 lockdowns in the country.



Disclaimer: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of ITU and of the Secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Source: Erwin Knippenberg and Moritz Meyer, The hidden potential of mobile phone data: Insights on COVID-19 in The Gambia (World Bank blogs, 10 September 2020). Data at http://bit.do/WDR2021-Map-O_1.

These maps helped them understand the extent to which lockdowns were succeeding in reducing movement and allowed them to identify the factors linked to lockdown compliance and non-compliance and to plan accordingly. These early efforts at repurposing CDRs to track infected individuals seemed to have a positive effect – in Gambia, the maps helped reveal that the lockdown disproportionally affected poorer districts, indicating a need for relief and recovery efforts to target these areas. In a low-income country like Gambia, smartphone penetration was only 75 per cent. The minority of the population lacking a smartphone was unable to generate CDR data and would not necessarily benefit directly from the public health protection afforded by contact tracing.[1]

[1] World Bank, ***World Development Report: Data for Better Lives*** (Washington, DC, March 2021), p. 5.

3.5.2 Digital contact tracing

The survey results showed that governments and regulators are increasingly focused on contact tracing as a means of controlling outbreaks, particularly when a vaccine is unavailable. In Pakistan, the Pakistan Telecommunication Authority has been leveraging digital technologies to trace and track patients and COVID-19 clusters. Tracing apps are now used by governments in Australia, Canada, France and Hong Kong, China, to name but a few, although issues around privacy remain.[22]

In China, MNOs have also been enlisted to help the government with contact tracing. China Unicom, China Mobile and China Telecom draw on the nationwide telecom data analysis platform developed after the COVID-19 outbreak to provide users with a list of places they have visited in the last 14 days.[23] There is growing evidence of the value of digital contact-tracing technologies (see **Figure 7**).

Figure 7. Growing evidence of the value of digital contact tracing

While many countries have deployed digital apps that attempt to identify people exposed to the coronavirus, empirical evidence that these contact-tracing apps work has been difficult to obtain. This is because most of the apps – especially those based on the Google/Apple Exposure Notification system, which uses the phone's Bluetooth signal to detect when two app users are close to each other, collect limited data to protect users' privacy. Now, studies from a few countries **show mounting evidence that apps can help prevent infections and are a valuable public-health tool**.[1]

- **Canary Islands, Spain**. In a pilot study of Spain's Radar Covid app, conducted in the Canary Islands in July 2020 and published in January 2021,[2] it was found that the app notified roughly twice the number of people exposed to simulated infections as manual contact tracing.[3]

1 Dyani Lewis, Contact-tracing apps help reduce COVID infections, data suggest, Nature, 22 February 2021.
2 Pablo Rodríguez et al., A population-based controlled experiment assessing the epidemiological impact of digital contact tracing, ***Nature Communication,*** 12(587) (January 2021).
3 Study provides first real-world evidence of Covid-19 contact tracing app effectiveness, Queen Mary University of London, 26 January 2021.

22 Recent developments in contact tracing can be found at *Contact Tracing Apps: A New World for Data Privacy* (Norton Rose Fulbright, December 2020).
23 See Masha Borak, China fights the coronavirus with mobile location data, Abacus News Bites, 14 February 2020.

- **United Kingdom**: On 9 February 2021, researchers in the United Kingdom released an evaluation of the National Health Service (NHS) COVID-19 app, which was launched in England and Wales late in September 2020. The evaluation,[1] which has not yet been peer reviewed, found that the app sent out 4.4 exposure notifications for every user who tested positive for the coronavirus and had agreed to the app notifying their contacts. That was more than twice the average of 1.8 contacts notified through manual contact tracing, although such contacts may have been notified through manual contact tracing. The team then used two methods – a mathematical model and a statistical comparison of neighbourhoods that differed in app usage – to estimate that the app might have helped to avert more than 224 000 infections between October and December 2020.[2] The NHS app has been downloaded on more than 21 million phones with about 16.5 million regular users – that is roughly 28 per cent of the population, or 49 per cent of people with compatible phones. It is estimated that every 1 per cent increase in the number of app users – above a minimum of 15 per cent – reduces the number of infections by 0.8 to 2.3 per cent. According to infectious diseases modeller Christophe Fraser at the University of Oxford, who led the evaluation, the NHS COVID-19 app also shortened the delay for close contacts to quarantine by 1 or 2 days.
- **Switzerland:** An evaluation of the SwissCovid app, published as a preprint in February 2021, found that the app boosted the number of people in quarantine in Zurich in September 2020 by 5 per cent; 17 per cent of those people tested positive.[3] Epidemiologist Viktor von Wyl at the University of Zurich, who has been evaluating the SwissCovid app, is quoted as saying that even though the numbers might seem low, the contribution is meaningful: "Averting one case now, or one transmission now, potentially prevents further transmissions downstream." He also noted that digital contact tracing is particularly effective at identifying contacts who do not live together. Von Wyl and his team calculated that non-household contacts notified of exposure by the SwissCovid app entered quarantine a day earlier than did those notified through manual contact tracing.

More broadly, researchers have identified barriers to an app's effectiveness, such as how well the app is integrated into the local health-care system.[4] Ideally, this link is automatic, as in the United Kingdom, because in the case of a surge or cluster manual processes can be easily overwhelmed.

Going forward, apps could be improved in terms of how they measure exposure risk. Joanna Masel, an evolutionary biologist at the University of Arizona in Tucson, where she is leading a pilot study of the COVID Watch app, has been saying that she would like to see apps that can predict risk of exposure according to how infectious a person is. For instance, apps could build in information about whether a user has a more infectious variant of the virus – if that information is available – or been exposed indoors or outdoors.

Finally, on 12 March 2021, a new paper was published[5] that *inter alia* models the impact of digital contact tracing in the COVID-19 pandemic. Specifically, the paper investigates how well contact tracing apps, coupled with the quarantine of identified contacts, can mitigate the spread in real environments. It highlights a key outcome: **digital tracing enables containment for moderate reproductive numbers of COVID-19 and results improve with higher adoptions of the app (which is a function of smartphone penetration, app downloads and activation). As such it may arguably be very suitable for the new COVID normal – namely post vaccine/lifting of travel restrictions.**

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1 Chris Wymant et al., The epidemiological impact of the NHS COVID-19 app, GitHub, 9 February 2021.

2 Dynai Lewis, op. cit., note 39.

3 Tala Ballouz et al., Digital proximity tracing app notifications lead to faster quarantine in non-household contacts: results from the Zurich SARS-CoV-2 Cohort Study, MedRxiv, 23 December 2020.

4 Vittoria Colizza et al., Time to evaluate COVID-19 contact-tracing apps, nature medicine, 27: 361–362 (2021).

5 G. Cencetti et al., Digital proximity tracing on empirical contact networks for pandemic control was published, ***Nature Communications*** 12 (1655) (2021).

3.5.3 Extension of temporary initiatives

Another development since the ITU COVID-19 1.0 paper was issued is the duration of government and operator initiatives. Some have been extended as the pandemic continues, such as in South Africa, where temporary spectrum access has been extended from 30 November 2020 until 31 March 2021. This reflects the unanticipated longevity of the pandemic. Other initiatives that may need to be extended include the discounting of services and relaxed payment terms by operators, as the pandemic continues to negatively affect employment rates and financial security.

Finally, NGOs and non-profits responded to the ITU survey, listing initiatives such as offering policy advice and mobilizing services to educate communities on COVID-19. For example, the World Wide Web Foundation, a non-profit organization founded in the United States but based in Switzerland, has introduced a set of policy briefs that seek to combat misinformation, increase Internet access worldwide and promote the use of data in a way that combats the spread of COVID-19 without breaching privacy laws. Initiatives of this kind are likely to continue as non-profit organizations seek to shape government responses.

Regional regulatory associations[24] have also played an important role in sharing information and promoting successful approaches.

3.5.4 Digital supply chains in relation to COVID-19 vaccines

Even as COVID-19 vaccines have begun to be administered, the logistics of vaccine distribution globally remain daunting. Vaccines need to be stored at certain temperatures to be useable.

For example, the Pfizer/BioNTech vaccine needs to be stored at -70°C and is viable at standard refrigerator temperatures for up to five days only. This can present a significant logistical hurdle for distribution. Moreover, a diluted vial can be kept for only six hours before it must be discarded.[25] The Moderna vaccine is slightly less challenging in terms of transport and temperature: it is stored frozen at -20°C, but it keeps for a month at refrigerator temperatures.[26] The Gamaleya vaccine (Sputnik V) typically requires storage at -18°C but can be stored at 2-8°C for a month if freeze-dried.[27] In contrast, the Oxford-AstraZeneca, Sinovac (Coronavac)[28], Novavax (authorization pending) and Johnson & Johnson COVID-19 vaccines require standard refrigeration.[29]

The United Nations recommends that governments consider the following when deploying COVID-19 vaccines, to avoid wastage and diversion: "assuring adequate storage capacity and conditions with a reliable cold chain adapted to the vaccines requirements, ensuring stock security, and deploying digital solutions to strengthen in-country supply chains and enable product track and trace capabilities".[30]

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24 A list is available here.
25 Your Questions about Coronavirus Vaccines, Answered, *Washington Post*, 21 December 2020.
26 Ibid.
27 Sputnik V can be stored at 2-8 degrees Centigrade for two months, developer says, TASS, 5 February 2021.
28 The potential vaccine could remain stable for up to three years in storage, which might offer Sinovac some advantages in vaccine distribution to regions where cold-chain storage is not an option (China's Sinovac coronavirus vaccine candidate appears safe, slightly weaker in elderly, Reuters, 7 September 2020).
29 Yvette Tan, Covid: What do we know about China's coronavirus vaccines? BBC News, 14 January 2021.
30 United Nations Development Fund, Supply Chain Management – COVID 19 Vaccines/Immunization Programme for Inclusion in the Health Procurement and Supply Chain Management (PSM) Roster of Experts and Senior Expert Consultants – UNDP Global Fund – Health Implementation Support.

Technology that monitors shipments and tracks vaccine location, temperature, humidity, vibration and acceleration could be critical to ensuring that COVID-19 vaccines are not rendered ineffective. Pfizer/BioNTech has created GPS-tracked coolers filled with dry ice for distribution (see **Figure 8**). Other companies (e.g. Cloudleaf) sell technology for monitoring shipments of vaccines. They use sensors attached to containers to track vaccine location, temperature, humidity, vibration and acceleration.[31] Similarly, Varcode, an Israeli start-up that makes smart tags that measure tags and temperature, has seen sales increase rapidly. The smart tags can track products throughout the supply chain.[32] Such technology, which harnesses IoT technologies, can be used to ensure vaccine efficacy, reduce waste and potentially save money.

Governments must begin to plan supply-chain logistics and service-delivery models, and to select administration sites. Their distribution plans will vary based on the storage and temperature requirements of the vaccine being provided, which could change as different vaccines are developed with potentially less onerous storage requirements. Each government's particular distribution considerations will also vary based on geographic conditions and population distribution. Even in developed, largely urban populations, distribution is an immense challenge: the transport and distribution of COVID-19 vaccines is considered the largest simultaneous global public-health initiative ever undertaken.[33]

In addition to vaccine distribution, it is important that governments use accurate systems to track and schedule vaccinations. As Pfizer requires two doses, the United States Government has used paper vaccine cards to remind individuals who have had their first dose when to get the second.[34] People receiving vaccinations also receive electronic notifications. For countries that have implemented digital IDs, such as India and Estonia, more advanced systems of vaccination monitoring may be possible.

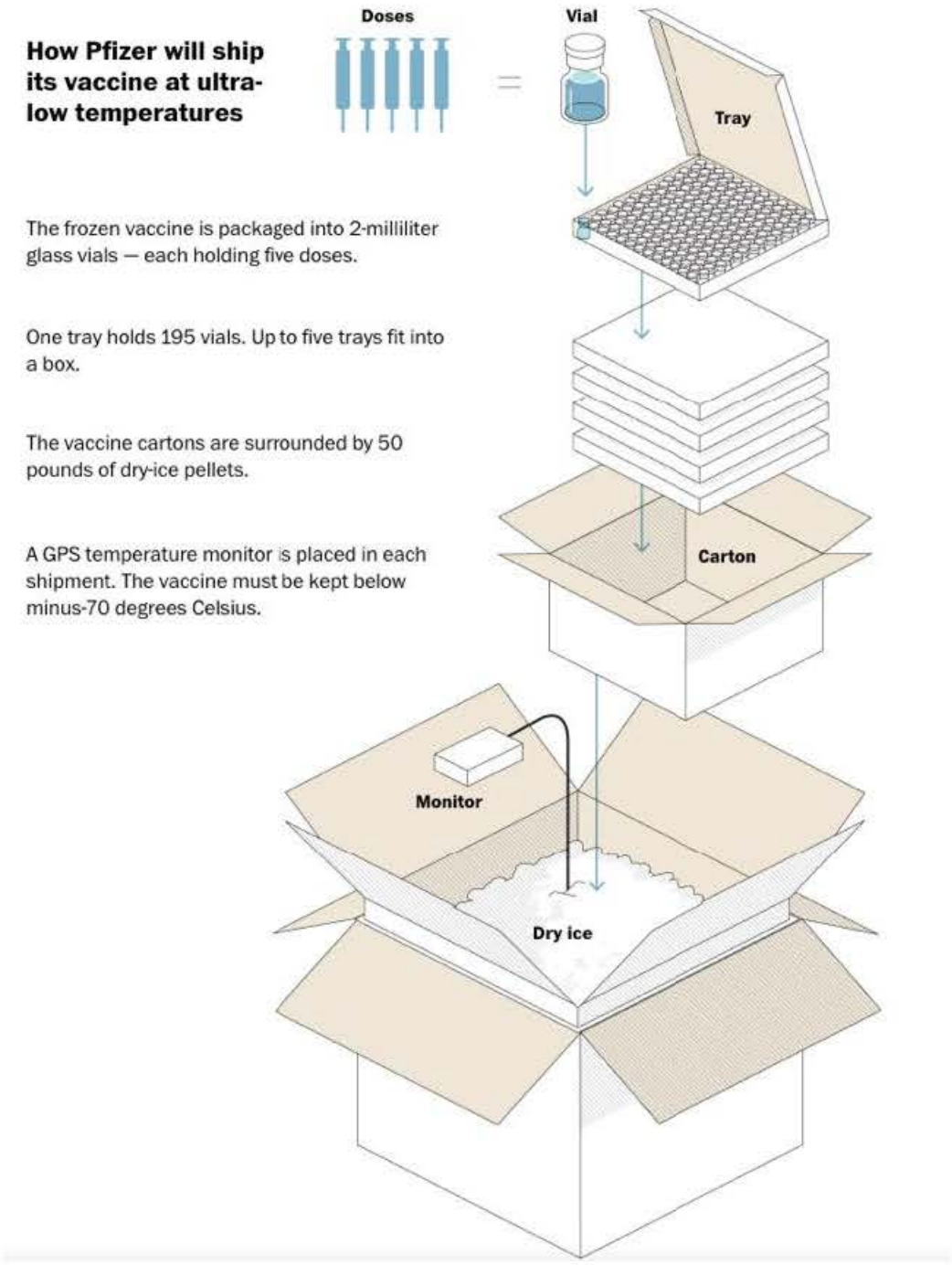
Overall, developing countries face considerable challenges, especially in rural and isolated areas, when it comes to monitoring, tracking and distributing vaccines using ICT technologies. That is why countries like Indonesia, with its large population spread over an archipelago of 17 000 islands, have developed new digital infrastructure to support their vaccination programmes (see section 6.3).

IoT-enabled cold storage to assist in the deployment of COVID-19 vaccines

IoT-enabled cold storage solutions allow greater control and tracking by transporters and storage facilities of temperature-sensitive medication. For vaccines, the ability to track temperature can help ensure confidence in integrity before dispensation, even before further testing.[35] According to WHO, in 2018, 19.4 million people across the globe lacked access to routine life-saving vaccines, partly because of the lack of efficient cold-chain systems.[36] Gricd, a Nigerian start-up founded in 2018, utilizes solar-powered, IoT-enabled mobile refrigeration boxes whose internal probes collect temperature data and transmit them to a server. Real-time information

31 Rajesh Kumar Singh, COVID Vaccine is Bonanza for Digital Supply Chain Tracking Industry, Reuters, 17 December 2020.
32 Ibid.
33 McKinsey Global Institute, *The COVID-19 Vaccines are here: What comes next?* (9 December 2020).
34 Bill Chappell, Vaccine Cards and Second-Dose Reminders are Part of Warp Speed's Immunization Plan, NPR, 3 December 2020.
35 World Bank, op. cit., note 37, p. 107
36 WHO, *The Global Vaccine Action Plan (2011–2020): Review and Lessons Learned,* report WHO/IVB/19.07, Strategic Advisory Group of Experts on Immunization (Geneva, 2019).

Figure 8. How Pfizer/BioNTech will ship the vaccine at ultra-low temperatures



Source: Your Questions about Coronavirus Vaccines, Answered, see note 50.

on location and temperature can be accessed by transport owners online or via a mobile app for the COVID-19 vaccine, ensuring that the cold chain is effectively monitored and maintained.[37]

[37] World Bank, op. cit., note 37.

4 Emerging into the new normal

4.1 Emerging longer-term consequences of the pandemic

COVID-19 has countless impacts across the globe, but one of the broadest and most ubiquitous is to raise the general level of uncertainty regarding the future. Many nations are experiencing a second wave of cases that is dwarfing the first wave of early 2020; these new waves also involve a number of virus mutations, including the UK, South African and Brazilian strains. Although multiple vaccines have been developed in a remarkably short period of time, significant uncertainties regarding production and distribution capability remain.

It has often been observed that the pandemic has seen an enormous acceleration in the shift to the digital economy. Levels of WFH previously anticipated to be decades away were achieved in a matter of weeks. The changes may be rapid, but the extent to which they will prove to be permanent is unknown – although many analysts argue that they will remain in the new normal[38]. The future trajectory of WFH, to take just one example, is highly uncertain. Will widespread vaccination be sufficient for organizations and workers to consider central offices and traditional work patterns to be safe again? Will businesses and employees conclude that the advantages of WFH are sufficient to make it a larger feature of work in the future? All of these unanswered questions underscore the degree of uncertainty surrounding this one pandemic-related issue. This uncertainty is multiplied across many different issues and questions about the future.

What has become apparent is that a broad range of digitally mediated interactions (e.g. online meetings and webinars) have become substitutes, albeit imperfect ones, for activities that previously required groups of people to gather in proximity, with home working arrangements being perhaps the most obvious and one of the most important examples.

Given these considerations, it is clear that ICTs have an enormous role to play in helping society adapt to the dislocations of the pandemic – a role, it must be emphasized, that comes in addition to the already central part that digital technologies have assumed in driving innovation, digital disruption and economic growth and development, particularly in emerging economies. This makes it critical for national governments, regional cooperative organizations and NGOs to collaborate with industry stakeholders to ensure that digital technologies are used as effectively as possible. It is critical that these technologies be used in the best possible way to soften the economic burden caused by the pandemic and ease, to the maximum extent possible, the social dislocations associated with it.

More specifically, the digital responses to the pandemic can usefully be classified into the four categories described below (see **Figure 9** and Section 4.2 for more details).

[38] See S. Flannery et al., Mapping the new normal for telecom services & communications infrastructure (Morgan Stanley, 2020).

Addressing the digital divide

The huge shift to online activity means that social groups without affordable connectivity are now more disadvantaged than before the pandemic. The ability to participate socially and economically, to obtain education, medical and other government services, to communicate and to access e-commerce services is completely dependent on affordable connectivity.

Addressing the digital divide has important consequences in terms of economic efficiency and development, but it is primarily driven by considerations of equity, that is, providing equal access to opportunities to participate in the digital economy and society.

Driving digital deepening

As businesses and governments shift their activities online, they will require faster and higher-capacity data services. Although there may be fewer people in central business districts for some time, the demand for data will likely stay high and continue to grow strongly. Particularly in emerging economies, it will be crucial rapidly to deploy 4G/5G coverage in urban and suburban areas, in order to support pandemic-driven data demand. In contrast to addressing the digital divide, digital deepening is primarily driven by economic objectives of increased efficiency, productivity, competitiveness and growth. It is not limited to access networks; backhaul, cloud infrastructure and international submarine/satellite capacity must also be properly dimensioned for the additional load and more.

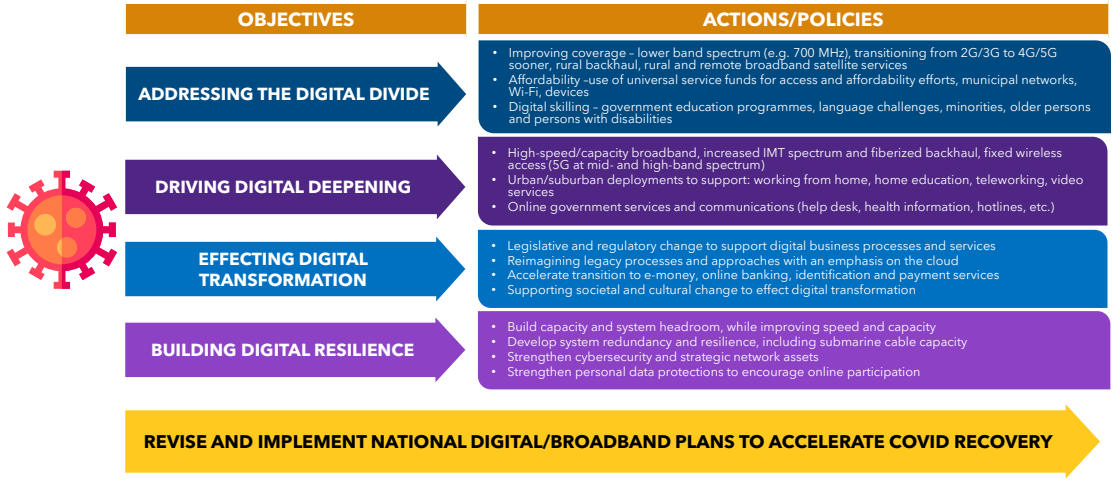
Effecting digital transformation

The shift to digital processes requires a broad digital transformation in institutions and in business and government processes, including access to health care, financial services and government services. A critical component of this shift is to improve the digital literacy of less capable groups so that they are comfortable accessing services online. More difficult, but just as important, is cultural change in societies, government and companies. This is neatly encapsulated in the case study on the challenge of eliminating the use of the hanko (判子) in Japan (see **Figure 17**).

Building digital resilience

The rapid increase in demand for services experienced at the onset of the COVID-19 pandemic means that additional capacity and resilience have to be built into telecommunication infrastructure systems and services. In a period of uncertainty, the returns for building additional "headroom" are increased. Again, building digital resilience it not limited to access networks; backhaul, cloud infrastructure, international submarine/satellite capacity and ICT systems must be properly dimensioned for present and future crises and disasters.

Figure 9. Digital responses to COVID-19



Source: ITU-WPC, March 2021

4.2 Addressing the digital divide

The digital divide was a big social and economic problem pre-COVID, but post-COVID it has become a bigger one. The shift to online working, the delivery of education and other government services online and the new emphasis on e-commerce all mean that the socio-economic penalty of not being connected has risen significantly.

Efforts by governments, operators, aid groups and NGOs are now hampered by the additional pressure on telecommunication services and operators caused by COVID-19. Responding to digital divide problems typically entails emphasizing geographic and population coverage of areas either not serviced or serviced inadequately. While the pandemic creates additional pressures and challenges, it also fosters a sense of urgency during which rapid changes can be made, such as allocating spectrum for emergency use in underserviced areas.

The challenges in emerging markets are highlighted in an Internet Society report[39] on the impact of the COVID-19 pandemic on Internet performance in three South Asian emerging markets (see **Figures 10** and **11**). A number of the case studies presented in section 6 of this report focus on this issue.

