Lessons Learned from COVID-19:

Perspectives from the Tower Industry

Contents

Executive Summary

COVID-19 has drastically changed every sphere of our lives, including business, education, healthcare, socializing, leisure and travel. As governments have implemented a wide range of policy responses to manage the impact of the virus, a unifying theme emerging from every country has been the importance of mobile connectivity.

The foundation of mobile connectivity is the network of communication masts and towers, most of which are provided by independent tower companies (TowerCos). TowerCos lease space on their towers to multiple mobile network operators (MNOs), who place their own network equipment on them to provide their services to consumers and businesses. This model of shared use reduces the overall investment and operating costs for MNOs, enabling them to deliver faster network rollout in more locations, improve coverage, reduce consumer prices, and raise service quality.

This paper assesses the contribution that TowerCos have made during the COVID-19 crisis and considers the policy responses various countries have implemented to ensure the smooth and continuous operations of telecommunications services. We identify important lessons from the perspective of TowerCos that are particularly relevant to governments and regulators in how they continue to manage the current crisis, as well as how they plan for future ones.

Lesson 1: TowerCos are the foundation of mobile connectivity – a vital role often unnoticed and undervalued by governments and regulators.

Lesson 2: Governments need to put in place specific measures to support critical passive telecommunications infrastructure in preparation for future unforeseen events, such as COVID-19.

Lesson 3: Agile frameworks and streamlined regulation deliver the best outcomes in both normal and crisis periods.

Lesson 4: Digital transformation and e-government services are key to long-term resilience.

Lesson 5: Concerns about health impacts of wireless technology need to be actively addressed and anticipated.

COVID-19 and the Importance of Mobile Connectivity

The world has undergone significant changes since the emergence of the COVID-19 pandemic. Countries have implemented a broad range of policy responses to manage the impact of the virus on their populations. A unifying theme emerging from every country, regardless of its policy approach, has been the importance of mobile connectivity and, less visibly, the extent of the vital role TowerCos play in delivering that connectivity.

COVID-19 policy responses have driven a surge in mobile traffic

To manage COVID-19, many countries have introduced policies requiring or encouraging people to spend more time at home and less time with others. The effect of this has been to shift many of the activities that we used to do in the physical world into a virtual one. People are remote working, receiving online education, obtaining healthcare assistance through broadband-enabled digital platforms, and engaging in social interactions and leisure activities online. This has led to a significant increase in the demand for mobile connectivity. The impact has been global and a range of examples from around the world are provided in the figure below:

Figure 1: Examples of increase in traffic over mobile networks in different regions due to COVID-19
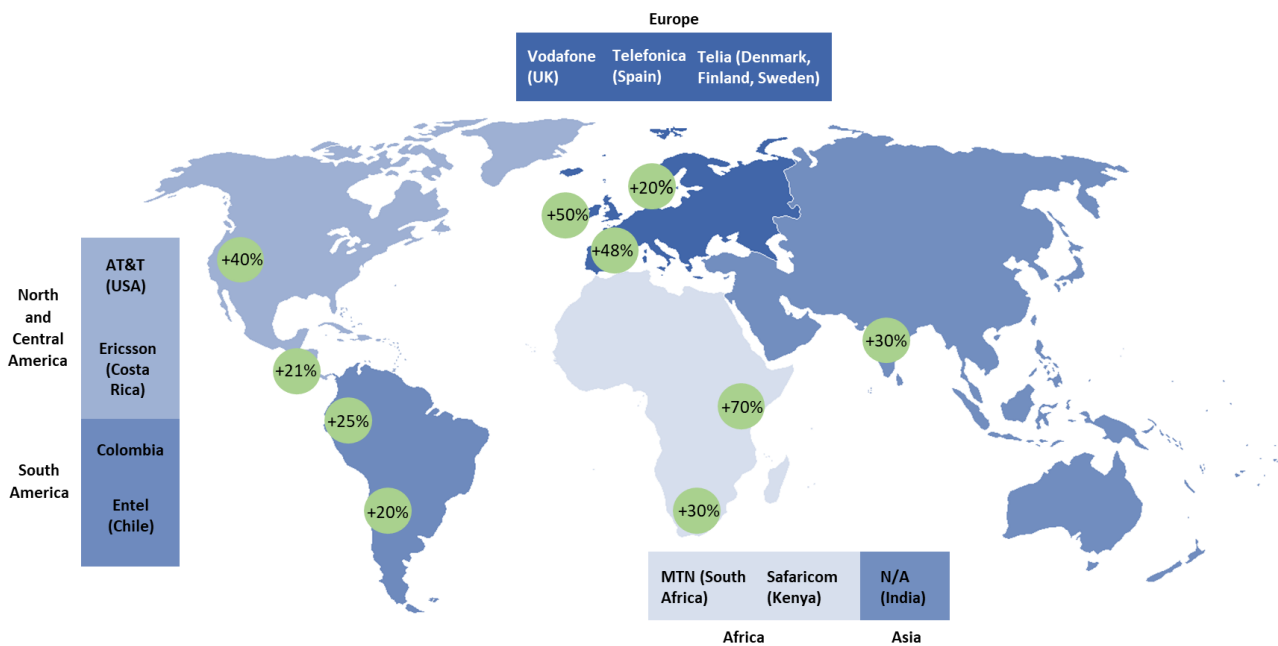
Europe[1,2,3], Africa[4,5], Asia[6], North and Central America[7,8], South America[9,10]