[39] Internet Society, The Impact of the COVID-19 Pandemic on Internet Performance in Afghanistan, Republic of Nepal and Sri Lanka (December 2020).

Figure 10. The impact of the COVID-19 pandemic on Internet performance in Afghanistan, Republic of Nepal and Sri Lanka

Internet Society survey: Report summary

Internet speeds in Afghanistan, Republic of Nepal and Sri Lanka have declined since the outbreak of the COVID-19 pandemic. During lockdowns in March and April 2020, there was a surge in demand for Internet use at home. The report draws on the results of an online survey conducted by the Internet Society to assess the impact of reduced performance and quality of networks on users in Afghanistan, Republic of Nepal and Sri Lanka.

Over 200 individuals answered the survey: 48 from Afghanistan, 67 from the Republic of Nepal and 87 from Sri Lanka. The respondents were predominantly male and working in various professions (government, business, self-employed, students). The report provides a country-by-country analysis of the findings and a discussion of trends found in all three countries.

Overview and cross-country trends

Around 50 to 80 per cent of users faced regular Internet performance issues during the pandemic, even though they had switched connection type or subscription plan and increased their spending on Internet connectivity.

Generally, users became more dissatisfied during the pandemic (in relation to speed, reliability and steadiness of their Internet connection, customer service and expected performance of the Internet in relation to the price paid).

About half of the respondents reduced their ratings for the speed, reliability and steadiness of their Internet connection during the pandemic, with a 15 to 30 percentage point drop in satisfaction.

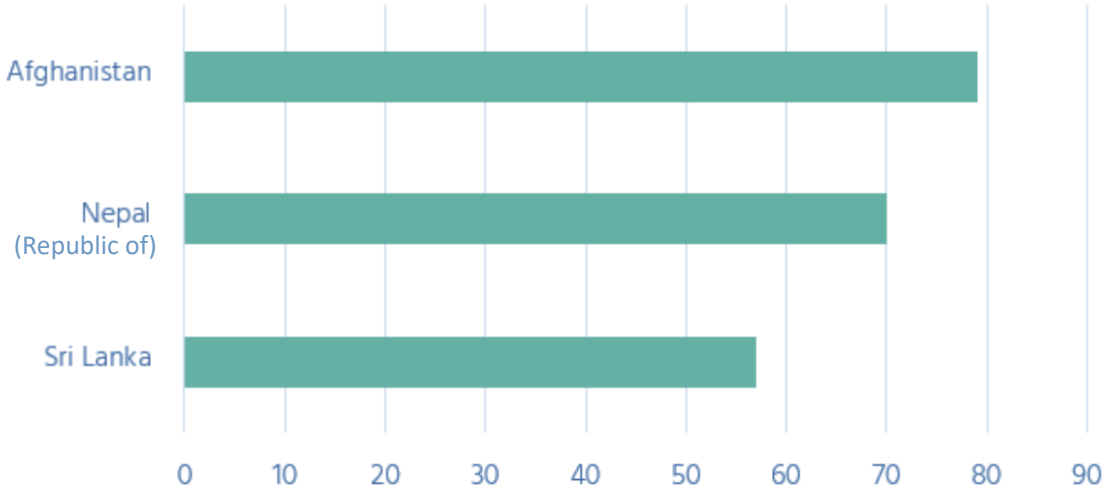
Users spent more money on their Internet connection during the pandemic, but this was more prominent in Afghanistan (over 40 per cent spent over USD 20 per month, compared to 25 per cent before the pandemic) and Sri Lanka than in the Republic of Nepal.

Most users (90 per cent) accessed the Internet with their mobile phones and/or laptops.

The primary type of home connection varied between countries.

Social networking was the most common activity in all three countries, both before and during the pandemic. Other top activities included using the Internet for work, study, information searches, over-the-top services and entertainment.

Figure 11. Percentage of respondents facing regular Internet performance issues during the pandemic



Source: Internet Society, note 65.

4.3 Driving digital deepening

The concept of "digital deepening" is driven primarily by economic considerations, the aim being to increase the efficiency, productivity and competitiveness of key economic regions, primarily the urban and suburban areas that typically drive most nations' economic development.

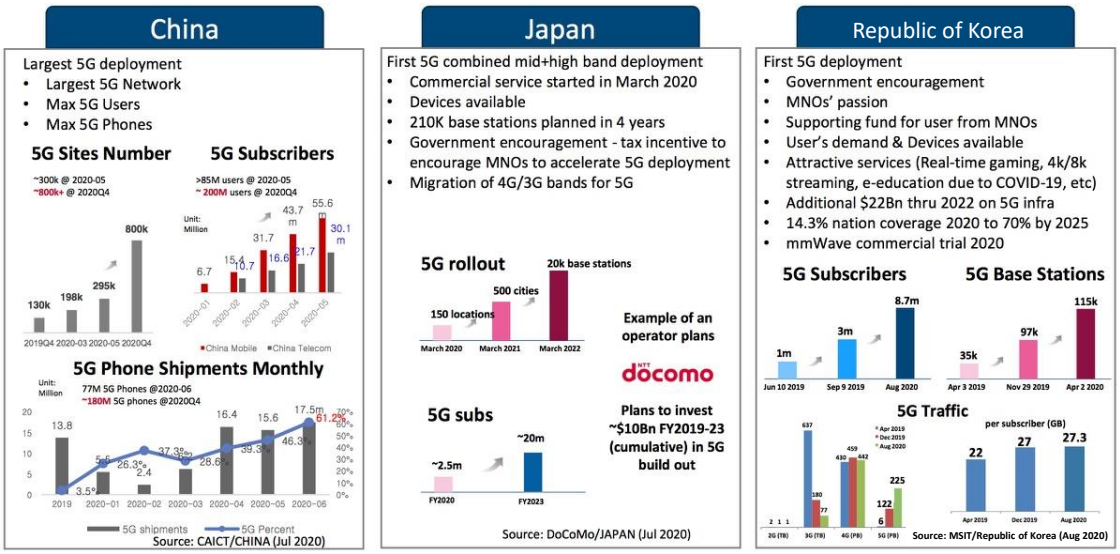
In relation to mobile services, as noted recently by the GSA, 5G continues to be one of the fastest adopted mobile technologies ever. In December 2020, 135 operators in 58 countries/territories had launched one or more 3GPP-compliant 5G services.[40] In the face of the global COVID-19 pandemic and the economic disruption that it has wrought, more spectrum has been made available for 5G, more 5G networks have been deployed by MNOs, and more compliant devices have been released. This momentum has been mirrored by the growth in 5G subscriptions globally. A short summary of initial 5G deployments in China, Japan and the Republic of Korea is provided in **Figure 12**.

Less heralded but arguably more important globally are the 806 operators running 4G/LTE networks providing mobile and/or fixed wireless access services in 237 countries/territories worldwide.[41] It is mainly these 4G/LTE networks that have permitted safe social interaction and online connectivity globally.[42] The deployment and operation of quality high-speed 4G/LTE services ensured that learning and working could take place from home and that the wheels of commerce continued to turn in 2020.

In order to make additional spectrum available for wireless services, a number of countries have fully or partly adopted the United States Federal Communications Commission decision of April 2020 to open up the 6 GHz band for unlicensed use by Wi-Fi 6 technology.[43] As at January 2021, spectrum allocations for Wi-Fi 6E had been approved in Brazil, Chile, the Republic of Korea, the United Arab Emirates, the United States and the United Kingdom (partly).[44]

40 GSA, *Webinar, End of 2020,* December 2020.
41 GSA, *Evolution from LTE to 5G*, November 2020
42 ITU, op. cit., note 3.
43 FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses, Federal Communications Commission, 23 April 2020.
44 Catherine Sbeglia, What is the status of global Wi-Fi 6E efforts? RCR Wireless News, 20 January 2021, and Brazil becomes unlicensed spectrum leader in LatAm – why it matters, bnamericas, 5 March 2020.

Figure 12. Examples of initial 5G deployments: China, Japan and the Republic of Korea



Source: HyoungJIn Choi, GSA, Conference in Indonesia 5G Roadmap and Digital Transformation, 10 December 2020, slide 20

Similarly, there have been significant increases in traffic on fixed, satellite and submarine cable networks. Globally, Internet bandwidth rose in 2020 by 35 per cent, a substantial increase over 2019's "modest" 26 per cent.[45] Driven largely by the response to the COVID-19 pandemic, this represents the largest one-year increase since 2013. Total international bandwidth now stands at 618 Tbit/s.[46]

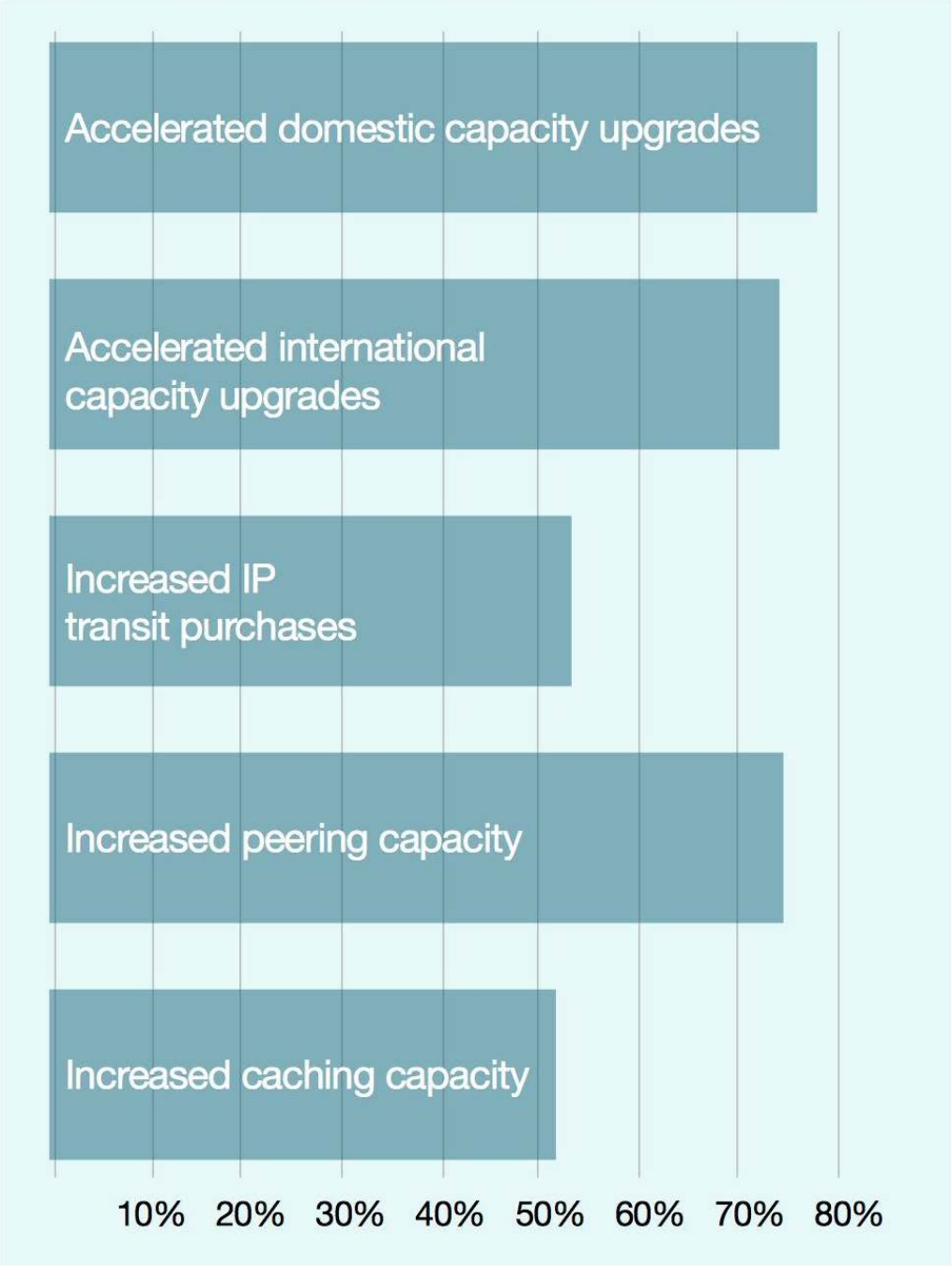
In general terms, network traffic loads had to be reconfigured because changing work patterns resulted in a dramatic increase in submarine network demand. As summarized by a key industry player at Ciena:

What we have seen with COVID-19 is that network operators are running their networks hotter, meaning they are running them closer to full capacity. They always have some spare capacity in case of spikes, this year was obviously an unplanned one, but most networks, terrestrial as well, were able to cope in the first few months of the pandemic with the networks they already had. They just ran them closer to full capacity. … That is why the Internet in many areas was bending, but never broke. There were no major outages due to too many people using the networks. There were some cases, where providers were asked to scale down their capacity – such as Netflix and YouTube in Europe – to help cope with surging demands.[47]

The key measures taken by operators in response to the effects of the COVID-19 pandemic, according to a TeleGeography survey, are detailed in **Figure 13**.

45 TeleGeography, *The State of the Network 2021*, p. 12.
46 Ibid.
47 COVID-19 Surge: "The Internet Was Bending, but Never Broke", interview with Ciena's Brian Lavallée, SubCable World, 18 January 2021.

Figure 13. Key measures taken by operators in response to COVID-19



Source: TeleGeography, 2021

4.4 Effecting digital transformation

4.4.1 Digital ID

Developing a digital economy and society requires more than simply technology, access and digital literacy. Comprehensive digital transformation also requires changes in laws, regulations, the nature of service delivery and a broad range of business and organizational processes. Adaptations are required in all these areas for the benefits of digitization to be realized. In December 2020, *The Economist* provided this example (discussed in greater detail below):

> When millions of migrant workers were required by India's sudden COVID lockdown to return to their villages from the cities where they worked, many feared the situation. But Aadhaar, the country's pioneering biometric ID system, came to the rescue. Under an income scheme for farmers launched in 2014 that would have been impossible without Aadhaar, USD 1.5 billion was transferred digitally and at speed into the bank accounts of 30 million people, with little waste or fraud and almost no distribution cost. Because 1 billion accounts are linked to people's Aadhaar identity numbers, India has been able to channel help to where it has been most needed with remarkable efficiency .[48]

Figure 14 shows how transformative digital ID,[49] a key enabler for a broad range of services, can be. Furthermore, digital ID technologies can be deployed rapidly and cheaply even in emerging economies. In addition to ID and payment services, they can be used for vaccine credentialing.

[48] Questions of Identity: Covid-19 Spurs National Plans to Give Citizens Digital Identities, *The Economist*, 8 December 2020.

[49] The principles of digital ID comprise three pillars established globally in 2017. **Pillar 1. Inclusion:** (i) Ensure individual access for individuals, free from discrimination; (ii) Remove barriers to access and use; **Pillar 2. Design:** (iii) Establish a trusted – unique, secure and accurate – identity; (iv) Create a response and interoperable platform; (v) Use open standards and prevent vendor and technology lock-in; (vi) Protect privacy and agency through system design; **Pillar 3. Governance:** (viii) Protect personal data, maintain cyber security and safeguard people's rights through a comprehensive legal and regulatory framework; (ix) Establish clear institutional mandates and accountability; and (x) Enforce legal and trust frameworks through independent oversight and adjudication of grievances. For more information, see https://id4d.worldbank.org/principles.

Figure 14. Electronic payment cards/ID cards

Electronic payment cards/ID cards

Nowadays, accessing government services, opening a bank account, obtaining formal employment and other essential activities require individuals to show proof of identity. The need for secure ID has been heightened by the pandemic, with ID required to receive welfare benefits and obtain health care and other government services. However, currently 1 billion people have no formal proof of identity, and almost one half of women in low-income countries do not have an ID, precluding their meaningful participation in the economy and society more broadly.[1] The issue of secure proof of identity is the focus of the World Bank's Identification for Development (ID4D) Annual Report and is reflected in target 16.9 of the Sustainable Development Goals (By 2030, provide legal identity for all, including birth registration).

Digital IDs can grant access to goods and services, protect rights and increase transparency.[2] They can be authenticated remotely through a digital channel, allowing full participation in a digital economy. The benefits of digital ID extend beyond government responses to the pandemic, although COVID-19 has undoubtedly spurred interest in creating an ID that can be verified remotely. Digital IDs also lead to increased efficiencies across a range of relationships**.**

According to McKinsey Global Institute, a good digital ID could unlock economic value equivalent to 3 to 6 per cent of GDP on average by 2030.[3] Of that value, it is estimated that 65 per cent would accrue to individuals in emerging economies, and about 40 per cent in mature economies.[4] Despite these benefits, digital IDs have had a mixed reception. Roughly 1.2 billion people with digital IDs live in India alone, yet programmes in countries such as Nigeria and the United Kingdom have achieved only low coverage levels.[5] Three countries that have implemented successful digital ID programmes – Estonia, India and Indonesia – are considered below.

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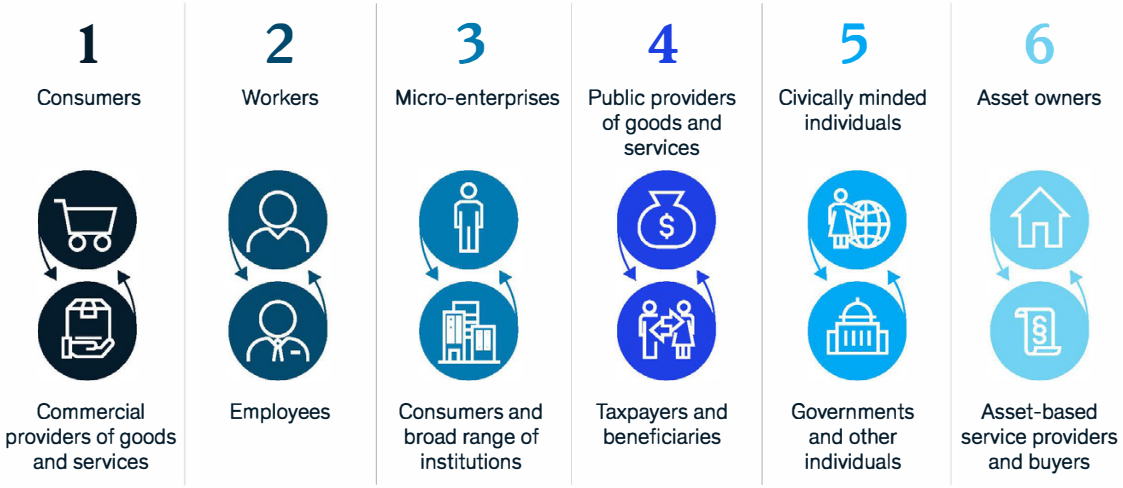
1 World Bank, *Identification for Development (ID4D) 2019 Annual Report* (Washington, DC, 31 December 2019).
2 Olivia White et al., *Digital Identification: A Key to Inclusive Growth* (McKinsey Global Institute, 17 April 2019).
3 PrivyID, 4 Elements of Good Digital ID, Explained [blog post], 28 June 2019.
4 Ibid.
5 Olivia White et al., op. cit., note 79.

It is important to emphasize that not only does digital ID provide enhanced access to a range of government services, it can also significantly improve economic participation through access to digital financial services. **Figure 15** illustrates the sources of the benefits arising from interactions between different groups in the economy that are enabled by digital IDs. Governments have many roles to play and much work to do in adapting laws, regulations and processes so that they can be executed in the digital domain. As emphasized above, these changes generate significant social and economic benefits.

Figure 15. How individuals use digital ID to interact with institutions and create shared value



Example use cases associated with each role

1	2	3	4	5	6
• Streamlined registration and authentication • Secure digital payments • e-KYC[1] for financial services	• Facilitated talent matching • Automated background verification • Efficient payroll services	• Formalized business registration • High-assurance contracting and transacting	• Streamlined e-government services • Digital tax filing • Direct disbursement of government benefits	• Online voting • Verification of political donations • School enrollment	• Formalized land ownership • Facilitated sales and purchases

Source: Olivia White et al. (see note 79)

India

Aadhaar, a 12-digit unique number issued by the Unique Identification Authority of India, is the world's largest biometric ID system. It has been used to pay public subsidies and unemployment benefits,[50] the funds being transferred directly to a bank account that is Aadhaar-linked. Thanks to Aadhaar, millions of migrant workers were paid by the government when India entered a sudden lockdown.[51] Aadhaar has also ensured that the right of residents to claim subsidized food in ration shops is protected, because their claims and identities are authenticated through Aadhaar, rather than left to the discretion of local officials.[52]

[50] Aadhaar Card Guide: Everything You Need to Know About It, *The Economic Times*, 8 December 2020.
[51] Questions of Identity, op. cit., note 75.
[52] Olivia White et al., op. cit., note 79.

Indonesia

Indonesia has been using digital identities since the Electronic Information and Transaction Law was adopted in 2008. The benefit of digital signatures in Indonesia, an archipelago of 17 000+ islands where it is hard to reach everyone, is substantial. Since its launch in 2016, PrivyID has provided a digital ID to 4.5 million users by matching government ID to a biometric selfie[53] via the database of the Directorate General of Population and Civil Registration and the Ministry of Homeland Affairs of Indonesia; this allows for quick and secure electronic verification of the user's identity.[54]

Estonia

Every one of Estonia's 1.3 million people has a mandatory digital identity that serves as the primary way citizens access services. Children receive their identity number at birth, and Estonians are given an ID card that has a chip embedded in it and can be used as ID in an electronic environment.

The system provides digital access to all of Estonia's e-services, including voting, tax, health records and government services.[55] Estonia's status as a digital leader in Europe – more digital signatures have been used in Estonia than in the rest of the EU together – stems from its decision to use digital ID.[56] This has brought substantial economic and productivity benefits: the Estonian Government estimates that Estonians save about 5 working days per year because of their electronic ID.[57]

Digital IDs could be an effective way to manage vaccinations, enable international travel and ultimately control the spread of COVID-19 (see **Figure 16**). However, realizing the full potential of digital ID will require public willingness to adopt the technology. Previous attempts in the United Kingdom to create digital IDs have failed because of privacy and reliability concerns.[58] Fears have also been raised over a "health apartheid" if vaccination status is linked to digital ID.[59] It is therefore important to ensure that privacy measures are robust and understood by the public.

53 Chris Burt, Indonesia Biometrics Provider PrivyID Joins FIDO Alliance and Plans Working Group Participation [blog post], Biometricupdate.com, 30 March 2020.
54 Jerry Chao, Solving Trust Issues in Indonesia through Digital Identities, 18 June 2019.
55 How Estonia is Pioneering the Digital Identity Space, Medium, 6 June 2019.
56 Simon Nixon, Estonia Seeks to Digitally Transform the EU, *The Wall Street Journal* (12 July 2017).
57 e-identity, e-estonia.com.
58 Tony Blair: It is common sense to move toward digital IDs, BBC News, 3 September 2020.
59 Ibid.

Figure 16. MOSIP/digital IDs and vaccine distribution

MOSIP/digital IDs and vaccine distribution

A vaccination registration system will be critical to the global recovery from COVID-19. Current immunization programmes are generally designed for children rather than adults, and the scale of immunization required in this pandemic suggests that new strategies to track immunization are required. Additionally, the COVID-19 vaccinations being developed all have different characteristics, including the number of doses needed, which creates logistical and monitoring challenges.[1] A further complicating factor in achieving immunization against COVID-19 is the limited supply of vaccines, which have to be administered on a rolling basis. It is important to verify that these limited doses are reaching real patients, and to minimize leakage, corruption and accidental duplication.[2]

A digital ID system would be immensely useful for organizing and maintaining a registry of an entire population's vaccination status. Digital IDs could be used to keep records of who has been tested or recovered, and to help target segments of the population governments may choose to prioritize for vaccine distribution, such as the elderly and health-care workers. They could also be used to create digital health passes that can verify health credentials and thus allow people to congregate safely in the workplace, at school or a stadium, or on an aircraft.