[1] GSMA (2020). "Covid-19 Network Traffic Surge Isn't Impacting Environment Confirm Telecom Operators''.
[2] The Guardian (2020). "Vodafone Reports 50% Rise in Internet Use as More People Work from Home."
[3] Ibid.
[4] Reuters (2020). "Vodacom Sees 40% Jump in Data Usage as People Stay at Home."
[5] CNBC Africa (2020). "Kenya's Safaricom sees 70% jump in data usage during COVID-19 lockdown."
[6] OPENSIGNAL (2020). "Analyzing mobile data consumption and experience during the COVID-19 pandemic."
[7] The Verge (2020). "AT&T CEO Addresses Major Surge in Mobile, Wi-Fi Usage as More People Work from Home."
[8] Ericsson (2020). "On the Front Line: Keeping Mexico and Central America Connected."
[9] America Retail (2020). "Chile: The sectors that have been able to navigate the Covid-19 tide."
[10] La Republica (2020). "Teleworking by Covid-19 could increase fixed data consumption in the country by 25%."
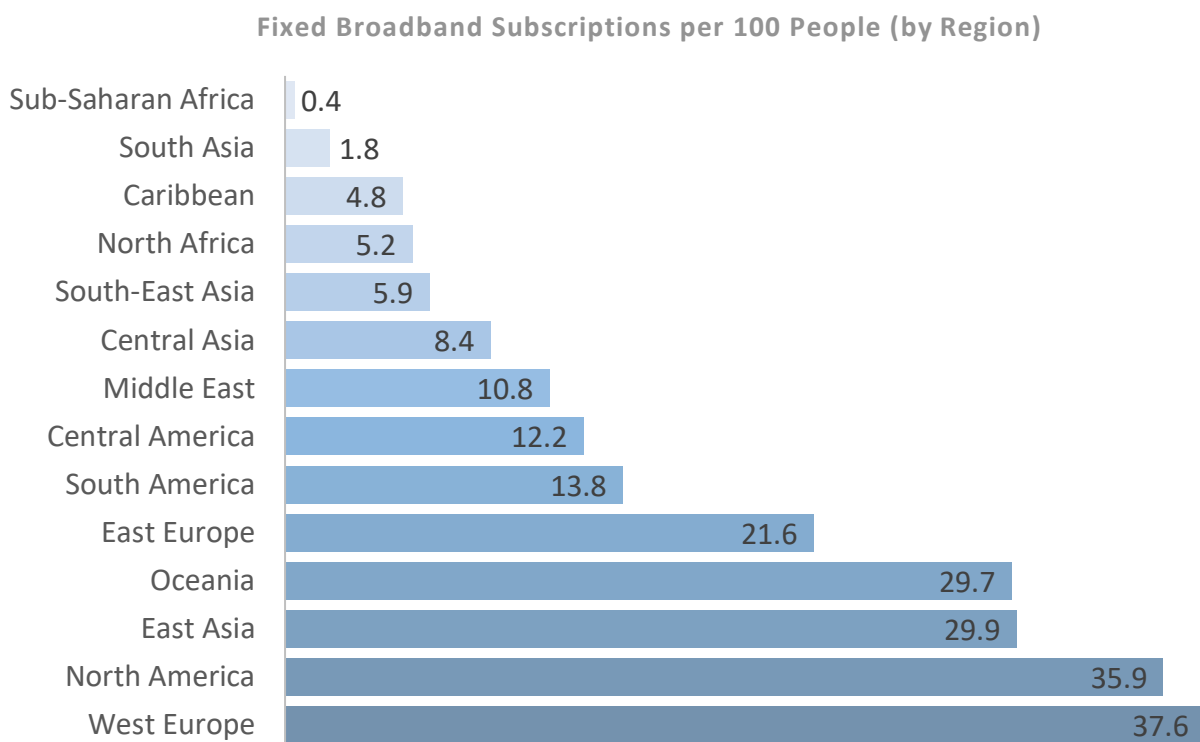
Mobile networks in rural areas have been more severely impacted during COVID-19 than those in urban centers

Increased demand during the COVID-19 crisis has affected the performance of mobile networks, highlighting the importance of mobile connectivity during this time. Research by OpenSignal, a company that measures the performance of mobile networks, analyzed the impact of lockdown in Italy.[11] The analysis showed that overall mobile speeds decreased during lockdown as use of mobile networks increased, and that performance reductions were worse in places with lower population density, such as rural areas, and less apparent in more urban areas. Weak performance is affecting rural areas because networks are not designed to deliver the same capacity performance as in urban areas. They have fewer masts and a "thinner" mobile network. Additionally, rural areas generally have less access to fixed broadband, meaning people living in those areas rely even more on mobile. The combination of less network capacity and a greater reliance on mobile networks have contributed to the weaker performance of networks in rural Italy – and rural areas worldwide – during the pandemic.

Developing countries have less fixed broadband and rely more on mobile, making network resilience even more critical

In developed countries with extensive fixed broadband networks, mobile connectivity is essential, but the burden of events such as COVID-19 is shared between fixed and mobile networks. In developing countries, fixed broadband infrastructure is generally less extensive, as shown in Figure 2. As a result, mobile networks are the only option for accessing the Internet for most people. Its importance, particularly when people are trying to maintain social distancing and follow other government rules, is even greater.

Figure 2: Regional levels of broadband connectivity globally

Fixed Broadband Subscriptions per 100 People (by Region)

| Region	Subscriptions
Sub-Saharan Africa	0.4
South Asia	1.8
Caribbean	4.8
North Africa	5.2
South-East Asia	5.9
Central Asia	8.4
Middle East	10.8
Central America	12.2
South America	13.8
East Europe	21.6
Oceania	29.7
East Asia	29.9
North America	35.9
West Europe	37.6

Source: Access Partnership analysis of data from ITU report "Measuring the Information Society Report 2018".

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[11] OpenSignal (2020) "Mobile networks in Italy are more resilient in urban areas than in rural during the crisis."

Services reliant on mobile connectivity during COVID-19

As the COVID-19 pandemic has evolved, policymakers worldwide have rushed to implement measures to ensure public safety, economic resilience, and business continuity. Robust and secure mobile connectivity underpins each of these areas, and ensuring it is available to individuals, businesses and governments has been a priority during the crisis. Here, we highlight some of the most essential services that rely on mobile connectivity, showing how connectivity has kept people safe, informed, educated and employed.

Figure 3: Vital services dependent on mobile connectivity
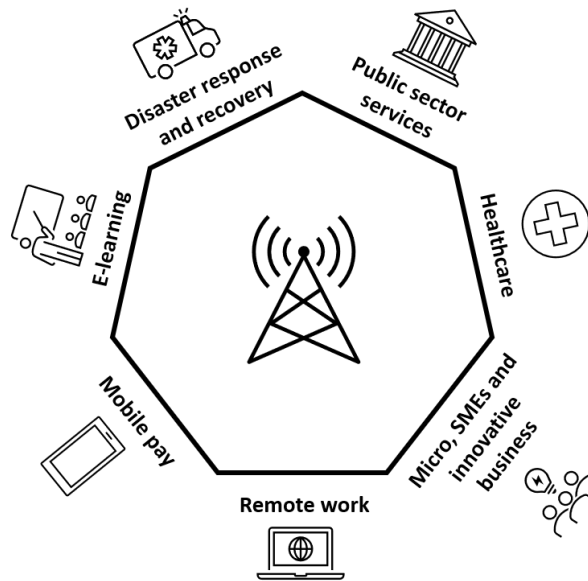
Disaster Response and Recovery

The police, firefighters, emergency medical services providers, healthcare professionals and military personnel are on the front lines in the fight against COVID-19. To perform their duties during the crisis, they rely on fast, resilient connectivity to coordinate and communicate emergency response. Most of this communication is carried over wireless mobile networks.