One of the most successful models for creating national, digital IDs is MOSIP, which stands for Modular Open-Source Identity Platform. MOSIP is a digital platform that can be taken up by any country, free of charge.[3] It was created after the success of Aadhaar in India by the International Institution of Information Technology – Bangalore (IIIT-B). The goal is to share the technology needed to create digital IDs with different countries that may not have India's level of digital infrastructure. Thanks to its modular and configurable design, MOSIP can be adapted to different country contexts and levels of digital infrastructure.[4] Governments, rather than a third party, own all their own data to ensure security and privacy. Several countries have already signed memoranda of understanding with IIIT-B, and MOSIP is gaining in popularity as the pandemic underscores the need for digital ID.[5]

Morocco

Morocco was the first country to sign a memorandum of understanding with IIIT-B to implement MOSIP. It has received financial support and technical assistance to implement MOSIP from the World Bank Identification for Development initiative. Morocco hopes to use MOSIP to reform its social safety net and to introduce virtual, paperless and cashless transactions.[6]

Philippines

The Philippines was one of the few countries without a foundational ID system until the Philippine Identification (PhilSys) Act was enacted in August 2018.[7] The World Bank worked with the Philippine Statistics Authority (PSA) to develop a five-year implementation strategy. The IIIT-B and the PSA signed a memorandum of understanding on 28 August 2019 for the adoption of MOSIP technology in PhilSys.[8]

Guinea

Guinea is the first of the Economic Community of West African States to attempt to implement MOSIP. Engineers from Guinea worked to create a Guinea-specific ID solution based on MOSIP 1.1.1. Named UNIR 1.0.0, the solution is currently being field tested.[9]

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1 World Bank, *East Asia and the Pacific Economic Update* (Washington, DC, October 2020), pp. 34–5.
2 COVID-19: Digital identity can lead us out of lockdown, but user confidence is key [blog post], GSMA, 30 April 2020.
3 Questions of Identity, op. cit., note 75.
4 Ibid.
5 Ibid.
6 World Bank, op. cit, note 77, p.28
7 Ibid.
8 MOU between IIT-Bangalore and PSA, Republic of the Philippines, MOSIP, 4 September 2019.
9 Spotlight on Guinea, MOSIP, 5 November 2020.

Digital coronavirus vaccine certificates for international travel

In other developments, ASEAN members are currently considering a digital coronavirus vaccine certificate in order to speed up the opening of the tourism industry. The certificate would provide smartphone-based proof of inoculation. Representatives from all 10 member countries, which have a total population of over 660 million people, discussed the idea of the certificate during the ASEAN Economic Ministers Meeting in early March 2021.

Tourism is a core industry for much of the ASEAN region and has been severely damaged by prolonged border closures, dragging down the regional economy. According to data from the ASEAN Secretariat, the 51 million intraregional visitor arrivals recorded in 2019 accounted for 36 per cent of the bloc's total. Besides tourism, the close economic ties between countries mean that companies have multiple offices throughout the region, creating demand for business travel. Opening up travel to people who have been inoculated against COVID-19 could help resuscitate this intraregional market.[60]

Other countries and regions have launched or are considering launching such certificates, often referred to as "vaccine passports". Ideally, these digital certificates will allow authorities to quickly check whether prospective travellers have been vaccinated and boost the economy by promoting tourism.[61]

European Union

The EU is proposing a Digital Green Pass, proving that an individual has been vaccinated and showing test results for those who are not yet vaccinated. The Digital Green Pass should facilitate Europeans' lives, gradually allowing them to move safely within the EU or abroad for work or tourism, according to the European Commission.[62]

China

China has launched a digital COVID-19 vaccination certificate for citizens planning to travel internationally. According to the country's Department of Consular Affairs, the certificate will provide information on the holder's COVID-19 vaccination status and coronavirus test results. The "vaccine passport" is available with immediate effect via the Chinese social media platform WeChat.[63] It is intended to verify information about testing and vaccination, and to contribute to the safe and orderly interaction of people across different nations.[64]

4.4.2 Digital transformation of legacy legal, administrative and health processes

From banking and health care to education, court hearings, administrative processes, and corporate management and governance, the global trend is to move things online. **Figure 17** provides examples of the digital transformation of legacy processes as a result of the pandemic.

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60 Kentaro Iwamoto, ASEAN eyes digital vaccine certificate for post-COVID travel, Nikkei.Asia, 3 March 2021.
61 Paul Keaveny, How would digital COVID vaccine passports work? And what's stopping people from faking them? The Conversation, 4 March 2021.
62 Kentaro Iwamoto, op. cit., note 103.
63 Coronavirus digest: China issues vaccine passport, DW, 9 March 2021.
64 Alberto Nardelli and Viktoria Dendrinou, China, EU plan vaccine certificates for international travel, The Age, 10 March 2021.

Figure 17. Examples of digital transformation of legacy processes as a result of the pandemic

Country	Digital transformation	Details of reform
Belgium	Greater flexibility for the organization of general and board meetings[65]	Royal Decree regarding general meetings and board meetings adopted on 9 April 2020, allowing (i) all legal entities governed by the Belgian Companies and Associations Code (companies and associations), (ii) all legal entities that acquired legal personality through a specific law, and (iii) contractual Institutions for Collective Investment greater flexibility to organize general and board meetings. It is sufficient, even for electronic meetings, if one person, such as a board member or a proxy holder, is physically present, if necessary, with a notary public.
Japan	New digital agency to reduce paper transactions and the use of the *hanko* (判子)	The national government has started a campaign to eliminate faxes, cut the paper trail and stamp out the *hanko*, a personal seal that is required on official documents in place of signatures. Telework during the pandemic is hampered by the fact that work *hanko* are left at the office. A survey found that Japan's Government was very analogue and only around 4 000, or about 7.5 per cent, of some 55 000 administrative procedures involving the central government could be completed entirely online. COVID reporting previously required faxes,[66] resulting in a time lag of "about three days" between positive tests for the novel coronavirus and the government's announcement of those cases. Fukuoka City issued a press release declaring all prefectural administrative documents *hanko*-free.
Thailand	From April 19, 2020, Thai law allows board and shareholder meetings to take place entirely online, and attendees are no longer required to be physically present in Thailand.[67]	Royal Decree on Teleconferences through Electronic Means B.E. 2563 (2020), which came into force on 19 April 2020, replacing the previous law. The key elements of the new royal decree are as follows: all attendees can attend meetings via electronic means, such as by phone or video call, from anywhere in the world; there is no physical attendance requirement; all attendees are able to vote during the meeting (whether by open or secret ballot); an audio or audiovisual recording must be made of the entire meeting, except for meetings held *in camera*; the electronic traffic data of every attendee must be kept as evidence; minutes must be taken of the meeting; the convening notice (and enclosures) can be distributed via e-mail instead of by standard post, but must in that case be properly archived as evidence by the meeting organizer.
United Kingdom	Visits to surgeries replaced by more telephone and video consultations[68]	In early March 2020, National Health Service England's medical director for primary care wrote to general practitioners recommending telephone or video triage to avoid patients coming into surgeries. This was followed by the development of a video technology package for physicians that can be used on personal mobile devices without exposing their personal contact details.

Source: Various industry sources, 2020

65 Royal Decree regarding general meetings and board meetings, memorandum, Van Bael & Bellis.
66 Chiaki Ogiwara, Compiling daily virus tally in Tokyo involves "3-day time lag", *The Asahi Shumbun* (20 July 2020).
67 Kobkit Thienpreecha, Thailand Eases Restrictions on Electronic Board and Shareholder Meetings, Tilleke & Gibbons, 20 April 2020.
68 Jacqui Thornton, Covid-19: how coronavirus will change the face of general practice forever, *British Medical Journal* 368 (2020).

4.5 Building digital resilience

Building digital resilience encapsulates the idea of building digital systems and processes designed to accommodate higher ongoing levels of uncertainty. As stated earlier, one of the fundamental impacts of COVID-19 has been to raise the overall level of uncertainty. In terms of technology and telecommunication systems, future end-user demand patterns and behaviours can be anticipated with less confidence because they have become inherently less predictable. It is therefore sensible to build excess capacity or "headroom" into digital systems as they are extended and developed.

Specifically, there is a need for redundant equipment and diverse network routes at the core of operator networks, and for data centre infrastructure. There is also a need proactively to monitor network sites and have out-of-band management access to devices so that staff can access them remotely from home. These types of issue and access needs have to be factored in when network infrastructure is deployed.

4.5.1 Network performance during the pandemic year of 2020

Further, as highlighted recently by Opensignal based on their analysis of global traffic data, flexibility will be required of MNOs. According to Opensignal, "As lockdowns ease, operators will look at how to manage capacity more dynamically, for example between downtown areas and residential suburbs, and be more nimble to future changes in the pattern of mobile usage. We will see greater thought on where to build mobile base stations."[69]

In February 2021, Opensignal undertook an analysis for the ITU of global mobile network experience data during the COVID-19 pandemic for the entire calendar year 2020. The findings are summarized in **Figures 18** and **19**.

4G download speed percentage variation

Overall, mobile speeds had gradually but consistently increased for all countries by December 2020, following a drop in March 2020. Compared to pre-pandemic levels, most countries had greater increases in broadband speeds by the end of 2020.

The most negative impact on mobile download speeds was experienced during the first lockdowns in March 2020. By May 2020, many countries had stabilized or returned to pre-lockdown levels. From June 2020 onwards, mobile speeds steadily increased. The exception was North America, which experienced no global drop in speeds in March 2020.

By the last quarter of the year, there were stable mobile speed increases across almost all countries. 4G download speeds were highly resilient globally, having successfully bounced back and experiencing overall improvement by the end of 2020.

[69] Ian Fogg et al., op. cit., note 19.

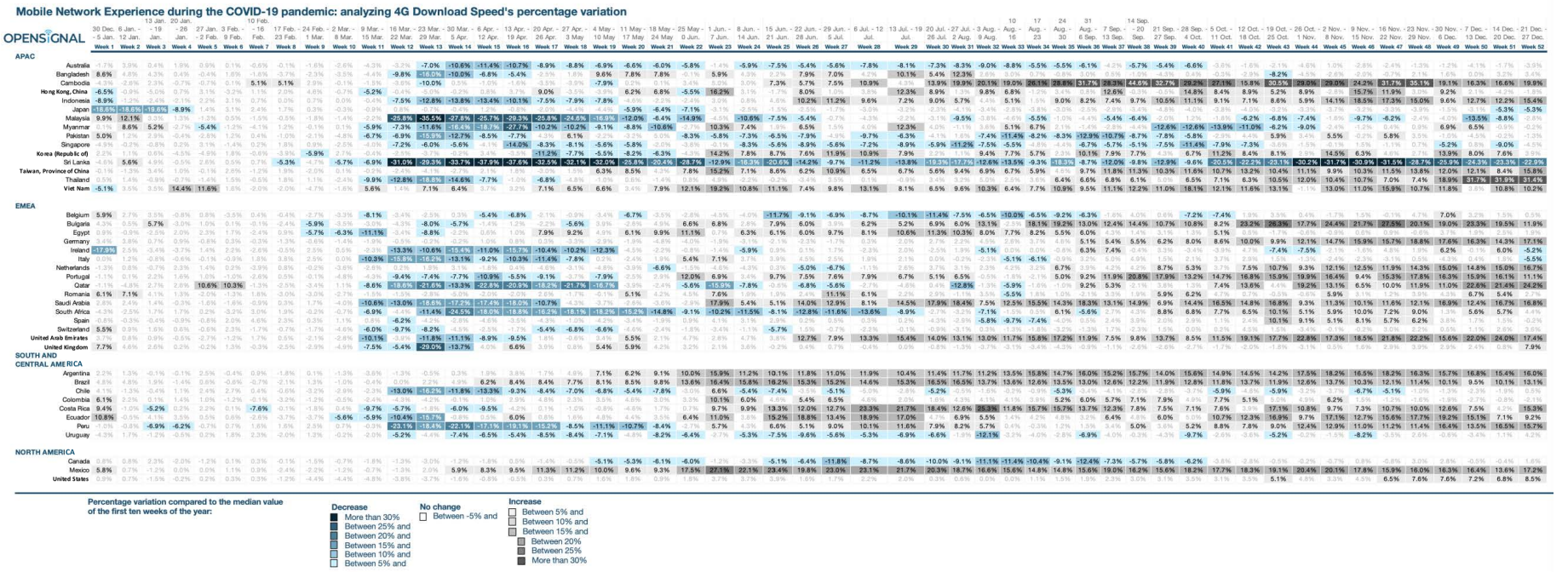
Time on Wi-Fi

Despite the pandemic continuing, time on Wi-Fi has continued to decrease across nearly all countries, compared to peak times at the beginning of the year. Similar to analyses from earlier in 2020, this occurred as governments started easing restrictions.

For most countries globally, time on Wi-Fi has returned to or dropped below pre-crisis levels, indicating that at the end of 2020 people were spending more time outside their homes than before the pandemic.

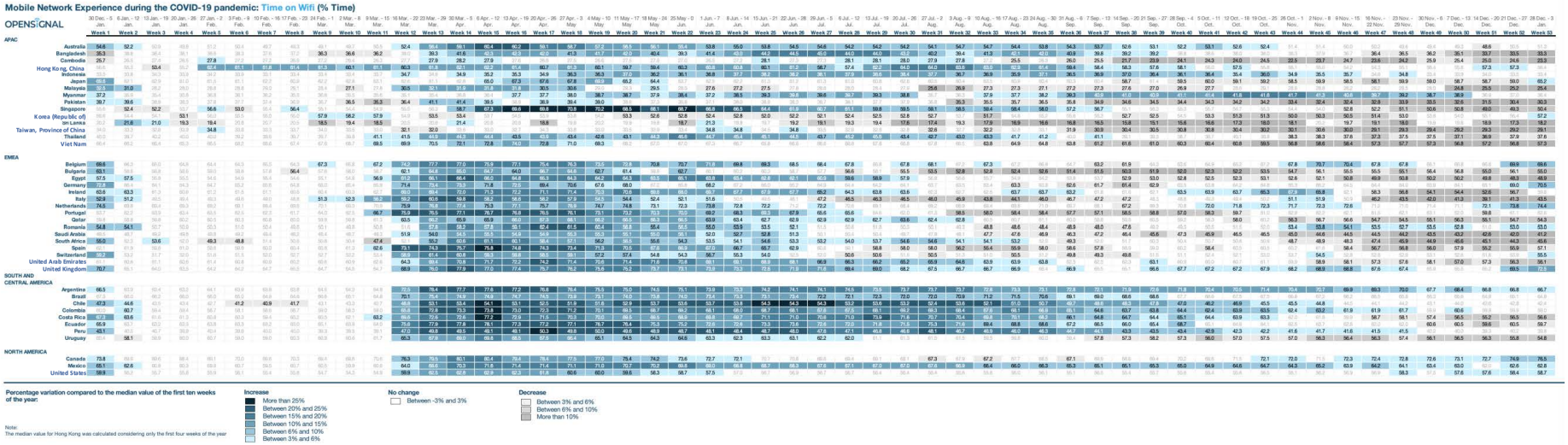
Given that Australia has for the most part successfully eliminated the coronavirus in the country, the Australian Government has already taken steps to analyse and assess the impact of the pandemic on Australian infrastructure, including telecommunication and broadband services. On 16 December 2020, Infrastructure Australia released a report (see **Figure 20)** highlighting the lessons learned and how to improve the resilience of telecommunication/ICT infrastructure.

Figure 18. Mobile network performance during the COVID-19 pandemic: Analysing download speed percentage variations



Source: Opensignal, February 2021

Figure 19. Mobile network experience during the COVID-19 pandemic: Analysing time spent on Wi-Fi



Source: Opensignal, February 2021

Figure 20. Infrastructure beyond COVID-19: A national study of the impact of the pandemic on Australia[70]

The Infrastructure Australia report found that the move to regional Australia by city workers will be semi-permanent, causing network bottlenecks that could constrain resources that would otherwise have been used for network upgrades and maintenance. However, with more people working from home, there is pressure on established networks to upgrade. The report found that, compared to other countries, Australia's infrastructure networks are relatively resilient, service providers adaptable and communities responsive to change.

Demand has shifted from central business districts to suburban and regional areas Regionalization

Around 30 per cent of employees have been working from home during the pandemic, resulting in greater Internet/broadband strain on the network. The impact of large-scale remote working led to a surge in usage, with demand being redistributed from central business districts to suburban and regional areas. Regionalization is expected to bring increased pressure to bear on broadband networks if the trend persists. A survey conducted by the Regional Australia Institute indicated that the number of Australians working from home in a regional setting doubled during the COVID-19 restrictions imposed from March 2020 to August 2020. Increased demand in areas that were not set up to manage business-grade Internet usage has resulted in higher congestion. Telecommunication providers have handled surges in demand in residential areas by optimizing network settings and the National Broadband Network (NBN) has allocated extra capacity.

Pressure on broadband infrastructure

The COVID-19 lockdown saw acute bandwidth congestion, which the NBN addressed by increasing capacity for Internet service providers. On average, it appears that Australians have not been significantly impacted in terms of Internet speeds and congestion, but the surge in usage as individuals transitioned to remote working and learning has revealed some bottlenecks in the network. The report found that Canberra, Adelaide, Melbourne and the Sunshine Coast experienced a decline in Internet quality, while the best place to work from home was Perth. Going forward, one solution is greater infrastructure investment in these areas. Additionally, putting standards in place for how providers should respond in future situations may also ease congestion caused by demand surges.

Increased broadband usage not the cause of complaints

Increased broadband usage during the pandemic appears not to have caused a spike in complaints, which were growing at a rate of c.3 per cent over the first three quarters of 2020. Press releases by the Telecommunications Industry Ombudsman indicate that existing issues such as frequent drop-outs or low speeds were exacerbated during the lockdown and emerged as problems reported by residential consumers. However, the Ombudsman also commented that telecommunication providers coped "extremely well" over the period of increased demand. Nonetheless, 35 per cent of survey respondents experienced outages, with more issues apparent in metropolitan areas, and 25 per cent switched plan or provider.

5G investment acceleration

Telecommunication companies have brought forward 5G investments, in part owing to the pandemic. Construction of 5G infrastructure is capital-intensive relative to 4G, yet it is recognized that 5G roll-out could increase provider profitability and potentially draw away from NBN demand. The report noted, importantly, that 5G investments are being made despite downward revenue pressure in the mobile businesses of the proponents, with the reduction in travellers and tourists adding to pressure on mobile roaming and prepaid revenue.

Demand for cloud services

The demand for cloud services from Australian companies accelerated as they moved to new models of working, even as the market approaches maturity. Despite the uptake of cloud services, data centre investment declined in 2020 as cash flows dried up during the pandemic, but it is expected to rebound in 2021. Higher levels of remote working and cloud usage also led to increased investment in cybersecurity services during lockdowns.

[70] Infrastructure Australia, *Infrastructure beyond COVID-19 – A national study on the impacts of the pandemic on Australia – An Interim Report for the 2021 Australian Infrastructure Plan* (Australian Government, December 2020).

4.6 Need for enhanced cybersecurity

It is widely accepted that heavy reliance on digital technologies during the COVID-19 pandemic has given rise to new vulnerabilities and risk, and WFH has increased vulnerabilities to cyberattacks.

The data protection, privacy and security rules promulgated by the EU in the General Data Protection Regulation[71] in 2018 have had a global impact. The new EU Cybersecurity Strategy (see **Figure 21**), laws and certification will likely also have global ramifications in terms of both application and approach.

Figure 21. EU Cybersecurity Strategy

On 16 December 2020, the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy presented a new EU Cybersecurity Strategy. The aim of the strategy is to protect European businesses and citizens from cyberthreats. Connected devices, including IoT devices, increase the attack surface and the cyber-risk. As such they need to be "secure-by design, resilient to cyber incidents, and quickly patched when vulnerabilities are discovered".[1] The strategy also covers the security of essential services such as hospitals, energy grids and railways, building collective capabilities to respond to major cyberattacks.[2] To support the strategy, the EU intends to quadruple its previous level of investment in its digital transition.[3]

The strategy describes how the EU can strengthen its digital resilience to be technologically sovereign. The policy has three principle instruments, which cover regulation, investment and policy:

- resilience, technological sovereignty and leadership;
- operational capacity to prevent, deter and respond;
- cooperation to advance a global and open cyberspace.

The strategy is one of a number of key EU documents relating to cybersecurity; others include a blueprint for rapid emergency response in the event of a large-scale, cross-border cyberincident and the EU Toolbox on 5G, which sets out measures to strengthen security requirements for 5G networks.[4]

1 European Commission, *Joint Communication to the European Parliament and the Council: The EU's Cybersecurity Strategy for the Digital Decade,* 16 December 2020, p. 5.
2 European Commission, Cybersecurity Policies [webpage, consulted on 2 May 2021].
3 European Commission, The EU's Cybersecurity Strategy in the Digital Decade [webpage, consulted on 2 May 2021].
4 European Commission, op. cit., note 118.

71 Available at https://gdpr.eu. Note that the regulation creates binding obligations for organizations anywhere in the world if they target or collect data related to people in the EU.

Heavy reliance on digital technologies during the pandemic is known to have given rise to new vulnerabilities and risks,[1] and working from home has increased vulnerabilities to cyberattacks.[2] The EU believes that the pandemic has also exposed the fragility of supply chains that are reliant on digital infrastructure and that were the target of cyberattacks during lockdowns.

The EU Cybersecurity Strategy is also a key component of the Commission's Recovery Plan for Europe, the EU's €1.8 trillion stimulus package.[3] Digital transitions are one of the package's main components, as cybersecurity is essential if people are to trust, use and benefit from digital connectivity and innovation.[4] Cybersecurity can stimulate the growth of artificial intelligence, encryption and quantum computing. The recovery plan therefore includes additional investments in cybersecurity,[5] as does the upcoming Digital Europe Programme, which plans to invest €1.9 billion in cybersecurity capacity.

1 European Commission, *Report on the Impacts of the Commission Recommendation of 26 March 2019 on the Cybersecurity of 5G Networks,* 16 December 2020.
2 European Commission, op. cit., note 117.
3 European Commission, op. cit., note 119.
4 European Commission, op. cit., note 117, p. 4.
5 European Commission, op. cit., note 119.

4.7 Need for ongoing sector reform

It is critical that the COVID-19 pandemic not obstruct sector reforms – globally, regionally or nationally. It is instructive that, notwithstanding the great challenges of 2020, continuing progress was made in relation to the Regional Comprehensive Economic Partnership (RCEP) in Asia, which will position the region after the pandemic, including in relation to telecommunications and electronic commerce.

4.7.1 Regional Comprehensive Economic Partnership (RCEP)

Initiated by ASEAN in 2012, the partnership is a multilateral trade agreement between 15 Asian and Pacific countries: Australia, China, Japan, New Zealand, the Republic of Korea and the 10 ASEAN countries (see **Figure 22**). The text-based negotiations were concluded in November 2019,[72] the market access provisions were agreed in 2020 and the partnership was signed on 15 November 2020.[73] It will now go through the signatories' respective ratification processes. The partnership will create a free-trade area accounting for approximately 30 per cent of the world's population and 30 per cent of global GDP, making it the world's largest trading bloc. While India is able to join at any time should it change its mind, any other State or customs territory may join 18 months after the partnership enters into force.

72 Australian Government, Department of Foreign Affairs and Trade, Joint Leaders' Statement on the Regional Comprehensive Economic Partnership (RCEP), 4 November 2019, Bangkok, Thailand.
73 Ibid. The text of the RCEP is available at www.dfat.gov.au/trade/agreements.

Figure 22. The countries participating in the Regional Comprehensive Economic Partnership

Disclaimer: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of ITU and of the Secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Source: Tanva Mahitivanichcha, RCEP Confirmed: The Formation of Asia Pacific's Largest Regional Trade Bloc, Grant Thornton, 14 January 2020

As part of the partnership's broader remit to lower trade barriers and improve market access for goods and services, its operationalization should significantly aid in the post-COVID-19 recovery. While not as extensive as the earlier abandoned Transpacific Partnership (TPP), especially for the telecommunication and ICT sector, the final text of the partnership agreement contains *inter alia* the following provisions:

- In relation to telecommunication services (Chapter 8/Annex 8B), it contains a framework of rules to govern trade in, access to and use of telecommunication services across the region. The Annex details the commitments by the signatories to promote competition in the provision of telecommunication services and to support access and use, competitive safeguards and the requirement to have an independent telecommunication regulatory body. Importantly, the Annex builds on the 1996 Negotiating Group on Basic Telecommunications (NGBT) Annex, which formed part of the World Trade Organization (WTO) process, extending it to cover mobile, broadband and reasonable and non-discriminatory treatment for access to the international submarine cable system. Such services were not mentioned in the NGBT Annex nearly 25 years ago.
- In relation to Chapter 12 on Electronic Commerce, the partnership supports member country businesses transferring data across borders as part of their activities and limits the scope for governments to impose restrictions, including requirements to localize (store) data. Rules promoting the digitization of trade documentation and the use of electronic signatures and electronic authentication will also help facilitate cross-border trade.

4.8 An alternative approach: COVID-19 responses and trade-offs – an economist's view

In this section, Simon Malloy describes an alternative approach that takes a more relaxed view of privacy considerations using ICT technology to address COVID-19 and future pandemics.

Two of the world's most pressing problems – managing the COVID-19 pandemic and regulating Big Tech – are related. They are related because finding better solutions for both problems requires a deeper and more comprehensive recognition of one of the most profound technology-driven changes in the last hundred years: that the cost of collecting and managing highly detailed personal information has crashed through the floor – probably by around four or five orders of magnitude.

These changes have happened so quickly that we have not developed policies and institutions that constitute anything like a sufficient response. This technological change reaches far beyond economic consequences. Its impacts are deeply social, psychological and political. In the hands of authoritarian regimes, it represents more oppressive control. In the hands of value-maximizing Big Tech, it creates polarization and civil discord, and fractures democratic processes. Even the most advanced nations have not sufficiently contended with concepts of ownership and rights in relation to personal information.

As the world continues to endure the first pandemic of the Internet age, we find that our efforts to manage it are hamstrung: we have the technology to defeat, or at least far more effectively manage, the virus but we don't have the socio-economic institutions needed to manage the risks of collecting the detailed personal information that we need to achieve this.

Non-economists are sometimes surprised to learn that there is a huge branch of economics called "institutional economics". This field of study has found that broadly defined institutions do a great deal of the heavy lifting in economic development. Of course, technology, human capital and many other factors drive development, but institutional factors – electoral processes, the rule of law, separation of powers, quality of legislation and governance, social norms relating to work ethics and so on – are also critical. And institutions are in an endless race with technological and economic change: the emergence of anti-trust legislation to regulate the challenge of the rise of nineteenth-century monopolists in the United States is an example.

Australia, for example, has well-developed and trusted electoral institutions consisting of national and state electoral commissions, a shared political commitment to enact electoral outcomes and trust in the system on the part of voters. Suffice it to follow the experience of certain developing nations to witness the tragedies that attend poorly developed electoral institutions.

To appreciate the enormous value of well-developed institutions for dealing with personal data, consider the benefits for the management of COVID-19 and, critically, any future pandemic.

A multiplicity of approaches have been employed for managing the pandemic, but a useful threefold classification would be as follows: vaccinate, lockdown and test track trace (TTT). These approaches are non-exclusive and complimentary, but each has a different profile for cost-benefits and effectiveness. The lockdowns and social distancing emergency measures used to "flatten the curve" have morphed, in some jurisdictions, into a virus elimination strategy. The economic and social costs of the strategy, however, are enormous and unsustainable.

Vaccination is the great global hope, but virus mutations, uncertainty about vaccine effectiveness and significant production and distribution challenges mean that it is far from certain that it can be a stand-alone solution.

In many countries, TTT approaches have been largely manual and therefore easily overwhelmed when infections surge. The potential of modern information technology to comprehensively automate key parts of this approach has been hugely underutilized, primarily owing to civil liberty and privacy concerns, although perhaps also because of a failure of imagination or a lack of will among decision-makers. See the World Bank view in **Figure 23** below.

Figure 23. World Bank: The value of data in response to the COVID-19 pandemic

Data offer tremendous potential to create value by improving programmes and policies, driving economies and empowering citizens. Data are a resource that can be used and reused repeatedly to create more and more value. In fact, the full value of data materializes when systems enable the use and reuse of data for different purposes. The COVID-19 pandemic has been a dramatic example of these opportunities, showing the potential of unlocking data for the public good. Many countries have used data to control the COVID-19 pandemic. These uses include, but are not limited to, tracking people's locations to better understand mobility patterns during lockdowns or to aid in disease contact tracing, and providing efficient service delivery and management of vaccinations.[1]

Leveraging private and public intent data to combat the pandemic – contact tracing and public policy needs

Contact tracing

During the COVID-19 pandemic, mobile phone data have proven extremely valuable when paired with public intent data in quantifying the effectiveness of policies for curfews and strict lockdowns, and looking forward, in aiding contact tracing efforts to contain disease spread. Data collected through mobile phones can include CDRs and GPS location data. In contract tracing efforts, by combining mobile phone data with data such as medical facility records, credit card transaction logs and closed-circuit television recordings, the government can further identify people at risk of exposure, as it has done in countries like the Republic of Korea. Lower-income countries, such as Ghana and Mozambique, have introduced the use of de-identified mobile phone data to combat the pandemic, typically with the support of international organizations that provide analytical skills for processing the data.[2] Overall, use of these data enable measurement of population density, travel patterns and population mixing in real time and at high resolution, making it possible to better target policy interventions and improve epidemiological modelling.[3]

On top of this, the potential of new data sources to support public health and epidemiology efforts in the future goes far beyond measurement of mobility. Efforts are under way to use data tools as early warning systems for outbreaks and to understand disease dynamics and routes of transmission. For example, the company BlueDot provides infectious disease surveillance services using advanced data analytics. It was able to warn of the outbreak of COVID-19 before the official announcement in early January 2020 by analysing news reports, disease networks and official proclamations.[4]

1 World Bank, op. cit., note 39.
2 Sarah Burns, How Anonymized Mobile Data Are Helping Ghana Fight COVID-19 [blog post], Global Partnership for Sustainable Development Data, 18 May 2020.
3 World Bank, op. cit., note 39.
4 Becky McCall, COVID-19 and Artificial Intelligence: Protecting Health-Care Workers and Curbing the Spread, *The Lancet* 2(4):E166–E167 (20 February 2020).

Addressing public policy needs

Data collected and curated by the private sector for commercial purposes holds great potential if repurposed for public policy needs such as COVID-19 tracking. The COVID-19 experience has also shown how public statistics constructed from private sector data – on credit card spending, employment and business revenues – can serve as a new tool for empirical research and policy analysis. In the United States, indicators disaggregated by ZIP code, industry, income group and business size showed that small businesses and low-income workers providing in-person services within wealthier ZIP codes were hit hardest by the reduction in consumer spending during the crisis. Identifying patterns such as this enabled governments to take better approaches when enacting policy.

Key exceptions are TTT implementation in the Republic of Korea and Taiwan, Province of China.[74] Using mobile phones for location tracking, quarantined individuals and any potential contacts are tracked in real time with data kept for up to one month. Taiwan, Province of China has embraced this approach perhaps because of its earlier experience with serious SARS outbreaks and a higher level of social coherence and trust in government than elsewhere. Its economy and growth have remained strong throughout 2020 and 2021, thanks to the efficiency of its pandemic management.

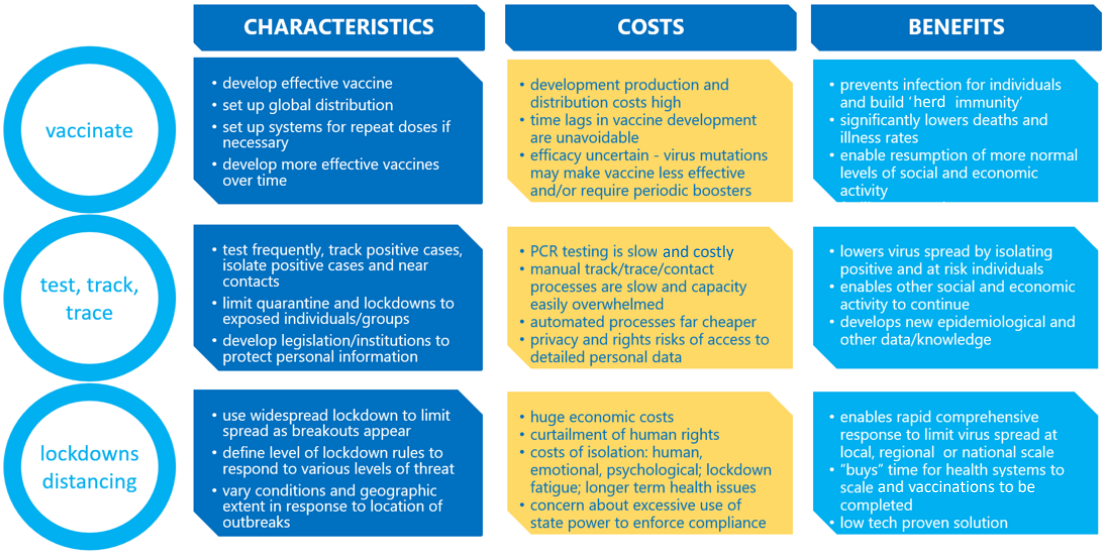
COVID-19 represents a diabolical challenge for rational holistic thinking about benefits and costs to society. Even for challenges far simpler than COVID-19, the simple concept of "evaluating costs and benefits" is far more complex than people typically assume. Which costs and benefits should be included in the analysis? How should these costs and benefits be valued? Do we really understand the causal links between decisions, on the one hand, and costs and benefits, on the other? What about the distribution of costs and benefits across time and how do we value the future relative to the present?

The only really non-contentious statement that can be made about COVID-19 in this context is that the costs it has imposed on the global community are truly enormous. In addition to the human cost of lost lives and illness, there is unemployment, destruction of businesses, lost opportunities for economic growth and poverty reduction. Many of these costs will be felt for decades, arguably indefinitely into the future – lost economic growth now means future economic growth is always off a reduced base. The losses are cumulative and compounding.

Figure 24 shows the characteristics, benefits and costs of the three main approaches to managing the pandemic. Countries around the globe have adopted different combinations of these approaches at different times and stages of the pandemic.

[74] See also section 3.5.2.

Figure 24. Three main COVID-19 management strategies: characteristics, benefits and costs



Source: Simon Molloy, March 2021

This perspective on pandemic management strategies and their associated costs and benefits makes clear that if vaccines prove less effective or are more problematic than anticipated, the pandemic will run for longer. If this happens, lockdowns will become increasingly unsustainable. In this scenario, it is inevitable that a more highly technological and automated approach to the TTT strategy will become necessary and will be a cornerstone of pandemic management going forward. In many countries, this strategy will only be viable if governments develop transparent and trusted privacy institutions and processes.

The potential benefits of better privacy institutions are enormous. Better policies and institutions for the management of private information give us leverage not only for COVID-19 and future mutations but for any future pandemic. Lockdowns and COVID-19 vaccines do not give us this leverage.

Imagine this frightening scenario: COVID-27 breaks out worldwide with a mortality rate of not around 1 per cent but 10 or 15 per cent – perhaps preferentially targeting children. Most global jurisdictions would probably take less than a day to mandate a fully automated tracking system for the entire population. COVID-19 provides the opportunity to develop advanced ICT-based pandemic management approaches now and build privacy institutions that will make these acceptable to the public.[75]

[75] The use of such digital contact tracing tools for other infectious diseases is already being discussed (see www.medrxiv.org/content/10.1101/2020.12.21.20248619v1).

5 ITU REG4COVID survey results

Between late 2020 and early 2021, ITU conducted an online survey of ICT national regulatory authorities, regulatory associations and other ICT stakeholders around the world. The aim was to collect initiatives and experiences, focusing on ongoing initiatives and innovative policy and regulatory measures designed to ensure communities and businesses remain connected, and to harness the full power and potential of ICTs to save lives during the COVID-19 crisis.

Note – This section provides a summary of the survey findings for questions 2, 3,4, 5, 7, 9, 10, 11, 12, 13, 14 and 16.

Question 2: In relation to COVID-19, what immediate ICT policy and regulatory initiatives and measures were implemented during the current crisis by the ICT National Regulatory Authority (NRA) or other Government entities in your country (tick all that apply)?

Immediate ICT policy and regulatory initiatives and measures were implemented in relation to COVID-19	Yes %
Supported e-learning during school closures/lockdowns	73%
Instituted emergency telecommunication measures	69%
Implemented voluntary measures requiring network operator cooperation in enhancing connectivity, accessibility and affordability	67%
Provided specific broadcasting channels for education and other public uses	59%
Implemented consumer protection measures (e.g. no or limited customer terminations for non-payment)	51%
Developed and used specific health applications	51%
Implemented mandatory measures requiring network operator cooperation in enhancing connectivity, accessibility and affordability	47%
Allowed flexible network and traffic management	45%
Developed and used contact tracing apps	43%
Mandated an increase in overall or minimum consumer broadband capacity and speeds	39%
Mandated the provision of free services to customers by licensees	31%
Accelerated universal service strategies and financing	31%
Allowed more flexible IMT spectrum use (e.g. granted temporary licences for IMT services)	27%
Accelerated the assignment/licensing of available IMT spectrum (e.g. granted permanent licences to operators for IMT services)	25%
Facilitated the use of new fixed wireless access networks (4G/5G) to quickly deploy necessary wireless broadband infrastructure	25%

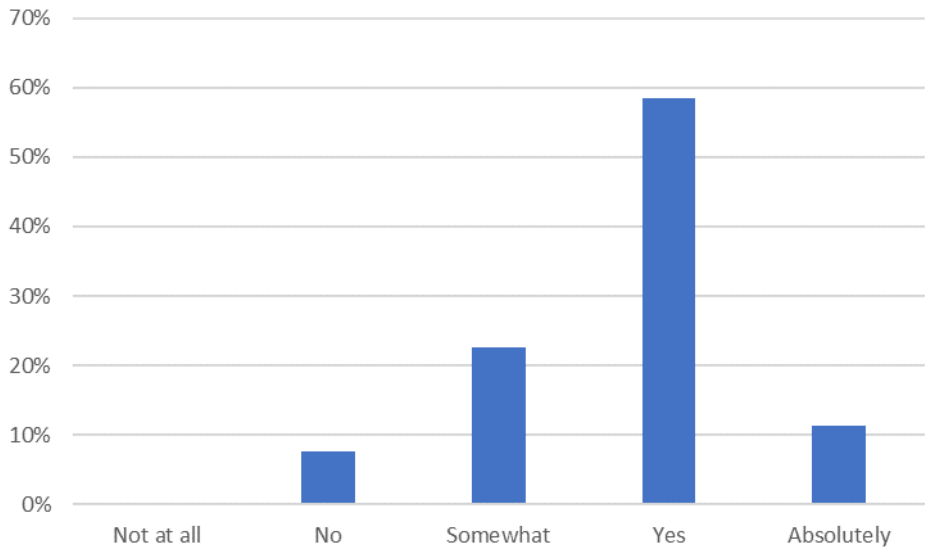
(continued)

Immediate ICT policy and regulatory initiatives and measures were implemented in relation to COVID-19	Yes %
Authorized the use of additional unlicensed spectrum	18%
Mandated or provided funds to boost free Wi-Fi in public areas and medical centres	14%
Relaxed current quality of service measures	14%
Provided government subsidies to operators for broadband services	10%
Reduced licence fees, including fees for spectrum licences	8%
Relaxed applicable competition policy rules	6%
Other	35%

The responses to Question 2 reveal the importance that policy-makers and regulators attached to citizens being able to maintain connectivity and make use of digital tools and services during the pandemic: 73 per cent of respondents indicated that e-learning was supported during the lockdown periods. Emergency telecommunication measures, voluntary measures requiring network operators to enhance connectivity, accessibility and affordability, and implementing consumer protection for non-payment of telecommunication services were also important.

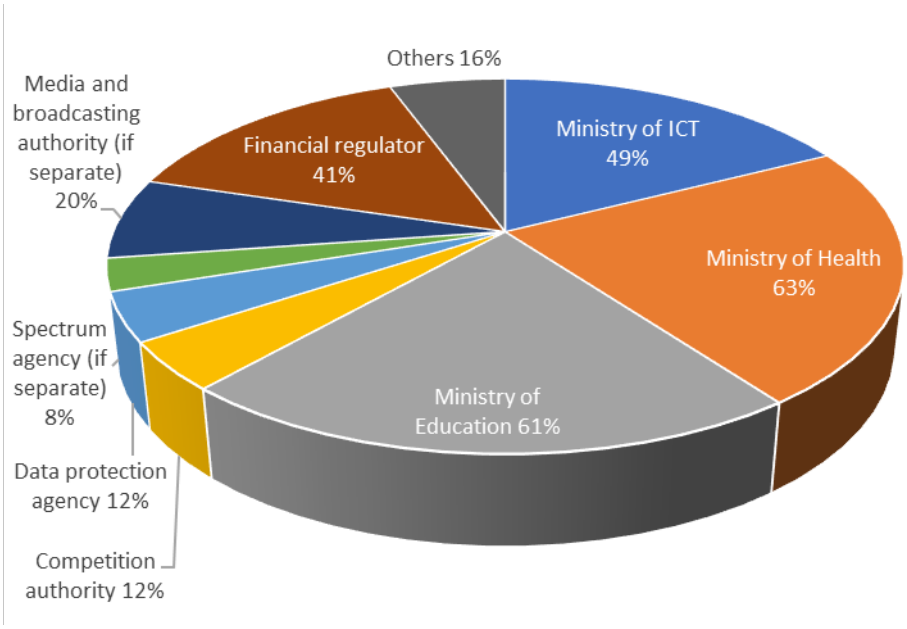
Conversely, there was little support for government subsidies to broadband operators, reduced licence fees for spectrum and the relaxation of competition policy rules.

Question 3: Does the Government or the ICT National Regulatory Authority (NRA) consider that the immediate measures which have been implemented are sufficient to address the current crisis situation (%)?



The responses to Question 3 indicate that around 70 per cent of national regulatory authority respondents believe that the measures implemented were sufficient to address the crisis situation (answer "yes" or "absolutely").

Question 4: Have any measures related to the COVID-19 crisis (e.g. competition policies, data protection policies and regulations, subsidies) been introduced by other Government entities (tick all that apply and provide URL to measures)?



The reponses to Question 4 indicate that ministries of education, health and ICT, along with financial regulators, were the most active in introducing measures in response to COVID-19.

Question 5: Which measures have been of greatest value in responding to the crisis? Please evaluate by level of importance from 0 (less important) to 10 (most important).

Which measures have been of greatest value in responding to the crisis?	Average usefulness (out of 10)
Implemented voluntary measures requiring network operator and service provider cooperation	7.9
Supported e-learning during school closures/lockdowns	7.1
Allowed flexible network and traffic management	6
Developed and used specific health applications	5.9
Developed and used contact tracing apps	5.5
Implemented consumer protection measures (e.g. no or limited customer terminations for non-payment)	4.9
Allowed more flexible IMT spectrum use (e.g. granted temporary licences for IMT services)	4.6
Implemented mandatory measures requiring network operator cooperation	4.5
Mandated the provision of free services to customers by licensees	4.4
Mandated an increase in overall or minimum consumer broadband capacity and speeds	4.3

(continued)

Which measures have been of greatest value in responding to the crisis?	Average usefulness (out of 10)
Facilitated the use of new fixed wireless access networks (4G/5G) to quickly deploy necessary wireless broadband infrastructure	3.9
Authorized the use of additional unlicensed spectrum	3.7
Accelerated universal service strategies and financing	3.7
Relaxed current quality of service measures	3.2
Accelerated the allocation of available IMT spectrum licences (e.g. granted permanent licenses for IMT services)	3.1
Relaxed applicable competition policy rules	3
Provided government subsidies to operators for broadband services	2.9
Mandated or provided funds to boost free Wi-Fi in public areas and medical centers	2.5
Reduced licence fees, including fees for spectrum licences	2.1
Other	3.5

Question 5 is important because it asks respondents to say which measures were of the greatest value for the pandemic response. The responses are ranked from most useful to least useful, from top to bottom. As can be seen, voluntary measures requiring network operators to cooperate with initiatives were regarded as extremely valuable, as was extra support for e-learning during lockdowns.

It is also interesting to note that while allowing more flexible IMT spectrum use was regarded as relatively valuable, in Question 2 respondents indicated that only 27 per cent of jurisdictions adopted this response.

The development and use of both contact tracing apps and specific health applications were also regarded as valuable.

Question 7: What immediate commercial initiatives were implemented by Telecom/ICT Operators and Service Providers in your country? Please evaluate by level of importance from 1 (less important) to 10 (most important). Please indicate 0 for not implemented

Immediate commercial initiatives implemented by telecom/ICT operators and service providers in the country	Average usefulness (out of 10)
Provided free access to online learning resources	5.9
Facilitated mobile money transactions, online prepaid recharges and other online transactions	5.5
Offered free data to schools	5.3

(continued)

Immediate commercial initiatives implemented by telecom/ICT operators and service providers in the country	Average usefulness (out of 10)
Increased broadband speeds/capacity to help customers working/studying from home	5.3
Provided free access to government/health and information services	5
Developed or supported the development of contact tracing apps	4
Offered free data and services to health centres	3.9
Offered free access to digital productivity tools (e.g. videoconferencing, commercial platforms, etc.)	3.7
Facilitated/subsidized prepaid mobile recharges	3.5
Facilitated improved connectivity for groups at a socio-economic disadvantage that cannot afford connectivity and/or the cost of acquiring digital devices	3.4
Deployed or augmented fixed wireless access networks	2.7
Renegotiated wholesale service conditions and rates	2.6
Offered free or subsidized digital devices to end consumers (e.g. dongles, handsets, laptops)	2.3
Facilitated connectivity in rural and isolated areas by providing satellite services	2.1
Offered free data to businesses	2
Effected changes to compression algorithms, etc., to minimize bandwidth demand	2
Granted free access to networks and waived any overcharge fees	1.9
Waived national roaming charges	1.7
Waived international roaming charges	1.6
Other	2.1

Question 7 asked respondents to rate the importance of commercial initiatives implemented by telecommunication/ICT operators and service providers.

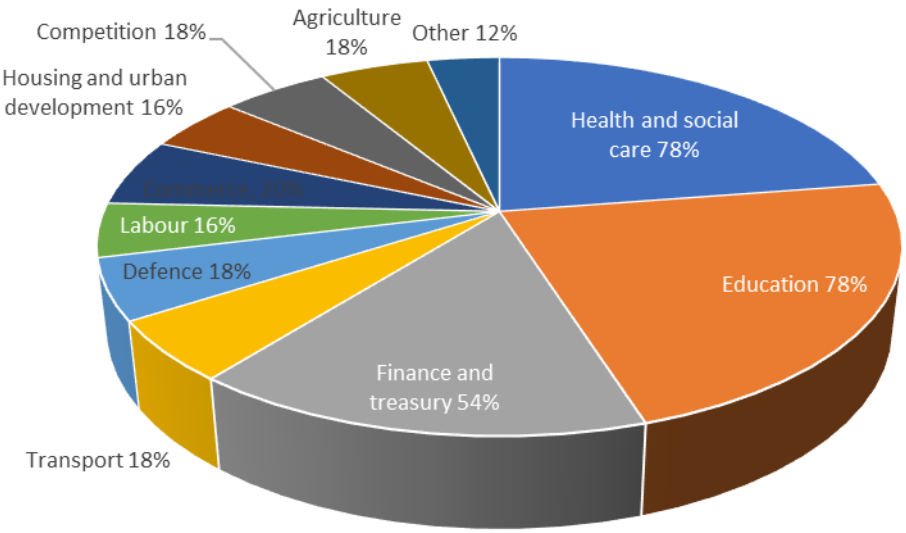
Again, online learning resources were regarded as important, as were facilitating online mobile money transactions, free data for schools and increased broadband speeds to help customers working or studying from home.

The waiving of roaming charges and overcharge fees, free data for businesses and changes to compression algorithms to minimize bandwidth demand were regarded as unimportant.

Question 9: Has your ICT National Regulatory Authority worked in collaboration with other Regulatory Agencies and/or Ministries that represent other industries/sectors (other than telecommunications)?

The replies to this question were overwhelmingly positive, with 92 per cent of respondents indicating that they had worked with other regulatory agencies and/or ministries representing industries/sectors other than telecommunications.

If yes, please specify with which other National Sectors



These responses indicate that the most important sectors were overwhelmingly health and social care, education, and finance and treasury.

Question 10: In your view, have there been significant barriers to the implementation of immediate measures/responses to address the adverse impacts arising from events like pandemics? Please evaluate by level of importance from 0 (less important) to 10 (most important)

Significant barriers to the implementation of immediate measures/ responses addressing adverse impacts arising from events like pandemics	Average of importance (out of 10)
New infrastructure deployment such as towers and backbone infrastructure delayed by complex and costly approval processes that restrict or impede development/rights of way/tower sites, etc.	4.1
A lack of content, services, resources in local language(s)	3.4
Low operator margins limiting the ability to provide free or subsidized services and/or capacity for further network investment in needed network infrastructure	3.3
Lack of collaborative regulatory approaches between different government agencies	3

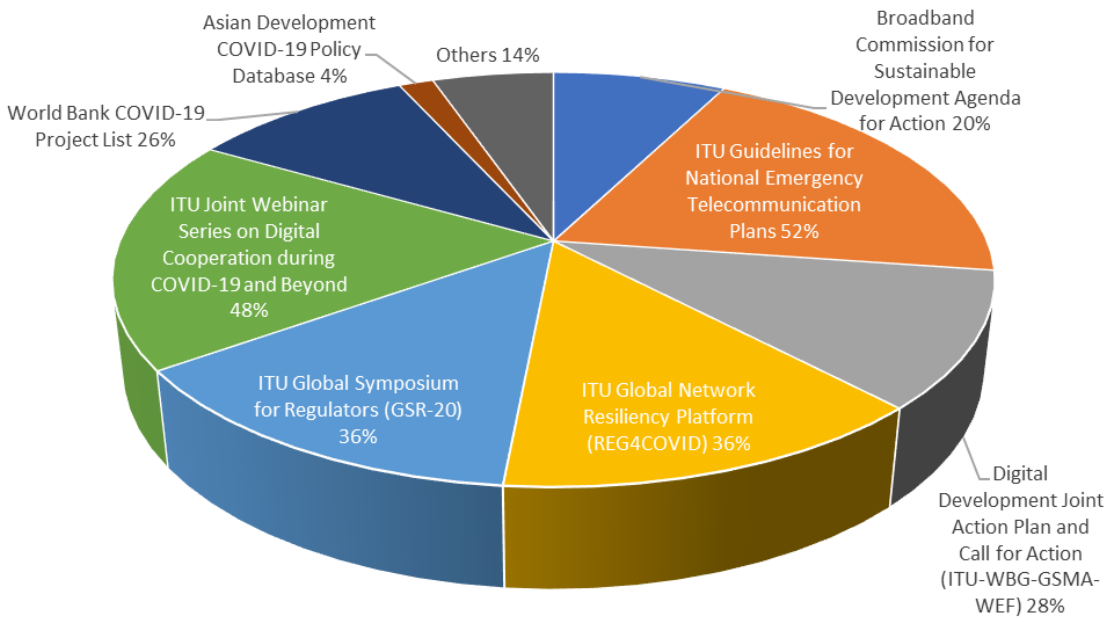
(continued)

Significant barriers to the implementation of immediate measures/ responses addressing adverse impacts arising from events like pandemics	Average of importance (out of 10)
Legal and regulatory barriers that limit rapid and effective regulatory responses	2.9
Structural rigidities in the processes for the timely allocation of IMT spectrum (e.g. need to undertake the transition from analogue to digital television or longer-term spectrum refarming of, say, C-band spectrum)	2.7
Lack of domestic cloud services to support demand	2.7
Limited access to international bandwidth/capacity	2.5
Poor availability of/access to/affordability of digital devices (e.g. smartphones and laptops), particularly for low-income individuals (including those located in rural areas), households and very small businesses	2.5
Limited access to cloud services	2.3
Blocking of innovative broadband solutions – for example, existing operators restrict/oppose community/municipal broadband/Wi-Fi solutions	2
Excessive reserve prices for IMT spectrum auctions, resulting in unallocated IMT spectrum	1.6

Respondents to Question 10 identified the main barriers to the implementation of immediate measures as being:

- the ability to deploy new infrastructure such as towers and backbone;
- lack of content or services in local languages;
- low operator margins;
- lack of collaborative regulatory approaches;
- legal and regulatory barriers;
- structural rigidities in the processes for the timely allocation of IMT spectrum.

Question 11: What international platforms, guidelines and events have assisted you in defining measures applied (tick all that apply))



The responses to Question 11 indicated that the most useful international platforms, guidelines and events for defining pandemic measures were:

- the ITU Guidelines for National Emergency Telecommunication Plans;
- the ITU Joint Webinar Series on Digital Cooperation during COVID-19 and Beyond;
- the ITU Global Symposium for Regulators (GSR-20);
- the ITU Global Network Resiliency Platform.

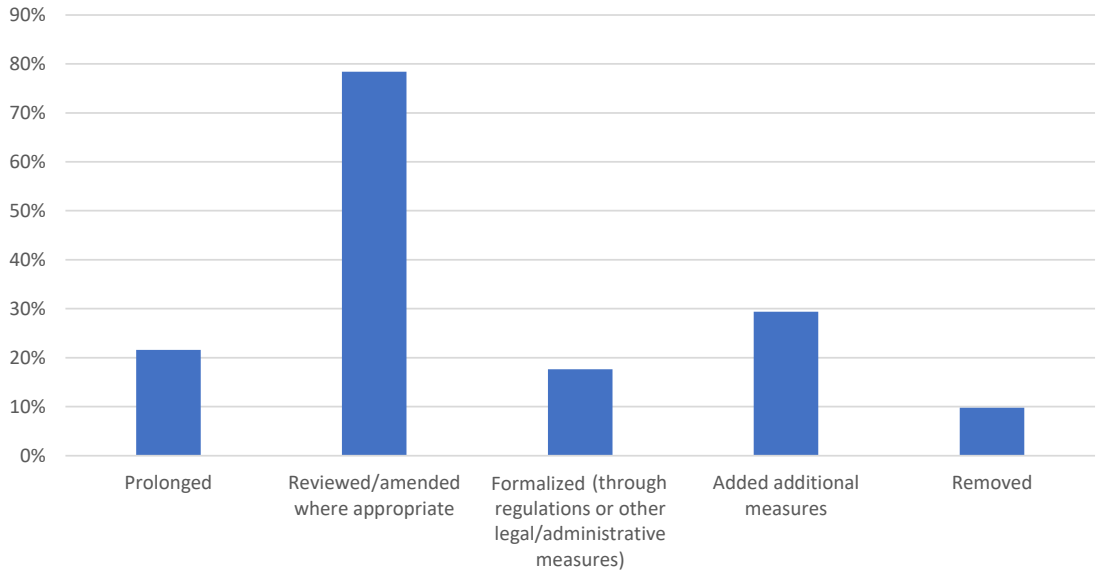
Question 12: Has your country already prepared a post-crisis plan?

The respondents were more or less evenly split on whether their countries had prepared a post-crisis plan or not, with 55 per cent answering "yes" and 45 per cent answering "no".

Question 13: What will happen to immediate emergency measures applied – will they be:

- prolonged;
- reviewed;
- formalized?

The respondents indicated by a significant margin that the most likely outcomes in relation to immediate emergency measures already applied would be that they would be reviewed/ amended as appropriate (see graph below).



Question 14: What are your country's plans for the post-crisis situation in terms of ICT policies and regulations? (tick all that apply)

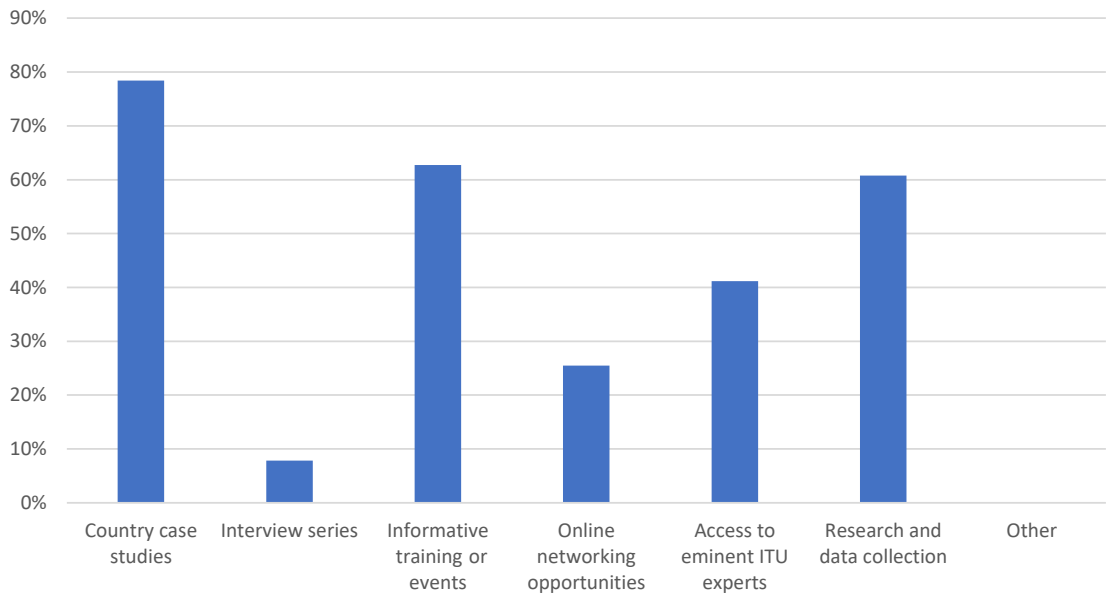
Which plans has your country engaged in for the post-crisis situation in terms of ICT policies and regulations?	Yes %
Encourage more collaboration with other sectors (formalizing memoranda of understanding, collaborative regulatory approaches)	57%
Accelerate the transition from legacy 2G/3G to 4G/5G networks in order to provide more efficient bandwidth to consumers	53%
Review national broadband/ICT plans and broadband penetration targets and speeds	49%
Adopt a more collaborative model between all national ICT stakeholders	49%
Conduct a feedback analysis of the crisis measures implemented and outcomes	47%
Facilitate last-mile connectivity initiatives	45%
Review universal service policies and financing to more effectively address the digital divide	39%
Institute digital training and skills enhancement for different segments of society (e.g. elderly, disabled, young people)	37%
Review the national ICT emergency plan	31%
Review laws/national ICT plan to include the ICT emergency plan	29%
Seek a way to provide/subsidize access to digital devices for less well-off socio-economic sections of the community	29%
Prepare a national ICT emergency plan	27%
Seek international monetary or other assistance to address identified gaps or limitations (e.g. from the World Bank, the Asian Development Bank, the African Development Bank)	27%
Change roadmaps to make more IMT spectrum readily available	25%
Facilitate greater international capacity (e.g. submarine cables, land cables)	25%
Formulate polices, including to reduce customs duties/subsidies to address device affordability and adoption of smartphones, connected laptops, etc.	24%

(continued)

Which plans has your country engaged in for the post-crisis situation in terms of ICT policies and regulations?	Yes %
Open up more of the telecommunication sector to competition and new investment by removing any restrictions that may exist (e.g. foreign ownership, exclusivity, tower ownership, fibre network licensing, technology-specific limitations, infrastructure sharing)	18%
Change IMT spectrum plans	16%
Make changes to specific frequency bands allocated for emergency communication	16%
Review retail tariff guidelines and regulations	16%
Develop and launch additional satellite connectivity options	12%
Change the licensing framework	12%
Provide a licence fee "holiday" or licence fee reductions to operators for the period of the pandemic	8%
Other	10%

The respondents indicated that the main priorities in the post-crisis period would be greater collaboration across economic sectors and between national ICT stakeholders. Improving telecommunication infrastructure was also a priority, specifically, accelerating the transition from 2G/3G to 4G/5G networks and facilitating last-mile connectivity initiatives. As for a number of the other questions, improving digital skills rated highly, as did revision of ICT emergency planning.

Question 16: What would be the 3 most beneficial work the ITU could do for your country to further support you in this crisis and beyond?



In terms of what ITU could do to help countries move beyond the current crisis, respondents favoured country case studies, training or events, and research and data collection.

6 Case studies

6.1 Overview

In this section, nine case studies covering a range of country experiences, topics and lessons learned, with a focus on addressing the digital divide post-pandemic, are presented, namely:

- **Colombia** – the CRC becomes an "intelligent regulator" in the pandemic (section 6.2);
- **Indonesia** – COVID-19 Vaccination One-Data System (section 6.3);
- **Israel** – Green passports and data-sharing agreements (section 6.4);
- **Kyrgyzstan** – Internet in a box: The ilimbox (section 6.5);
- **Latin America** – The challenge of, and recommendations for, the digital divide during COVID-19 (section 6.6);
- **Mexico** – Measures implemented by the IFT in the face of the COVID-19 pandemic (section 6.7);
- **Peru** – Addressing the digital divide with "Todos Conectados" (section 6.8);
- **South Africa** – Addressing the digital divide in the COVID-19 era (section 6.9);
- **United Arab Emirates** – Managing traffic and addressing the digital divide during COVID-19 (section 6.10).

6.2 Colombia – the CRC becomes an "intelligent regulator" in the pandemic

There is no question that the COVID-19 pandemic represents a global challenge for the ICT and postal sectors and for regulators. It has taught Colombia several lessons that it hopes to draw on to maintain the positive aspects of digitization, innovation and regulatory flexibility. The following lessons led the Communications Regulatory Commission (CRC) to accelerate both internal and external processes to establish itself as an "intelligent regulator".

- Colombia learned that it must regulate based on evidence, which was found to have helped the country speed up processes during the pandemic. For example, the CRC monitored the state of network services every two days to avoid collapses, thereby obtaining evidence that the network presented no problems.
- It proved imperative to work in coordination and collaboration with all stakeholders. Over-the-top services voluntarily took steps to avoid network collapse, such as lowering video quality without affecting the user experience. Coordination between regulators on infrastructure-sharing projects (e.g. in relation to energy) was also successful.
- The pandemic strengthened the importance of intelligent regulation as a response to technological developments and changes in consumer habits. It provided possibilities to energize markets and promote investment. Intelligent regulation must be designed so as to stimulate markets and guarantee healthy competition. In addition to lowering prices and improving quality of service, it will also lead to satisfaction and better customer service, which is a differentiating factor.

6.2.1 Legal framework in Colombia and progress in the country

The government's digital policy is regulated in Decree 1008 of 2018 and establishes general guidelines for the use and operation of ICTs within State entities. In its 2020–2021 Regulatory

Agenda, the CRC incorporated, under Innovation, encouragement of the use of emerging technologies that help solve problems and mitigate risks in process management through appropriate management of information and data quality. The purpose is to empower public entities to leverage their digital transformation and the use of emerging technologies, which they can do by reinventing or modifying processes, products or services, to ensure value is generated for the public.

6.2.2 Advances of the Communications Regulatory Commission (CRC)

Digital transformation is multisectoral and global, meaning coordination between regulators and public policy-makers and between national and international entities is essential. Regulators must use digital tools to meet their challenges; a regulator that is in line with technological reality adapts and makes regulatory decisions based on evidence, incorporating emerging technologies into its processes and the regulation itself.

To face the challenges of digital transformation, regulators must be aware of trends. Data enable them to make informed decisions and to be flexible and innovative so as to leverage digital change. For this reason, the CRC is implementing the concept of "Smart Regulation", which includes regulatory simplification, reducing regulatory burdens, generating spaces for self-regulation, and implementing innovative models such as the regulatory sandbox.

The CRC is aware of the importance of innovation and technology in its work, and has therefore taken a series of initiatives aimed at making it a state-of-the-art regulator in line with the best international practices. The main initiatives developed or planned are listed below.

Machine learning and process automation for query response

In 2017, applications to the CRC were entered through four main filing channels that required various manual sub-processes for processing and response. Given the increase in the formalities of the approval process from May 2017, going from hundreds to thousands per month, steps were taken concerning:

- text recognition usage, analysis techniques and the development of the Machine Learning API (Application Programming Interface) that can identify the theme of the Procedure Qualification Record;
- automatic registration in the Document Management System (SGD);
- the design and development of automatic outflows of responses to petition rights within the SGD, taking advantage of pre-classifications.

These steps were taken to implement APIs integrating the machine-learning tool with other CRC information systems.[76]

Regulatory sandbox

CRC efforts to develop one of the first ICT sandboxes in the world culminated in May 2020 in the issuance of Resolution CRC 5980. The sandbox is applicable to telecommunication network and service providers both internationally and domestically, content and application providers, and postal service operators.

[76] From 2018, the CRC made the internally developed Postdata platform available to all interested public parties, with the aim of bringing the public closer to Postdata information and creating value for the digital ecosystem.

An evaluation period in 2021 will hopefully result in a set of projects authorized by the CRC to enter a trial phase – a testing ground to determine the viability of new business model innovators and analyse the relevance of making the current regulatory framework more flexible.

Web scraping rates

In 2020, the CRC made progress on a data analytics technique, web scraping, that extracts and processes information from websites. It uses the technique to automate the processes of collecting, validating and rating information reports from the agents it regulates. This first phase focused on:

- designing the information-capture processes of fixed and mobile telecommunication services;
- defining automatic validation processes for information on rates and service plans;
- designing the processes for compiling and analysing information on rates and service plans; and
- visualizing the information compiled and multivariable comparison tools.

In the second phase, to be developed in 2021, discussions will be held with operators to establish criteria for optimizing data capture. The discussions will also cover building the joint elements of an online tool for comparing rates that allows users to have more detailed, complete and updated information, and thus to make more informed decisions when choosing communication services.

DataJam Postscript 2020

During the launch of the Postdata portal in May 2020, the CRC also designed a data jam, which is a platform for citizen participation on which the CRC can propose challenges. These challenges are based on either the analysis and visualization of data or on information in ICT, postal or audiovisual content sectors. They are open to any interested person wishing to propose innovative solutions that will be evaluated directly by the CRC Team.

The challenges posed in 2020 concerned access to telecommunication services in the regions and mobile number portability. They called on citizens, academics and operators to co-create analytical information solutions, making use of the data sets published by the CRC on its Postdata platform. Another version of the CRC data jam is expected in 2021.

CRC–Ministry of Science Agreement

In December 2020, the CRC concluded a special cooperation agreement with the Ministry of Science, Technology and Innovation. The agreement entails combining technical, administrative and financial efforts for the promotion and execution of research, technological development and innovation programmes or projects. The projects will serve to improve, promote, enhance and strengthen the ICT, postal and audiovisual content sectors in the country. The aim is to promote innovation, research and technological buy-in that in turn will strengthen regulatory work.

The agreement will run until 2023.

RPU scanning

In 2020, a project called "Digitization of the Regime for the Protection of the Rights of the Users of Communications Services" was carried out. Its objective was to facilitate the adoption of digitization in the development of interactions currently carried out by users of communication services. It recognizes the approach introduced by Law 1978 of 2019, whereby the State acts in the ICT sector in order to promote the digitization of procedures associated with the provision of communication services and requests from various interest groups to adopt digitization processes within their companies.

6.3 Indonesia – COVID-19 Vaccination One-Data System

6.3.1 Overview

The Indonesian Government has announced that the COVID-19 vaccination programme will target 181.5 million people out of a population of 270 million within 15 months.[77] Although Indonesia had originally prioritized Indonesians aged 18 to 59 for vaccination, it has now started to inoculate 21.5 million residents over the age of 60 in its "second batch" of vaccinations.[78]

Indonesia faces enormous logistical hurdles to achieve mass vaccination across a vast archipelago of about 17 000 islands. Tens of millions of people live in hard-to-reach areas accessible mainly by boat or poor roads.

The Government has prepared two vaccination schemes: the government (public) and independent (private) schemes. The government scheme will be carried out by the Ministry of Health and the independent scheme will be rolled out by the Ministry of State-Owned Enterprises. As many as 75 million people are covered by the independent scheme, while 32 million people are covered by the public scheme.[79]

6.3.2 The COVID-19 Vaccination One-Data System

In preparation for the distribution of the COVID-19 vaccine in Indonesia, the Government has appointed two State-owned companies, PT Bio Farma and PT Telkom, to develop new digital infrastructure to support both the government vaccination programme and independently purchased vaccinations. The COVID-19 Vaccination One-Data System will integrate data from multiple sources into one datum in order to prevent data duplication. The data collected will include personal details such as names and addresses. The system will record vaccine recipients by filtering individual data on priority vaccine recipients (by name, by address). It will subsequently be used to register for the two vaccination schemes, to map the vaccine supply and to distribute vaccines to vaccination locations. [80]

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77 Indonesia warns of big fines for refusing COVID-19 vaccine, in a world first, ABC News, Australia, 18 February 2021.

78 Office of the Assistant to the Deputy Cabinet Secretary for State Documents & Translation, VP Ma'ruf Amin Receives First COVID-19 Jab, Cabinet Secretariat of the Republic of Indonesia, 17 February 2021.

79 Office of the Assistant, op. cit., note 137.

80 Ibid.

According to the digital health-care director of Bio Farma, the infrastructure will comprise four phases: track and trace technology, distribution, pre-order facility and vaccination report.[81]

- The track and trace technology will feature 2D barcodes on the vaccine packaging, containing important information such as the vaccine expiry date, batch number and serial number, to prevent counterfeit vaccines.
- Regarding distribution, the infrastructure seeks to ensure that all vaccines are stored in a temperature-controlled system at between 2 and 8°C.
- Further benefits include a pre-order service for independently purchased vaccinations that will prevent vaccine hoarding.
- The digital solution also offers an integrated reporting system, providing consumers with a report or digital certificate that can be used to travel by air or train.

The system being developed by the joint venture will follow the existing regulations relating to data privacy.

6.3.3 Vaccination of older persons

Now that Indonesia has begun vaccinating older persons, the Ministry of Health has added two new mechanisms for the registration and implementation of vaccinations. Vaccine participants can register on either the Ministry of Health or the Committee for COVID-19 website; or they can register via a second mechanism run by organizations and institutions collecting and registering data on older persons in their areas. Once the data have been collected, the organizations cooperate with provincial and local health offices to determine the logistics for vaccination, and then notify the participants who have registered for mass vaccinations when and where the vaccination will take place.[82]

6.3.4 Private vaccine programme

The vaccination roll-out is also creating new opportunities for collaboration between the public and private sectors, prompting the Indonesian Government to partner with the private sector in order to increase the pace of the roll-out. Grab, south-east Asia's ride-hailing app, is setting up drive-through vaccination services across Indonesia in collaboration with the government. The Grab vaccine centre in Bali is prepared to dispense 840 shots a day, for a total of 5 000 vaccinations a week.[83] The programme is the first of its kind in south-east Asia.

Private entities must use a different vaccine supply from the Indonesian Government's stockpile, provide the shots for free and submit recipient data to the Ministry of Health.

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81 Bio Farma develops digital infrastructure for COVID-19 vaccine, *The Jakarta Post,* 3 December 2020.

82 Office of the Assistant to the Deputy Cabinet Secretary for State Documents & Translation, Gov't Announces COVID-19 Vaccination Procedures for Elderly, Cabinet Secretariat of the Republic of Indonesia, 19 February 2021.

83 Soraya Permatasari, Grab Drive-Through Service to Boost Indonesia Vaccine Drive, Bloomberg, 28 February 2021.

6.4 Israel – Green passports and data-sharing agreements

6.4.1 Israel's green passports

Israel is currently leading the world in vaccinating its population against COVID-19, using the Pfizer-BioNTech vaccine. This has allowed Israel to introduce digital vaccination passports, known as "green passports". The green passport is granted to those who are a week past the second dose of the vaccine and to those who have caught and recovered from COVID-19.[84] The passports are available to download on an app run by the Ministry of Health but can also be printed out on paper. They feature a QR code that, once scanned, checks Israeli health records to confirm that the holder has received both doses of a COVID vaccine. Only those who have been given both doses are allowed back into gyms, movie theatres and swimming pools. The restrictions will not apply to museums, libraries and essential shops.[85]

The green passports are likely to transform many industries in Israel. They have been heralded as a way to return to some form of normality and to revive struggling sectors where social distancing is not possible.[86] Tourism, music venues and airlines will all benefit from the use of green passports. Additionally, Israel is already becoming a haven for cruise ships because of the high proportion of the population that is vaccinated, along with the ease of identifying who has been vaccinated.[87]

6.4.2 Call detail records

In March 2020, the Government of Israel approved emergency regulations to allow the individual data collected from cell phones to be used to track people with a view to curtailing the spread of COVID-19 through contact tracing. The sharing of private CDR data with public authorities created social value by supporting the control of COVID-19 infections, thereby saving lives. Analysis of the cellular data suggested that its use led to identification of more than one-third of all of the country's coronavirus cases in the early weeks of the pandemic, possibly contributing to Israel's exceptionally low initial rates of coronavirus infections and deaths.[88]

However, at the same time, this transfer of data raised issues of equity and fundamental concerns about trust – citizens were concerned that their CDR data could be repurposed by government officials for other unintended and potentially harmful purposes beyond public health. Lawmakers raised privacy concerns, eventually pushing the Supreme Court to halt the programme. The Court ruled in late April 2020 that the Government must legislate the use of cell-phone tracking and that "a suitable alternative, compatible with the principles of privacy, must be found".[89]

6.4.3 Data-sharing agreement with Pfizer

In a deal with Pfizer, Israel promised to share medical data in exchange for the continued flow of the hard-to-procure Pfizer vaccine. This could enable Israel to become the first country to

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84 Maayan Jaffe-Hoffman, Everything you need to know about Israel's green passport program, *Jerusalem Post* (28 February2021).
85 James Rothwell, Vaccine passports open doors in Israel, *The Sydney Morning Herald* (21 February 2021).
86 Cat Ferguson and Joshua Mitnick, Israel's "green pass" is an early vision of how we leave lockdown, MIT Technology Review, 1 March 2021.
87 Gene Sloan, Israel, of all places, is about to be one of the world's biggest cruise hubs, The Points Guy, 1 March 2021. https://thepointsguy.com/news/royal-caribbean-israel-cruises/
88 World Bank, op. cit., note 39, p. 17.
89 Ibid.

vaccinate most of its population, while facilitating valuable research to help the rest of the world.[90] Pfizer will receive anonymized data about the consequences, side effects and efficacy of the inoculations, and about the time it takes to develop antibodies, disaggregated by type of population, age group, gender, pre-existing conditions and other factors. The findings of this huge research project will serve to set vaccination strategies in the rest of the world and help pharmaceutical companies continue to research and develop coronavirus vaccinations and other treatments. The data will be shared with the World Health Organisation (WHO).[91]

Israel is an ideal country to provide these data. It has a strong, standardized public health system, with mandatory universal health care provided by four publicly funded health maintenance organizations (HMOs) with meticulously digitized medical records. The United States, for example, has 64 health jurisdictions, each with its own rules and regulations. Furthermore, although operating independently, the four HMOs in Israel have used the same electronic medical records platform for the past two decades. This centralized system gives the nation a global competitive advantage, as it started digitizing patient data years ago, and, with Israel's relatively small population, has helped administer more than 2 million doses of the vaccine in under a month.[92]

The deal with Pfizer nevertheless raises ethical concerns in relation to data privacy. Dr Tehilla Shwartz Altshuler, an expert in digital privacy at the Israel Democracy Institute, contends that permission should be required to give away personal data and that sharing large quantities of information could potentially jeopardize individuals' privacy, even if the information is anonymized.[93] While speedy vaccine delivery may well be worth the price of handing over the data, Shwartz Altshuler believes that the public should have been given the choice. According to the Ministry of Health, Israel is not giving Pfizer any personal information, only general statistics.[94]

The privacy concerns raised have prompted the Ministry of Health to publish a partially redacted version of its agreement with Pfizer.[95] While the agreement is to share only "aggregate de-identified data", questions remain as to the nature of the data that will be shared with Pfizer.[96] The agreement also lacks provisions on the information security measures to be taken by Pfizer to prevent unauthorized access to data.

6.5 Kyrgyzstan – Internet in a box: The ilimbox

When Kyrgyzstan moved all education online during the COVID-19 pandemic, 20 remote schools, such as the one in Zaradaly, were left out because they had no Internet connection. Zaradaly has no electricity, fixed Internet or mobile data, so connecting the village's school meant having two Internet Society employees and a donkey deliver the "Internet in a box", a

90 Guy Davies, Israel is leading the world in its vaccinations, but the program is not without controversy, ABC News, 16 January 2021.
91 Tammy Lovell, Israel to share data with Pfizer in exchange for COVID-19 vaccine doses, HIMSS, 11 January 2021.
92 Shoshanna Solomon, Experts urge dose of transparency as medical data traded to Pfizer for vaccines, *The Times of Israel* (2 May 2021).
93 Ilan Ben Zion, Israel trades Pfizer doses for medical data in vaccine blitz, AP, 18 January 2021.
94 Shoshanna Solomon, op. cit., note 155.
95 The agreement is available at https://govextra.gov.il/media/30806/11221-moh-pfizer-collaboration-agreement-redacted.pdf.
96 Assaf Harell, Big data and the pursuit of herd immunity: Israel's COVID-19 data-sharing agreement, IAPP, 29 January 2021.

digital library called the ilimbox (see photo). Eleven primary school students aged between 7 and 12 learned how to use it.

Learning to use the ilimbox © Rest of World (photos are pre-pandemic).

The Internet Society is a non-profit that builds community broadband networks and teaches digital literacy around the world. Its aim was to bring the Internet to local schools cut off from education during the coronavirus pandemic using the ilimbox.

The ilimbox is a tissue-box-sized digital library providing an interim solution for the lack of an Internet connection. Its name translates to "science in a box" – the ilimbox is a repository of downloaded Internet content that can be accessed by offline communities. It stores 500 books, 250 videos and 4 million Wikipedia articles in Kyrgyz, Russian and English. When connected to a power source, the ilimbox becomes a local Wi-Fi hot spot. Students can then install the partnering Android app and download the content stored on the drive.

Building Internet infrastructure has been a great challenge in Kyrgyzstan, a mountainous and landlocked country in which it is expensive and difficult to lay cables. While the ilimbox can act as a window for people wanting to access knowledge and the Internet, it is not a complete solution. The hope is that real Internet services can be brought to the village of Zardaly in the future, and that its residents can be taught to use it for work, study and other things.[97]

6.6 Latin America – The challenges of, and recommendations for, the digital divide during COVID-19

This case study sets out the findings of a 2020 study by the Inter-American Development Bank.[98]

6.6.1 Background: The impact of COVID-19 in Latin America and the Caribbean

The COVID-19 pandemic has accentuated the connectivity and digitalization lag in countries in the Latin American and Caribbean region. The lockdowns imposed increased the demand for digital tools enabling remote access to economic, educational and social activities. Despite a significant increase in broadband network coverage in the region, a considerable number of people remain without connectivity and it is proving difficult to accelerate the digital transformation. As a result, only a few activities can be accessed remotely.

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97 Zeyi Yang, Where the internet was delivered by a donkey, Rest of World, 8 February 2021.

98 Antonio Garcia Zaballos et al., *The Impact of Digital Infrastructure on the Consequences of COVID-19 and on the Mitigation of Future Effects*, Discussion paper No. IDB-DP- 827 (Inter-American Development Bank, Washington, DC, 2020).

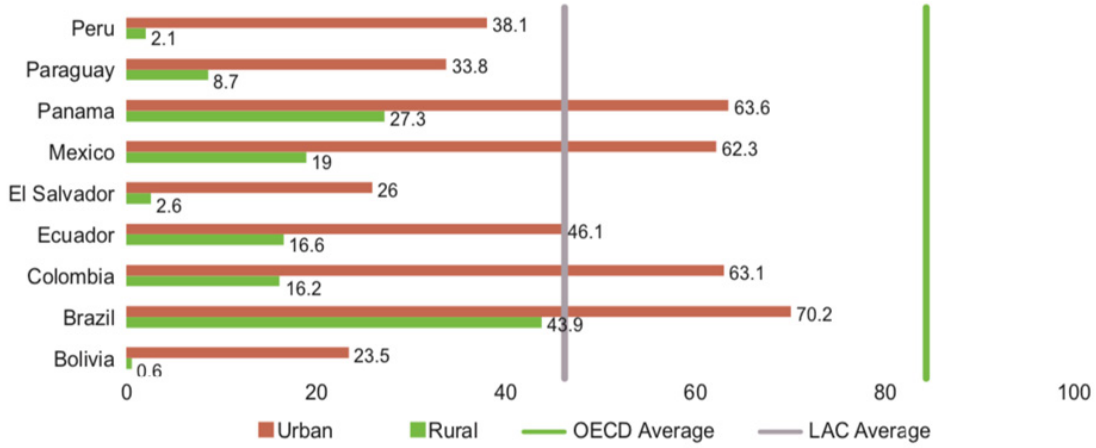
As one-third of the population in the region does not use the Internet, one of the priorities should be to connect people who are not currently connected. Connectivity is a necessary but insufficient condition for obtaining the benefits of digital technology. In particular, it can increase the effectiveness of government actions to alleviate the pandemic-related economic crisis.

6.6.2 The digital divide in Latin America and the Caribbean

The difficulties faced by countries in the region are closely related to the digital divide. On the supply side, the lack of infrastructure and connection quality are the main impediments to efficient connectivity. On the demand side, price and income or capacity factors are the main constraints.

- Supply constraints: Connectivity is substantially lower than in urban locations, as illustrated in **Figure 25**. In Mexico, rural localities are estimated to have lower broadband network coverage regardless of the level of marginalization.[99]
- Demand constraints: With respect to income levels, access to broadband service is expensive in most of the region's countries. Relatively low levels of household income limit access to the Internet and therefore the possibility to use it efficiently. The proportion of the population that has basic and standard skills in the use of ICTs is substantially lower than the OECD average. This lack of skills may have exacerbated the effect of the pandemic in the region by hindering the digitalization of various activities.

Figure 25. Latin American and Caribbean households with an Internet connection, by location, 2018 (percentage)



Source: Antonio Garcia Zaballos et al., note 161

6.6.3 Policies to enhance the impact of telecommunications and address the digital divide

Further investment is recommended, particularly in regions that have fallen behind, such as Latin America and the Caribbean, in better telecommunication infrastructure and digital skills. In the new normal, widespread home broadband and mobile coverage is more important than ever to prevent the widening of digital divides. **Figures 26** and **27** summarize the recommendations for mobile and broadband networks.

[99] Martin Cave et al., *Bridging Mexico's digital divide: an inside-out/outside-in view of competition and regulation* (Consejo Ejecutivo de Empresas Globales, Mexico, 2018).

Figure 26. Policy recommendations for mobile networks

Policy recommendations for mobile networks during the new normal	
Government	
Improve access to sites, giving operators more control over landlords	Where appropriate, issue national regulations to be applied at the regional and local levels, with legal and political incentives to encourage implementation, including standardized fees for access to public facilities, one-stop-shop provision of all necessary regulatory processes and maximum time-limits for permits to be granted. Consider publishing regulations such as the United Kingdom's new code. Establish a barrier-busting team to act as a gateway for input, a resource to address issues and a permanent centre of expertise in best practice.
Regulator	
Spectrum and masts in rural areas	Improve the range of existing sites by allowing higher masts and transmission power in rural areas and by making available 700 MHz spectrum. Provide flexible access to spectrum, including by enabling spectrum sharing and leasing, and allow new business models. Maximize spectrum supply and sharing.
Local authority	
Construction permits	Implement efficient processes for handling construction permits for mobile network antenna sites, consistent with the national framework.

Source: Webbsearch, Obstacles to deploying a denser mobile network, with a focus on the Americas, 2019

Figure 27. Policy recommendations for broadband networks

Policy recommendations for broadband networks during the new normal	
Passive infrastructure access	Operators other than the incumbent ("altnets") can access ducts and poles owned by the incumbent and typically used for the existing copper network. While such access can reduce deployment costs by as much as 90 per cent, in practice ducts are often not in the right place, already full, not well mapped, or have other problems. As a result, passive infrastructure access has yet to live up to the hopes of its proponents.
Vouchers and similar	Households are given vouchers that they can use to pay for the installation costs of home broadband. This can incentivize altnets and incumbents to roll out broadband, knowing that they can charge a connection price that might offset much of their deployment costs. Voucher schemes have worked relatively well, especially where there is a vibrant, competitive altnet environment and where other restrictions have been removed.

Source: Antonio Garcia Zaballos et al., note 161

6.7 Mexico – Measures implemented by the IFT in the face of the COVID-19 pandemic

The Federal Telecommunications Institute (IFT) developed several recommendations and actions in the face of the COVID-19 pandemic, in order to maintain the effective provision of telecommunication service. The recommendations and actions are summarized below.

6.7.1 Microsite "In the face of coronavirus"

The microsite "In the face of coronavirus – telecoms are on your side"[100]:

- advocates responsible use of telecommunication networks;
- makes available tools, such as the Data Consumption Simulator[101], for planning consumption in response to changes in user activity;
- explains the measures taken by the IFT and operators in response to the emergency, and makes available official information published *inter alia* by the Ministry of Health.

6.7.2 Avoid network saturation

To avoid network saturation, the IFT issued the following recommendations for users:

- prioritize Internet use for information, work, educational and health purposes;
- restrict use for videoconferencing or video calls and prefer voice communications;
- give preference to instant messaging services (SMS, WhatsApp, Messenger) and landline calls;
- take advantage of lower data traffic periods (afternoon/evening) to download heavy files, movies and videos or to play games online.

6.7.3 Free updated information on the pandemic for mobile phone users

Thanks to coordination between the IFT, the telecommunication industry and the Federal Government, the following was decided:

- users would receive free SMS with announcements and other updated information about COVID-19;
- such SMS would be sent for the duration of the health emergency, giving the population timely access to official information and enabling it to enjoy its constitutional right to receive information;
- access to the Federal Government information portal on the COVID-19 pandemic would be free of charge, allowing users to consult the official information found there without consuming data.

[100] See www.ift.org.mx/comunicacion-y-medios/frente-al-coronavirus-las-telecom-estan-de-tu-lado.
[101] Available at http://simulador.ift.org.mx/simulador.php.

6.7.4 Continuation of telecommunication and broadcasting services during the COVID-19 emergency

In view of the measures ordered by the General Health Council, the IFT exhorted federal, state and municipal authorities to:

- guarantee that workers of telecommunication and broadcasting licence holders and related services had sufficient and broad facilities to provide telecommunication and broadcasting services for the benefit of the population;
- within its jurisdiction, help telecommunication and broadcast operators develop and execute actions to install, operate and maintain their infrastructure.

6.7.5 Mobile telecommunication operators provide user support

The mobile service operators AT&T, Movistar and Telcel offered their users different forms of support, including an "emergency plan" giving active prepaid customers one-time access to a free package of voice calls and SMS for communications during the emergency. Other measures are as follows:

- at least 100 minutes of voice for national calls and 150 SMS for at least 15 days, and activation of the emerging remote plan, for example, by SMS or by telephone;
- cost-free calls to emergency numbers such as 911 and to the Federal Government coronavirus hotline;
- free browsing on the health authorities' Internet portal, as long as the content is accessed from that portal:
- cost-free access to the Ministry of Health COVID-19MX mobile application and, depending on what has been implemented by each operator, to educational and cultural pages.

The details of each plan could be consulted on the operators' pages or by telephone via their customer service lines.

The operators strengthened their remote service channels (telephone or Internet) for balance recharges, payment of invoices and purchase of equipment, so as to limit people's movements.

During this period, some mobile service operators offered other support schemes or measures for their users, such as flexible data limits and/or fair-use policies, at no extra charge, and extended the validity of some prepaid plans.

6.7.6 Mobile virtual network operators

From April 17, customers of Addinteli, ADS Mobile, Bait-Bodega Aurrera Internet y Telefonía, Diri, Diveracy, Grupo Inten, IENTC, Megacable, Newww, Retemex, Servitron, Vasanta and Wimo (mobile virtual network operators providing services through the Wholesale Shared Network operated by Altán) were able to request access to the "Stay at home" emergency plan. The plan is designed to guarantee service and access to the network during the emergency and includes unlimited calls and SMS plus 10 GB for Internet browsing at a cost of MXN 100 per month.

The plan also includes free calls to emergency numbers such as 911 and to the Federal Government coronavirus hotline, free browsing on the health authorities' Internet portal, access to the Ministry of Health COVID-19MX mobile application and, depending on what is implemented by each mobile virtual network operator, to educational and cultural pages.

6.7.7 Support for pay TV and fixed Internet users

Operators affiliated with the Independent Telecommunications Association of Mexico provided their users with support through the "Line of Life" emergency plan, to keep them connected during the health emergency. The plan guarantees subscribers, should they not be able to pay, fixed Internet service with access to 2 Mbit/s speed and, in the pay television service, access to national/local channels and to the educational, news and cultural services of the public broadcasting system.

For HughesNet satellite Internet service subscribers, installation (of leased equipment) and service activation were free until 30 June 2020. In addition, while the health emergency lasts, users will be able to continue browsing at 25 Mbit/s, because the fair-use condition of reducing browsing speed when data capacity is used up is suspended during this period.

6.7.8 Emerging and provisional package of fixed Internet and telephony services

Under the IFT collaborative regulation mechanisms, and in order to support users during the health emergency, landline and telephony service operators Izzi, Megacable, Telmex, Totalplay and Maxcom agreed to offer their clients the option of temporarily migrating to a low-cost plan.

The "Contingency Support" package fulfils the operators' commitment and social responsibility to enable users facing a difficult situation because of the pandemic to maintain connectivity in their homes. It was available from 1 May for active subscribers with a fixed Internet access contract, but only to residential users; it costs MXN 100 per package, including value-added tax, or per month, as defined by each operator in accordance with its commercial policies.

Residential users who needed it were able to migrate to this package once without incurring a penalty, in May, and to stay in it until 30 June. The plan includes an Internet speed of up to 2 Mbit/s, and unlimited browsing and data, with the exception of video and video game downloads.

6.7.9 Access to multiprogramming channels on open TV to transmit educational content

The IFT approved an agreement making it easier for operators of the open television service to use additional programming channels, under the multiprogramming scheme, to temporarily broadcast audiovisual content that includes lessons broadcast by the Ministry of Public Education during the emergency. The broadcasts will run until the date on which the competent health and educational authorities decide, by official means or communication, that in-person lessons will resume throughout the country.

6.7.10 Procedures reactivated electronically to promote the development of industry and user activities

Although the suspension of face-to-face activities was extended to 30 May 2020, 73 per cent of IFT procedures were reactivated in such a manner that they could be carried out electronically, in order to ensure continuity of essential telecommunication and broadcasting functions during the health emergency.

It was therefore agreed to allow 126 of the 173 procedures found in the IFT catalogue to be carried out remotely, without additional costs and taking advantage of technological resources and the IFT's five years of experience in telework.

6.7.11 Information materials on the use of telecommunications made available in indigenous languages

In order to provide information to the indigenous population, the IFT made available online information materials in Mazahua, Tzotzil, Zapotec and Nahuatl containing recommendations for the use of telecommunication services during the Covid-19 pandemic. Videos and infographics are used to provide information on the benefits of telecommunications, make recommendations on hygiene and cleaning measures to prevent the spread of the virus, and promote practices aimed at avoiding saturation in terms of Internet use.[102]

6.7.12 Industry support

Information on other measures for users adopted by the IFT in terms of digital platform services, pay television, telephony and fixed Internet may be consulted on the IFT portal.

6.8 Peru – Addressing the digital divide with "Todos Conectados"

6.8.1 Emergency measures

On 15 March 2020, the Peruvian Government declared a state of national emergency in response to COVID-19. It subsequently adopted different types of measures in relation to telecommunications: measures that prohibit the disconnection of telecommunication services for non-payment, measures to provide relevant information to consumers about mobile services online, and measures to bridge the digital divide through the universal service fund.

Continuation of service despite non-payment

Resolution No. 035-2020-PD of 16 March 2020 prohibits the disconnection of telecommunication services for non-payment. However, a further resolution adopted on April 3 allowed operators to reduce the features of telecommunication plans in the event of non-payment, and by 1 July 2020 regulators were once again allowed to shut off services for users who had not paid.

Providing information online about telecommunication services

Three notable measures were undertaken to help Peruvians understand their options for telecommunication services. Under the first measure, Resolution No. 153-2020-CD**,** MNOs must provide customers signing a new contract with a "short contract" that summarizes the main features and characteristics of the service acquired. The second was the creation of Comparatel.pe, which allows customers to compare plans from the MNO's commercial offer and choose the one that best suits their needs. Thirdly, the Supervisory Agency for Private Investment in Telecommunications asked all MNOs to develop a web app enabling customers to carry out transactions such as plan switching and service cancellation. It was the first regulator in Latin America to do so.

[102] See www.ift.org.mx/comunicacion-y-medios/frente-al-coronavirus-las-telecom-estan-de-tu-lado/recomendaciones-ift for further information.

6.8.2 Addressing the digital divide – changes to universal service fund policy

When the second wave hit Peru on 31 January 2021, the Government's focus shifted to narrowing the digital divide by increasing service coverage and enabling greater access to telehealth and tele-education services. Currently, 30 per cent of Peru's rural population has access to the Internet. It is hoped that this number will grow to 80 percent, in line with the rest of Peru.[103]

Therefore, in February 2021, the Peruvian Council of Ministers launched "Todos Conectados", a programme aimed at bringing free Internet to local and rural areas in Peru and to closing digital infrastructure gaps.[104] The programme is estimated to cost PEN 180 million (USD 40.5 million).[105]

Todos Conectados was launched as an emergency decree and aims to bring connectivity to 3.2 million people located in rural areas using satellite services, Wi-Fi and digital centres.[106] The plan has three key areas. Under the plan, the Government will hire satellite Internet services for 1 200 public sites in 860 locations in jungle areas.[107] The plan also entails the deployment of 6 531 free Wi-Fi points in public squares in rural areas, 3 636 of which are to be established in 2021, and the installation of 1 000 digital access centres in isolated areas, 564 of which are to be established by July 2021. It is expected that these new measures will increase Internet penetration in rural areas to 80 per cent, a dramatic increase from the current rate of 30 per cent.[108]

6.9 South Africa – Addressing the digital divide in the COVID-19 era

6.9.1 Overview of the digital divide in South Africa

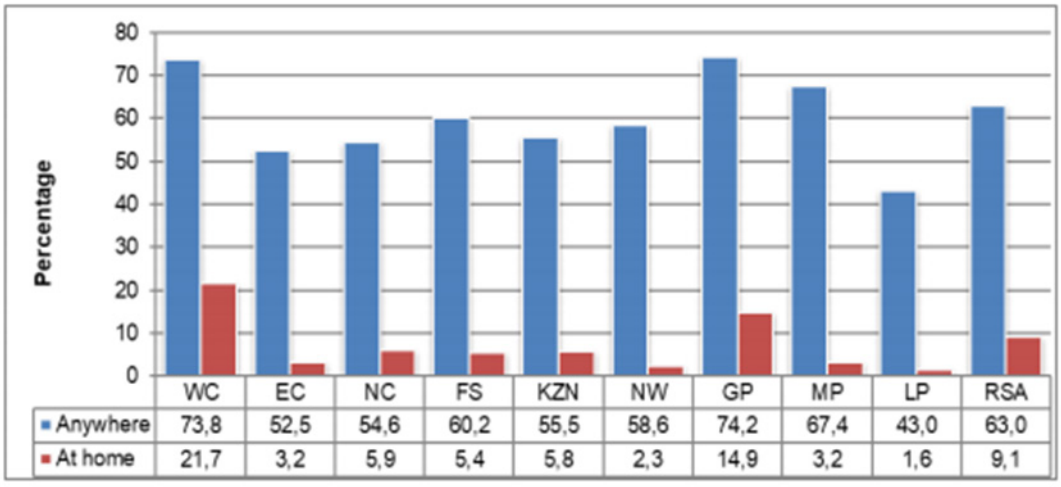
COVID-19 has thrown into stark relief the digital divide in South Africa. A lack of access to affordable ICT services, infrastructure and content has exacerbated the impact of lockdowns on the poor, the remote and the marginalized.[109] The digital divide is evident in South Africa in a number of ways. First, many South Africans are unable to afford the right technology or Internet access. South Africa's data prices were criticized in 2019 by the Competition Commission for being too high in comparison to both international markets and other African markets,[110] and at least 35 per cent of South Africans do not have a smartphone (equating to over 20 million people).[111] Second, South Africa has poor digital infrastructure that is unevenly distributed. The use of mobile Internet devices lags in rural areas: 44 per cent compared to 67.8 per cent in metropolitan areas and 59.5 per cent in urban areas. While 15.4 per cent of households in

[103] Gestion, *Government will Provide Free Internet in More Than 6000 Public Squares in the Country* (3 February 2021).
[104] International Monetary Fund, Policy Responses to COVID-19: Peru [webpage] (accessed on 4 February 2021).
[105] Peru Embarks on New Rural Connectivity Push, BNamericas, 5 February 2021.
[106] Swissinfo, *Peru will Hire Satellite Internet to Benefit 3.2 Million People* (4 February 2021).
[107] Ibid.
[108] Peru Embarks on New Rural Connectivity Push, op. cit., note 171.
[109] Charley Lewis, ICT Sector Policy and Regulation in the Time of Covid-19, IT Web, 3 April 2020.
[110] Competition Commission, *Data Services Market Inquiry,* South Africa, April 2019. The report examined the cost of data in South Africa at the request of the Minister of Economic Development and the #datamustfall campaign. South Africa's post-paid market is better priced that its prepaid market, which suggests that poorer, prepaid customers are charged relatively higher prices than post-paid customers. Concerningly, Vodacom and MTN prices in South Africa were considerably higher than in other countries in which they operate. The report has since forced Vodacom, MTN and Telekom to drop their prices.
[111] Data from the Independent Communications Authority of South Africa, 1 March 2021.

metropolitan areas have access to the Internet at home, only 1.2 per cent of rural households have access.[112]

Figure 28 demonstrates how the digital divide affects people along economic and geographical lines: 21.7 per cent of people in Western Cape have an active home Internet connection, while in Limpopo, one of the poorest provinces in South Africa, only 1.6 per cent have an active home Internet connection.[113]

Figure 28. Percentage of households with access to the Internet by province (South Africa)



	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Anywhere	73,8	52,5	54,6	60,2	55,5	58,6	74,2	67,4	43,0	63,0
At home	21,7	3,2	5,9	5,4	5,8	2,3	14,9	3,2	1,6	9,1

Source: Statistics South Africa, see note 179

COVID-19 has necessitated the transition to online work, study, entertainment, banking, medical appointments and more. The digital divide has meant that this transition has been markedly more difficult for the poor and those located in rural areas. Of great concern is the impact of the digital divide in education. As Czerniewicz et al. note, COVID-19 made it "impossible not to recognise the historical, geospatial, economic inequalities of the country and the world students live in".[114] Students who are unable to attend school or learn remotely face significant adverse consequences: the most enduring negative impact of COVID-19 for children may be learning losses.[115] However, ICT has great potential to mitigate the impact of the pandemic and education fall-out by connecting students. The strategies adopted to utilize ICT to combat the digital divide are considered below, after a discussion of the impact of the digital divide on education during the pandemic.

6.9.2 Impact on various education sectors

Universities

The disadvantages faced by poor and remote students at university were heightened by the shift to remote learning. Such differences had previously been somewhat masked by on-campus learning. However, with the move to remote learning, students and staff who lived in areas with

[112] Ibid., p. 53.
[113] Statistics South Africa, *General Household Survey, 2019*, p. 52.
[114] Czerniewicz et al., A Wake-Up Call: Equity Inequality and Covid-19 Emergency Remote Teaching and Learning, *Postdigitial Science and Education* 2(3): 4.
[115] Mohohlwan et al., *Schooling in SA During the COVID-19 Pandemic* (17 February 2021), p 10.

poor Internet connections suffered to a greater extent.[116] When universities were residential with onsite learning, students were given more equitable access to computers and Wi-Fi. However, once the pandemic began, students who had not used computers in schools were unable to move to a remote learning environment as they did not get the training they needed.

Existing inequalities were highlighted at an institutional level by the disparity in responses to COVID-19.[117] Previously advantaged, predominately white universities were more likely to be teaching online prior to the pandemic, as compared to historically disadvantaged, black institutions that were still grappling with how to implement online teaching when the pandemic hit. There were also disparities in the amount of support staff received to transition to online learning (including strong leadership and training).[118]

Schools

The closure of schools on 18 March 2020 had a greater impact on primary and secondary students than the closure of universities had on post-secondary students. While all universities are in or near urban centres and so have the tools to deliver electronic or blended learning, many schools are in poor or rural areas and do not. In poorer households, many children do not have parents able to take on the role of home-schooling.[119]

Further, many students also relied on free school meals, and there has therefore been increased hunger since the lockdown.[120] Additionally, the impact of school shutdowns is long lasting: learning losses from children missing school can have lasting implications, stretching into the labour market and affecting lifetime earnings.[121]

The digital divide exacerbated the difficulties students faced with online learning. One common issue for students without high quality Internet access was downloading homework, which was difficult to access due to connectivity issues.[122] Higher-income households were better placed to learn remotely, as they had access to devices, better Internet connectivity and the ability to pay for the requisite data. Poorer schools had fewer technological resources, and most had no form of computing or IT resources at all.[123] Additionally, before the pandemic, many teachers had not received substantive formal technology training.[124]

In the second half of 2020, in-person attendance at school was able to increase; however, during the second lockdown those in the wealthiest 10 per cent of households were twice as likely to have attended school as those in the poorest 80 per cent of households.[125] This demonstrates that during the lockdown periods, poorer students' education is likely to be impacted to a greater extent as they have inferior connectivity, less access to devices and are less likely to attend school in person. South Africa is currently battling a third wave and a new strain of

116 Czerniewicz et al., op. cit., note 180, p. 17.
117 Ibid., p. 16.
118 Ibid.
119 Impact of school closures on education outcomes in South Africa, The Conversation, 6 May 2020.
120 COVID-19 school closures in South Africa and their impact on children, The Conversation, 15 July 2020.
121 Ibid.
122 Emily Gordin and Kate Hairsine, *How the Internet is Making Stay-at-Home Difficult for Africans* (7 April 2020).
123 What South Africa's teachers brought to the virtual classroom during COVID-19, The Conversation, 4 October 2020. See also Here's how many South African schools don't have the Internet or a computer lab – and what it will cost to fix the problem, Businesstech, 18 July 2018.
124 Ibid.
125 Mohohlwan et al., op. cit., note 181, p 3.

COVID-19, which delayed the return to schools by two weeks.[126] The impact of the digital divide is therefore likely to continue as South Africa undergoes lockdowns to contain the pandemic.

As with universities, the digital divide is exacerbated by the difference in resources that South African schools have available to them. Schools in the poorest quintile have significantly fewer resources and less support, and education inequality is "entrenched" in South Africa.[127] This is reflected in the digital divide and is a trend seen across Africa: half of the total number of learners does not have access to a household computer and 43 per cent have no Internet at home.[128]

6.9.3 Strategies to address the digital divide

The South African Government, MNOs and the regulator (the Independent Communications Authority of South Africa), have implemented a number of initiatives to address the digital divide and mitigate its impact on students during the pandemic.

- **Cost of data:** Although unrelated to the pandemic, Vodacom and MTN cut their mobile data prices by 20 to 50 per cent, which has benefited mobile users during lockdown.[129] However, the quality of connectivity means that students still may not have access to the Internet for their studies, and with the unemployment rate at 43.1 per cent (a rise of 4.6 per cent over the past year), households are less likely to be able to afford enough data for schooling.[130] The Competition Commission recommended in 2019 that mobile operators should offer subscribers a lifeline package of daily free data to ensure that all citizens have data access on a continual basis regardless of income levels; however, this has not been given legislative or regulatory effect.[131]
- **Providing access to devices:** Some universities donated, loaned or financed devices for students from their own finances, but many university students were left out or only had access to a smartphone, rather than a computer.[132]
- **Zero-rated websites:** The Acting Minister of Communications and Digital Technologies published directives in 2020 that provide a framework for the zero-rating of websites for education and health.[133] Vodacom, MTN and Telkom each provided their own zero-rated learning portal, with free content for all school grades.[134] However, these portals are only available to customers, and with no single common platform the benefit of this initiative has been limited.
- **TV and radio curriculum support programmes:** The South African Broadcasting Corporation and the Department of Basic Education launched a multimedia support initiative to provide

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126 Kalden Ongmu, South Africa: schools to stay closed amid surge in coronavirus cases, WION, 22 January 2021.

127 How South Africa can disrupt its deeply rooted educational inequality, The Conversation, 6 October 2015.

128 Coronavirus Africa: Startling digital divides in distance learning emerge, press release, UNESCO, 24 April 2020.

129 Data prices were cut in response to the Competition Commissioner's two year inquiry: see Nqobile Dludla, South Africa's MTN Drops Data Prices After Competition Probe, Reuters, 20 March 2020.

130 The official unemployment rate was 30.8 per cent between July and September 2020. The unemployment rate varies by province: Western Cape's expanded unemployment rate was recorded as 29.1 per cent, while the Eastern Cape's expanded unemployment rate was 51.2 per cent. See Statistics South Africa, *Quarterly Labour Force Survey: Quarter 3 2020*.

131 Competition Commission, op. cit., note 176, p. 18 [48.4].

132 Czerniewicz et al., op. cit., note 180, p 9.

133 Department of Telecommunications and Postal Service, Directions on Zero-Rating of Websites for Education and Health, under regulation 4(10) of the Regulations made under the Disaster Management Act, 2002 (Act 57 of 2002), *Government Gazette No. 41413*, 5 June 2020.

134 Yarik Turianskyi, COVID-19: Implications for the "digital divide" in Africa, Africa Portal, 14 May 2020; Telkom zero-rates education websites amid coronavirus outbreak, Tech Central, 16 March 2020. MTN agreed to provide free access to educational websites for children only after they were threatened with legal action: Edward-John Bottomley, An NGO has just forced MTN to make a bunch of educational websites free in SA, Business Insider, 22 July 2020.

educational resources to students during the lockdown.[135] The advantage of this initiative is that it is not dependent on an Internet connection and so is more accessible for poor and rural students.

However, the benefit of zero-rated sites is undermined by the lack of devices and poor connectivity. For example, live online sessions with lecturers at universities were not zero-rated, so students who did not have enough data had to watch the sessions afterwards and were therefore excluded from participation.[136] Additionally, zero-rated websites can still incur unexpected data charges or produce a sub-optimal user experience for those with no data available if webpages include files and images from external domains that are not zero-rated. Zero-rating therefore benefits those who already have access to the Internet and devices, and does not adequately address the digital divide.

6.9.4 Conclusion: addressing the digital divide is a work in progress

South Africa has so far undertaken a range of measures to address the digital divide in education, but the measures have been described as a "disparate plethora" and, as seen above, are undermined by a lack of connectivity and devices.[137] It has been argued that South Africa should also prioritize "systemic provision of free lifeline data, across-the-board increases in data caps, an undertaking not to disconnect subscribers, and dissemination of information by SMS" to address the digital divide and benefit students.[138]

Previous attempts to address inequality in education have been hampered by a fear of helping one group at the expense of another, but as one academic put it, "the response [to COVID-19] is that we do whatever we can to address barriers to access in the moment".[139] South Africa's response to addressing the digital divide in COVID-19 is a work in progress, but offers some valuable lessons for other emerging markets.

6.10 United Arab Emirates – Managing traffic and addressing the digital divide during COVID-19

6.10.1 Background: the United Arab Emirates universal service policy

The Telecommunications Regulatory Authority (TRA) of the United Arab Emirates (UAE) is required to ensure that telecommunication services are sufficient to satisfy the public demands of those who wish to make use of such services.[140] To meet this mandate, in 2017 the TRA released its policy, Promoting the Universal Provision of Telecommunication Services in the United Arab Emirates.[141]

The United Arab Emirates was already a global leader in terms of fibre broadband availability and take-up, with 75 per cent of households connected to fibre broadband networks and over 90

[135] South African Government, Basic Education and SABC Launch Coronavirus COVID-19 TV and Radio Curriculum Support Programmes for Learners, 8 April 2020
[136] Czerniewicz et al., op. cit., note 180, p. 13.
[137] Charley Lewis, op., cit., note 175.
[138] Ibid.
[139] Czerniewicz., op. cit., note 180, p. 7.
[140] UAE Federal Law by Decree No. 3 of 2003, Article 13.
[141] TRA, Promoting the Universal Provision of Telecommunication Services in the UAE, Version 1.0, 12 December 2017.

per cent of homes passed by fibre in 2017.[142] However, the TRA was concerned that consumers located outside the main population centres were receiving a lower-quality service. The policy therefore required that all consumers in permanent dwellings should have access to services that can deliver basic voice, television services and high-speed data packages of at least 10 Mbit/s.[143]

In order to achieve universal service in an efficient way that maximizes net benefits to society, the TRA preferred fibre to the home (FTTH, because once the fibre network was deployed, licensees would be able to offer higher data speeds to customers without significant expenditure.[144] As a result of this policy, the United Arab Emirates now has the highest fibre penetration level in the world.[145]

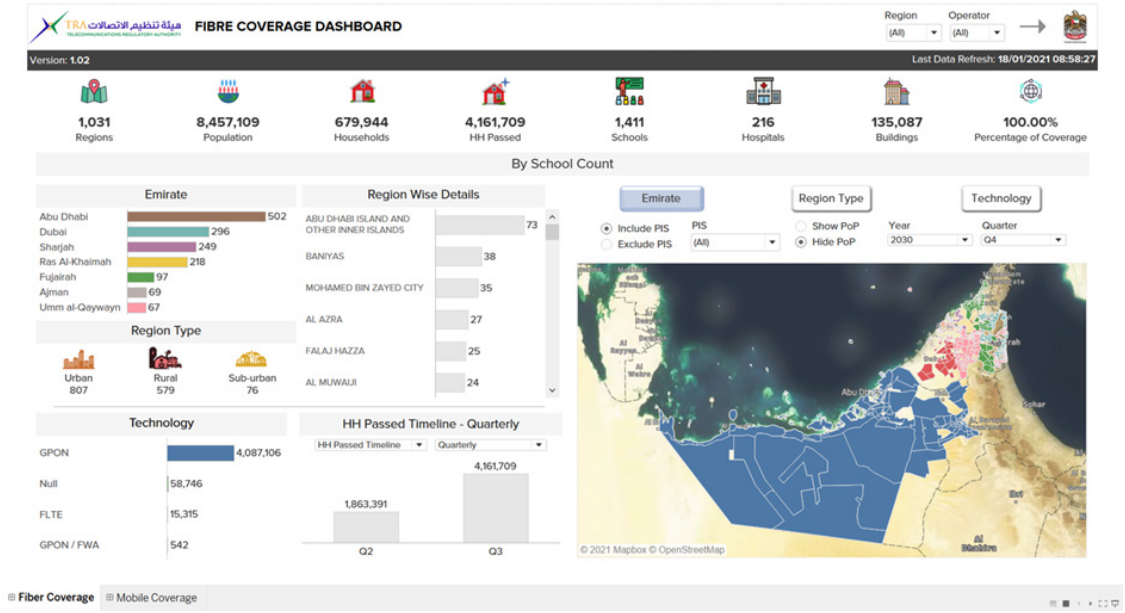
6.10.2 United Arab Emirates TRA's COVID response

The onset of COVID-19 made it critical for households to have access to a high-speed, quality service so that people could work and study from home. To ensure that consumers in the United Arab Emirates were receiving a high quality of service (QoS) during this period, the TRA created a dataset comparing the number of households, buildings, schools and hospitals in each of the seven emirates with the number of households, hospitals, schools and buildings that the licensees had provided with FTTH, based on the licensees' data. It also requested licensees to provide information regarding the technology being deployed, the location of the optical distribution frame (ODFs) and points of presence (PoPs), and an indication of the year and quarter by which the region would be covered by fibre.

By comparing the two datasets and receiving up-to-date information, the TRA was able to create an internal interactive fibre deployment monitoring dashboard that is updated quarterly based on updates from licensees (see **Figure 29**). It is thus able to better monitor implementation of the 2017 universal service obligations (USO) policy and ensure that section 13 of the Telecommunications Act is satisfied.

142 Ibid., 3.2.
143 Ibid., 4.2.
144 Ibid., 4.5.
145 FTTH Council: UAE becomes digital hub for innovation with global leadership in fiber optic network, ITP.net, 9 December 2019.

Figure 29. Example of the United Arab Emirates TRA dashboard (indicative data)



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Source: TRA, United Arab Emirates, February 2021

7 Conclusions and recommendations

7.1 Conclusions

As detailed in this report, ICTs clearly have an enormous role to play in helping society adapt to the dislocations caused by the pandemic. This enhanced role comes in addition to the already central part that digital technologies have assumed in driving innovation, digital disruption and economic growth and development, particularly in emerging economies. It is critical, then, that national governments, regional cooperative organizations and NGOs collaborate with industry stakeholders to ensure that digital technologies are used as effectively as possible to soften the economic burden of the pandemic and ease, to the maximum extent possible, the social dislocations associated with it.

This report has explored four main themes (described below) that should be addressed globally by regional and national governments supported by national regulatory authorities and industry stakeholders: (i) addressing the digital divide; (ii) driving digital deepening; (iii) effecting digital transformation; and (iv) building digital resilience.

Addressing the digital divide

The huge shift to online activity means that social groups without affordable connectivity are now more disadvantaged than before the pandemic. The ability to participate socially and economically, to obtain education, medical and other government services, to communicate and to access e-commerce services is completely dependent on affordable connectivity.

Addressing the digital divide has important consequences in terms of economic efficiency and development, but it is primarily driven by considerations of equity, that is, providing equal access to opportunities to participate in the digital economy and society.

Driving digital deepening

As businesses and governments shift their activities online, they will require faster and higher-capacity data services. Although there may be fewer people in central business districts for some time, the demand for data will likely stay high and continue to grow strongly. Particularly in emerging economies, it will be crucial rapidly to deploy 4G/5G coverage in urban and suburban areas, in order to support pandemic-driven data demand. In contrast to addressing the digital divide, digital deepening is primarily driven by economic objectives of increased efficiency, productivity, competitiveness and growth. It is not limited to access networks; backhaul, cloud infrastructure and international submarine/satellite capacity must also be properly dimensioned for the additional load and more.

Effecting digital transformation

The shift to digital processes requires a broad digital transformation in institutions and in business and government processes, including access to health care, financial services and government services. A critical component of this shift is to improve the digital literacy of less

capable groups so that they are comfortable accessing services online. More difficult, but just as important, is cultural change in societies, government and companies.

Building digital resilience

The rapid increase in demand for services experienced at the onset of the COVID-19 pandemic means that additional capacity and resilience have to be built into telecommunication infrastructure systems and services. In a period of uncertainty, the returns for building additional "headroom" are increased. Again, building digital resilience it not limited to access networks; backhaul, cloud infrastructure, international submarine/satellite capacity and ICT systems must be properly dimensioned for present and future crises and disasters.

Specifically, in the short and medium term, as ICTs have a great capacity to facilitate the move to the new normal, governments and national regulatory authorities should endorse and support, as part of the ICT sector response to COVID-19:

- enhanced digital contact tracing (via smartphones) with public campaigns to support greater public buy-in;
- strong digital supply chains for COVID-19 vaccines and their distribution;
- digital vaccine certificates and vaccine passports – utilizing digital IDs where possible – to facilitate domestic and international travel and trade.

8 Appendix A – REG4COVID updates

Since June 2020, the following COVID-19 initiatives have been entered into the ITU REG4COVID database.

8.1 Short-term regulatory initiatives

Initiative	Country	Examples
Voluntary network management	**Italy**	The Italian Government invited telecommunication operators to improve their quality of service, in particular by giving priority to entities handling the emergency.
Mandatory network management	**Italy**	The Government ordered the strengthening of distance learning to facilitate the use of e-learning platforms.
	Jordan	Toll-free numbers were allocated to emergency services.
Free access to health Information	**Pakistan**	To facilitate the operations of educational institutions and businesses, 205 IPs have been whitelisted to carry out voice-over. The Pakistan Telecommunication Authority (PTA) has also allocated 15 different short codes and seven toll-free numbers to government entities working on controlling the pandemic.
	Georgia	The Georgian Government has launched a website dedicated to COVID-19 that answers frequently asked questions and posts up-to-date statistics. There is also a hotline to the Ministry of Health.

(continued)

Initiative	Country	Examples
Allowing more flexible IMT spectrum use	**Ghana**	In April 2020, the National Communications Authority (NCA) granted 5 MHz of additional temporary spectrum at no cost to MTN and Vodafone to ease congestion and to keep costs reasonable for consumers.
	Jordan	Jordan's Telecommunications Regulatory Authority decided to temporarily allocate spectrum for operations; remove spectrum utilization restrictions on all licences; plan with telecommunication operators to cover territories that are being used for quarantines and to enforce network capabilities at borders; and monitor networks to give technical help. Spectrum allocation will be extended as long as needed.
	South Africa	Temporary spectrum was assigned as part of the National State of Disaster Regulations. The spectrum was originally supposed to be returned to the Independent Communications Authority (ICASA) on 30 November 2020, but was extended to no later than 31 March 2021. However, all licensees who were assigned temporary spectrum and want to keep using it are required to pay the prescribed radio frequency spectrum licence fees.
New fixed wireless access networks	**Pakistan**	The Pakistan Telecommunications Authority and the telecommunication sector are striving to quickly expand the network to areas devoid of broadband coverage (fixed line and mobile)
Free access to online learning resources	**Jordan**	Jordan's Telecommunications Regulatory Authority asked operators to allow access to government and Education Ministry e-learning websites.
	Syrian Arab Republic	The Syrian Government launched a web-based free videoconferencing solution, an application for remote learning and live lessons that were broadcast via the educational satellite channel.
	Georgia	TV broadcasting of educational programmes is free for students learning remotely.

(continued)

Initiative	Country	Examples
Contact tracing	**Pakistan**	The Pakistan Telecommunications Authority has been leveraging digital technologies to trace and track patients and identify COVID-19 clusters. It is running an extensive awareness-raising campaign via the telecommunication network.
	Georgia	The Georgian Government has rolled out a Stop Covid app, which anonymously determines social interactions. If someone tests positive for COVID-19, people who have had contact with the infected person will receive a warning and instructions to contact their local government authority.
Increasing broadband capacity and speeds	**New Zealand**	The New Zealand Government allocated NZD 50 million for rural broadband connectivity in addition to the NZD15 million announced in late April to upgrade rural mobile towers as part of the country's COVID Response and Recovery Fund.
	Australia	NBN provided retail service providers with additional bandwidth capacity at no extra cost to manage the increased demands once Australians began to work from home.

Source: ITU, REG4COVID database, 2020

8.2 Short-Term commercial initiatives

Initiative	Country	Examples
Providing other services to customers	**Nepal (Republic of)**	Nepal Telecom has introduced the "Happy Learning Pack" to manage online classes. The pack has two special data packages.
	Malawi	Telekom Networks Malawi (TNM) partnered with the College of Medicine to offer students a 10-GB data bundle for online learning and give access to over 10 000 books on Buku Digital Library.
Discounting services, relaxing payment terms	**Malawi**	TMN launched the cheapest 4G phone in Malawi, particularly to benefit those in rural areas
	Sierra Leone	To help ease the economic hardship that many customers are facing, Sierra Tel discounted their DSL Internet Service plans by 25 and 50 per cent for those on low-income services, in June and July 2020. Payment plans of up to six months were also offered from 30 June 2020.
	Pakistan	Operators increased data allowances and offered discounted bundles and packages (additional data and on-net voice minutes).
Contact tracing	**China**	China Unicom provides users with a list of places that they have visited in the last 14 days to help with tracing. Using those data, China Unicom launched an epidemic prevention and control model to evaluate how prepared various areas of cities are for a pandemic.
Promoting COVID-19 research	**Spain**	Dreamlab (a Vodafone initiative) partnered with the Imperial College of London to find anti-viral foods that could help COVID-19 patients recover. Dreamlab uses the idling power of consumer smartphones alongside artificial intelligence to speed up the discovery of novel anti-viral components in existing medicines: 100 000 smartphones have the combined power of a supercomputer, which reduces the time required for data processing. The project was launched by Vodafone Foundation Australia, Italy, New Zealand, Spain, Romania and United Kingdom, with other Vodafone markets to follow. In December 2020, Vodafone announced that global users of the DreamLab app had helped complete the first phase of the coronavirus/artificial intelligence research project in just six months.

Source: ITU, REG4COVID database, 2020

8.3 Short-term NGO/not-for-profit initiatives

Initiative	Country	Examples
Policy advice	**United States**	The World Wide Web Foundation produced a set of policy briefs on misinformation, Internet access and data rights in response to COVID-19.

Source: ITU, REG4COVID database, 2020

8.4 Other responses

Country / Organization	Examples
United Kingdom	The United Kingdom's COVID-19 response highlights that good digital projects are based on much more than just technology; they also require strong digital policy, services and standards and embedded digital, data and technology skills across the public sector.
Mexico	The Federal Telecommunications Institute developed and maintains a portal with all the information related to the action taken during the COVID-19 crisis. The portal also gives access to the activities and special offers furnished by ICT operators and service providers to support customers during the health crisis.
Kenya	The COVID-19 ICT Advisory Committee was appointed through Gazette Notice No. 3236 of 2020 by the Cabinet Secretary, Ministry of ICT, Innovation and Youth Affairs on 21 April 2020 to coordinate ICT-specific responses to the effects of the COVID-19 pandemic and beyond in Kenya. The objective was to harness local ICT innovations that address the impact of COVID-19 in Kenya in the areas of health, economics, food, livelihoods, logistics/transport and security. These different innovations are leveraging ICT and telecommunications to deliver different solutions for countering the COVID-19 pandemic.
Spain	Telefónica presented its proposal for a Digital Deal, a roadmap for the new digital world. In line with the 2018 Manifesto, the Digital Deal promotes the establishment of game rules adapted to the new post-COVID reality to avoid inequalities in the digital world, driving access to new generation connectivity and protecting human rights in the face of technological threats. It focuses on people and is based on dialogue and agreement between administrations, society and companies. Telefónica presented its proposal for a Digital Deal, which aims to be the roadmap for the digitalization of SMEs, the self-employed and public authorities. Telefónica advanced in the execution of its strategic priorities and confirms the guidance for the year and the dividend for 2020.
United Nations	The COVID-19 Law Lab is a database of laws collected from over 190 countries across the world to help States establish and implement strong legal frameworks to manage the pandemic. The goal is to ensure that laws protect the health and well-being of individuals and communities and that they adhere to international human rights standards. The COVID-19 Law Lab contains state-of-emergency declarations, quarantine and disease surveillance measures, and legal measures relating to mask-wearing, social distancing and access to medication/vaccines. The database will continue to grow as more countries and themes are added. It will also feature research on different legal frameworks for COVID-19. These analyses will focus on the human rights impacts of public health laws and help countries identify best practices to guide their immediate responses to COVID-19 and socio-economic recovery efforts once the pandemic is under control. It builds on the work of the UHC Legal Solutions Network, which was established to help countries achieve universal health coverage through the implementation of rights-based legal frameworks.

9 Appendix B – COVID online education initiatives

The COVID-19 pandemic and associated lockdowns caused the closure of 91 per cent of schools worldwide, equating to around 1.6 billion children and young people.[146] Some of the initiatives consequently taken by corporations, governments and intergovernmental organizations are outlined below. These initiatives aim to accelerate remote learning and minimize disruption to students, while also addressing the digital divide.

International organization/ global company	Scope	Project
UNESCO	**Worldwide**	UNESCO provides guidance for governments on the use of digital technologies in education as part of their response to COVID-19. It outlines five inter-related areas through which government strategies and implementation processes should be delivered:[a] 1. a whole-of-society approach: delivering equity in education 2. enabling access: building resilient infrastructures for education 3. being context-specific: technologies and content 4. ensuring appropriate pedagogies: teaching and learning 5. making wise use of technology: security, privacy and data.
Collaboration between the Harvard Graduate School of Education, the OECD Directorate of Education and Skills, the World Bank Education Network and the organization HundrED	**Worldwide**	These organizations have collaborated to write a number of reports aimed at "supporting education decision-making to develop and implement effective education responses to the COVID-19 pandemic".[b] Among other resources, they have provided a catalogue of the best online learning tools from around the world and created a checklist for an education response to the pandemic.

[146] Jason Miks and John McIlwaine, Keeping the World's Children Learning through COVID-19 (UNICEF, 20 April 2020).

(continued)

International organization/ global company	Scope	Project
Apple	**Worldwide**	Apple updated its software, Schoolwork 2.0, to assist teachers with online learning once schools moved online in the pandemic. The original app was created in 2018, but the updated version lets teachers manage assignments and hand-outs remotely.[c] Teachers can keep an eye on student progress and work with students individually or with the whole class. Apple also produces apps with education material for teachers. The app requires a school's IT administrator to set up school accounts for its students.
Google.org (the philanthropic arm of Google)	**Philippines**	Google.org has created four local initiatives to support inclusive online learning in the Philippines:[d] 1. Google.org grant of USD 250 000 to INCO and the Asian Institute of Journalism and Communication, to equip teachers to deliver distance learning, using two teaching modes –online and printed – supported by SMS and regular consultations; 2. national deployment of G Suite for Education for students in partnership with the Department of Education; 3. mobile accessibility to learning tools such as G Suite for Education, Search and YouTube for students in collaboration with Globe and Smart; 4. EduCreator Camp, a virtual training camp that aims to empower Filipino YouTube education creators with the equipment and best practice resources to further develop their channels and content.

Notes:
a. Wayan Vota, New UNESCO Report: How to Deploy EduTech in Post-COVID-19 Schools, ICTworks, 16 December 2020.
c. Shara Tibken, Apple Wants to Help Parents, Teachers Get Over Distance Learning Hurdles, Cnet, 26 May 2020.
d. Digital: Google Philippines delivers four initiatives to support inclusive distance learning in the country, Adobo Magazine, 24 August 2020.

Regional entities	Scope	Project
Ministry of Public Education (MEP), State Distance Learning University (UNED) and SINART Costa Rica Media	**Costa Rica**	UNED, the MEP and SINART collaborated to create free courses and seminars for teachers. The initiatives include the Mathematics Reform Programme, preparation for the FARO national tests, and "Stay at home and read a book". The UNED National College of Distance Education has also made its academic platform available to the MEP so that teachers and secondary school students could make use of the academic resources available while schools were closed.[a]
Nepal Telecom	**Nepal (Republic of)**	Nepal Telecom has introduced the "Happy Learning Pack" to manage online classes. The pack was originally created for teachers and students in schools, colleges and universities, but is now available for anyone wishing to attend online meetings. It allocates a certain amount of data to be used for remote learning platforms such as Zoom, Microsoft Teams and Google Meet.[b]
Telekom Networks Malawi (TNM) and College of Medicine	**Malawi**	As part of the partnership between TNM and the College of Medicine, students were given access to over 10 000 e-books on Buku Digital Library in August 2020. The partnership was created to enable students to continue remote learning.[c]
Syrian Government	**Syrian Arab Republic**	The Syrian Government created a self-learning programme and launched a web-based free videoconferencing solution, an application for remote learning and live lessons broadcast via the educational satellite channel. The programme helps children to continue learning more subjects such as Arabic, English, maths and science.[d]

Notes:
a. Hellen Ruiz Hidalgo, From the Academy: UNED's response to COVID-19, UNED.
b. Nepal Telecom "Happy Learning Pack" is Now Available for All, Nepali Telecom, 7 November 2020.
c. College of Medicine, TNM launch "Netflix" of Online Education in Malawi, *Maravi Post* (12 August 2020).
d. Jason Miks and John McIlwaine, op. cit., note 212.

10 Appendix C – REG4COVID online survey

This brief questionnaire is addressed to ICT national regulatory authorities, regulatory associations and other stakeholders around the world. Its objective is to collect initiatives and experiences, focusing on ongoing initiatives and innovative policy and regulatory measures designed to ensure that communities and businesses remain connected, and to harness the full power and potential of ICTs to save lives.

Person completing the questionnaire

Title (Mr, Ms)	
Last name	
First name	
Position	
Organization	
Country	
Phone number	
E-mail	
Website	

Questions:

1. Has your country defined and implemented a national emergency telecommunication/ICT plan or a contingency plan for any specific hazard, including a pandemic like COVID-19?

   - o Yes
   - o No

2. In relation to COVID-19, what short- and medium-term policy and regulatory initiatives and measures have the national regulatory authorities in your jurisdiction implemented during the current crisis? (Tick all that apply.)

   - ☐ Instituted emergency telecommunication measures
   - ☐ Implemented MANDATORY measures requiring network operator cooperation in enhancing connectivity, accessibility and affordability
   - ☐ Implemented VOLUNTARY measures requiring network operator cooperation in enhancing connectivity, accessibility and affordability
   - ☐ Reduced licence fees, including fees for spectrum licences
   - ☐ Authorized the use of additional unlicensed spectrum during this period

- ☐ Facilitated the use of new fixed wireless access networks (4G/5G) to quickly deploy necessary wireless broadband infrastructure
- ☐ Relaxed current quality-of-service measures
- ☐ Accelerated universal service strategies
- ☐ Implemented consumer protection measures (i.e. no or limited customer terminations for non-payment)
- ☐ Relaxed applicable competition policy rules
- ☐ Provided government subsidies to operators for broadband services
- ☐ Developed and used specific health applications
- ☐ Developed and used contact tracing apps
- ☐ Supported e-learning during school closures/lockdown periods
- ☐ Allowed more flexible IMT spectrum use (e.g. granted temporary licences for IMT services)
- ☐ Accelerated the allocation of IMT spectrum licences (e.g. granted permanent licences for IMT services)
- ☐ Mandated an increase in overall or minimum consumer broadband capacity and speeds
- ☐ Mandated the provision of free services to customers by licensees
- ☐ Mandated or provided funds to boost free Wi-Fi in public areas and medical centres
- ☐ Allowed flexible network and traffic management
- ☐ Others, please specify: _____

3. Do the national regulatory authorities consider that the short- and medium-term measures implemented are sufficient to address the current crisis situation

   - o Yes
   - o No

4. Which measures have been of greatest value in responding to the crisis? (Please rank in order of effectiveness, with "1" being the most effective.)

[REPEAT LIST FOR Q2 ABOVE]

5. Are there any measures/responses that have not been tried and that you believe would be valuable? (Please list.) _____

IN SURVEY MONKEY IMPLEMENT ABILITY FOR SURVEY RESPONDENTS TO ADD ADDITIONAL BOXES TO INPUT ADDITIONAL SUGGESTIONS

6. What short- and medium-term commercial initiatives were implemented by telecom/ICT operators and service providers in your country? (Please rank in order, with "1" being the most important and effective in your view.)

   - ☐ Offered customers additional data
   - ☐ Offered free data to businesses, schools, health centres
   - ☐ Offered free access to digital productivity tools (e.g. videoconferencing)
   - ☐ Developed or supported the development of contact tracing apps
   - ☐ Effected changes to compression algorithms, etc., to minimize bandwidth demand

- ☐ Offered free or subsidized digital devices to end consumers (dongles, handsets, laptops)
- ☐ Increased broadband speeds/capacity to help customers working/studying from home
- ☐ Facilitated/subsidized prepaid mobile recharges
- ☐ Provided free access to government/health and information services
- ☐ Provided free access to online learning resources
- ☐ Facilitated mobile money transactions, online prepaid recharges and other online transactions
- ☐ Deployed or augmented fixed wireless access networks
- ☐ Granted free access to networks and waived any overcharge fees
- ☐ Waived national and international roaming charges
- ☐ Facilitated connectivity in rural and isolated areas by providing satellite services
- ☐ Facilitated improved connectivity to the "urban unconnected" (groups of socio-economic disadvantaged people who cannot afford connectivity and/or the cost of acquiring digital devices)
- ☐ Others, please specify: _____

7. Please indicate the websites (of national regulatory authorites and network operators) where information about such responses is publicly available: www._____ _____

IN SURVEY MONKEY IMPLEMENT ABILITY FOR SURVEY RESPONDENTS TO ADD ADDITIONAL BOXES TO INPUT ADDITIONAL URLS

8. In your view, have there been significant barriers to the implementation of medium- and long-term measures/responses to address the adverse impacts of events like pandemics? (Please rank these barriers in order of their importance in your country.)

- ☐ Insufficient government budgets to fund responses
- ☐ Low operator margins limiting their ability to provide free or subsidized services and/or the capacity for invest further in needed network infrastructure
- ☐ Structural rigidities in the processes for the timely allocation of IMT spectrum (e.g. need to transition from analogue to digital television or longer-term spectrum refarming of, say, C-Band spectrum)
- ☐ Limited access to international bandwidth/capacity and cloud services and/or lack of domestic cloud services to support demand
- ☐ Legal and regulatory barriers that limit rapid and effective regulatory responses
- ☐ New infrastructure deployment, such as towers and backbone infrastructure, delayed by complex and costly approval processes that restrict or impede development/rights of way/tower sites, etc.
- ☐ Excessively high reserve prices for IMT spectrum auctions, resulting in unallocated IMT spectrum
- ☐ Blocking of innovative broadband solutions (e.g. existing operators restrict/oppose community/municipal broadband/Wi-Fi solutions)
- ☐ Lack of content, services, resources in local language/s

- ☐ Poor availability of/access to/affordability of digital devices (e.g. smartphones and laptops), particularly for low-income individuals (including those in rural areas), households and very small businesses

9. Have your national regulatory authorities worked with other regulators and/or ministries that represent other industries/sectors (other than telecommunications)?

   - o Yes
   - o No

   1. If yes, please specify with which other national sectors (tick as many as necessary):

      - ☐ Health and social care
      - ☐ Education
      - ☐ Finance and treasury
      - ☐ Transport
      - ☐ Defence
      - ☐ Labour
      - ☐ Commerce
      - ☐ Housing and urban development
      - ☐ Competition
      - ☐ Agriculture
      - ☐ Others, please specify: _____

10. The future: what are your country's plans for the post-crisis situation in terms of ICT policies and regulations? (Tick all that apply.)

    - ☐ Analyse feedback on the crisis measures implemented and outcomes
    - ☐ Review the national ICT emergency plan
    - ☐ Prepare a national ICT emergency plan
    - ☐ Review laws/national ICT plans to include the ICT emergency plan
    - ☐ Review national broadband/ICT plans and broadband penetration targets and speeds
    - ☐ Open up more of the telecommunication sector to competition and new investment by removing any existing restrictions (e.g. foreign ownership, exclusivity, tower ownership, fibre network licensing, technology-specific limitations)
    - ☐ Change to IMT spectrum plans or roadmaps to make more IMT spectrum readily available
    - ☐ Review universal service policies and address the digital divide
    - ☐ Review retail tariff guidelines and regulations
    - ☐ Accelerate the transition from legacy 2G/3G networks to 4G/5G networks in order to provide more efficient bandwidth to consumers
    - ☐ Provide a licence fee "holiday" or licence fee reductions to operators
    - ☐ Formulate polices, including to reduce customs duties/subsidies so as to address device affordability and promote the adoption of smartphones, connected laptops, etc.
    - ☐ Develop and launch additional satellite connectivity options
    - ☐ Facilitate greater international capacity (e.g. submarine cables, land cables)

- ☐ Institute digital training and skills enhancement for all sections of society (e.g. older persons, persons with disabilities, women)
- ☐ Seek ways to provide/subsidize access to digital devices for less well-off socio-economic sectors of the community
- ☐ Seek international monetary or other assistance to address identified gaps or limitations (e.g. from the World Bank, the Asian Development Bank, the African Development Bank)
- ☐ Adopt a more collaborative model between all national ICT stakeholders
- ☐ Encourage more collaboration with other sectors
- ☐ Others, please specify: _____

11. What in your view are the most important measures in question 10 that must be included your country s plans for the post-crisis situation in terms of ICT policies and regulations? (List the top three.)

Please share any recommendations or lessons learned that you consider could be useful for other global national regulatory agencies or ministries: _____

_____

Please share any learnings, regulations, insights or text that you consider useful: _____

Office of the Director
International Telecommunication Union (ITU)
Telecommunication Development Bureau (BDT)
Place des Nations
CH-1211 Geneva 20
Switzerland

Email: bdtdirector@itu.int
Tel.: +41 22 730 5035/5435
Fax: +41 22 730 5484

Office of Deputy Director and Regional Presence
Field Operations Coordination Department (DDR)
Place des Nations
CH-1211 Geneva 20
Switzerland

Email: bdtdeputydir@itu.int
Tel.: +41 22 730 5131
Fax: +41 22 730 5484

Digital Networks and Society (DNS)

Email: bdt-dns@itu.int
Tel.: +41 22 730 5421
Fax: +41 22 730 5484

Digital Knowledge Hub Department (DKH)

Email: bdt-dkh@itu.int
Tel.: +41 22 730 5900
Fax: +41 22 730 5484

Partnerships for Digital Development Department (PDD)

Email: bdt-pdd@itu.int
Tel.: +41 22 730 5447
Fax: +41 22 730 5484

Africa

Ethiopia

International Telecommunication Union (ITU) Regional Office
Gambia Road
Leghar Ethio Telecom Bldg. 3rd floor
P.O. Box 60 005
Addis Ababa
Ethiopia

Email: itu-ro-africa@itu.int
Tel.: +251 11 551 4977
Tel.: +251 11 551 4855
Tel.: +251 11 551 8328
Fax: +251 11 551 7299

Cameroon

Union internationale des télécommunications (UIT)
Bureau de zone
Immeuble CAMPOST, 3e étage
Boulevard du 20 mai
Boîte postale 11017
Yaoundé
Cameroon

Email: itu-yaounde@itu.int
Tel.: + 237 22 22 9292
Tel.: + 237 22 22 9291
Fax: + 237 22 22 9297

Senegal

Union internationale des télécommunications (UIT)
Bureau de zone
8, Route des Almadies
Immeuble Rokhaya, 3e étage
Boîte postale 29471
Dakar - Yoff
Senegal

Email: itu-dakar@itu.int
Tel.: +221 33 859 7010
Tel.: +221 33 859 7021
Fax: +221 33 868 6386

Zimbabwe

International Telecommunication Union (ITU) Area Office
TelOne Centre for Learning
Corner Samora Machel and Hampton Road
P.O. Box BE 792
Belvedere Harare
Zimbabwe

Email: itu-harare@itu.int
Tel.: +263 4 77 5939
Tel.: +263 4 77 5941
Fax: +263 4 77 1257

Americas

Brazil

União Internacional de Telecomunicações (UIT)
Escritório Regional
SAUS Quadra 6 Ed. Luis Eduardo Magalhães,
Bloco "E", 10º andar, Ala Sul (Anatel)
CEP 70070-940 Brasilia - DF
Brazil

Email: itubrasilia@itu.int
Tel.: +55 61 2312 2730-1
Tel.: +55 61 2312 2733-5
Fax: +55 61 2312 2738

Barbados

International Telecommunication Union (ITU) Area Office
United Nations House
Marine Gardens
Hastings, Christ Church
P.O. Box 1047
Bridgetown
Barbados

Email: itubridgetown@itu.int
Tel.: +1 246 431 0343
Fax: +1 246 437 7403

Chile

Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Merced 753, Piso 4
Santiago de Chile
Chile

Email: itusantiago@itu.int
Tel.: +56 2 632 6134/6147
Fax: +56 2 632 6154

Honduras

Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Colonia Altos de Miramontes
Calle principal, Edificio No. 1583
Frente a Santos y Cía
Apartado Postal 976
Tegucigalpa
Honduras

Email: itutegucigalpa@itu.int
Tel.: +504 2235 5470
Fax: +504 2235 5471

Arab States

Egypt

International Telecommunication Union (ITU) Regional Office
Smart Village, Building B 147,
3rd floor
Km 28 Cairo
Alexandria Desert Road
Giza Governorate
Cairo
Egypt

Email: itu-ro-arabstates@itu.int
Tel.: +202 3537 1777
Fax: +202 3537 1888

Asia-Pacific

Thailand

International Telecommunication Union (ITU) Regional Office
Thailand Post Training Center
5th floor
111 Chaengwattana Road
Laksi
Bangkok 10210
Thailand

Mailing address:
P.O. Box 178, Laksi Post Office
Laksi, Bangkok 10210, Thailand

Email: ituasiapacificregion@itu.int
Tel.: +66 2 575 0055
Fax: +66 2 575 3507

Indonesia

International Telecommunication Union (ITU) Area Office
Sapta Pesona Building
13th floor
Jl. Merdan Merdeka Barat No. 17
Jakarta 10110
Indonesia

Mailing address:
c/o UNDP – P.O. Box 2338
Jakarta 10110, Indonesia

Email: ituasiapacificregion@itu.int
Tel.: +62 21 381 3572
Tel.: +62 21 380 2322/2324
Fax: +62 21 389 5521

CIS

Russian Federation

International Telecommunication Union (ITU) Regional Office
4, Building 1
Sergiy Radonezhsky Str.
Moscow 105120
Russian Federation

Email: itumoscow@itu.int
Tel.: +7 495 926 6070

Europe

Switzerland

International Telecommunication Union (ITU) Office for Europe
Place des Nations
CH-1211 Geneva 20
Switzerland
Email: eurregion@itu.int
Tel.: +41 22 730 5467
Fax: +41 22 730 5484

International Telecommunication Union
Telecommunication Development Bureau
Place des Nations
CH-1211 Geneva 20
Switzerland

ISBN: 978-92-61-33951-7

Published in Switzerland
Geneva, 2021
Photo credits: Shutterstock