Elsewhere, portable cell sites to enhance mobile broadband coverage are key to supporting the connectivity needs of pop-up healthcare clinics, drive-thru coronavirus testing sites and quarantine facilities, all of which play a critical role in helping to flatten the curve worldwide. This has been particularly important in rural and remote areas where fixed lines do not exist.

For example, *FirstNet*, a wireless broadband communications platform dedicated to America's first responders and public safety community, deployed a portable cell site to enhance coverage around a critical makeshift healthcare facility in Tulare County, California.[12]

Public Sector Services

Dissemination of vital information to the masses to keep citizens up to date with the latest advice is only possible due to high mobile penetration rates; there are six billion unique mobile subscribers worldwide.[13]

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[12] AT&T (2020). "Covid-19: Our Response."
[13] GSMA (2020). "The Mobile Economy."

Success stories include the United Nations High Commission for Refugees' (UNHCR) use of mobile applications to communicate COVID-19 related messaging to beneficiaries in Ecuador.[14] In the United Arab Emirates, text messages have been at the center of the National Early Warning System, providing information to citizens during the nationwide lockdown.[15]

Healthcare

Through wireless mobile broadband, healthcare services are being provided at distance, which contributes to efforts to minimize physical contact between healthcare professionals and patients. This is evident in reports by telehealth app developers *Plushcare* and France's *Doctolib*, who reported a 70% and 40% increase in the volume of online appointments, respectively.[16]

Furthermore, as MNOs rallied in response to the crisis, one of their first actions was to coordinate the sharing of aggregated and anonymized mobile data with government authorities, to help track COVID-19 and determine where medical equipment is needed. Operators explored how to leverage big data capabilities to help monitor and limit the spread of the disease. Today, this contributes to ethical contact tracing, which has been essential to crisis response in South Korea, New Zealand, and other countries.

Remote Work

Nationwide lockdowns have forced employees to work remotely. Consequently, demand for reliable, high throughput connectivity suddenly moved away from business districts to residential areas, straining existing fixed networks. Fortunately for many, mobile broadband is readily available to facilitate video conferences and access to cloud services, all of which have been essential to ensuring continuity for businesses.

E-Learning

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), 60% of the world's student population is affected by nationwide closures during the COVID-19 pandemic. As a result, distant learning through data-heavy e-learning applications has been the norm where possible, and by relying on mobile broadband connectivity, companies like *Dialog* are able to offer a suite of free educational content and applications for students at home in Sri Lanka. In Syrian refugee camps, where fixed lines are not available, teachers rely on mobile applications, including WhatsApp, to send digital lessons to their students.[17]

In South Africa and Ghana, operators Telkom and MTN have zero-rated many educational and awareness websites to support home learning during school closures. Also, in Senegal, Sonatel is providing a free 1 GB education pass to students for 30 days, giving them access to high quality education via the University of Senegal.

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[14] UNHCR (2020). "Coronavirus Emergency Appeal: UNHCR's Preparedness and Response Plan (REVISION)." (pdf)
[15] UAE Government (2020). "Handling Emergencies."
[16] Le Specialiste (2020): Coronavirus: Doctolib met gratuitment sa plateforme de teleconsultation a disposition de tous les médecin de France.
[17] UNWOMEN (2020). "Using Technology to Assist Vulnerable Syrian Refugees During Covid-19 Lockdown."

Micro, Small and Medium Enterprises (MSMEs) and Innovative Business

MSMEs were among the worst hit businesses during the COVID-19 crisis. Despite the challenges, turning to mobile broadband-enabled technology was a lifeline. In a survey of 86 000 small businesses in the USA, 35% indicated that they are expanding the use of digital payments to remain in business.[18]

In India, where 63 million MSMEs employ more than 100 million people, Mumbai-based *m.Paani* helps small retailers to digitize.[19] In a short period, it has enabled over 80 000 retailers to develop an online presence, which in turn is keeping them in business as they now rely on mobile broadband enabled digital wallets and a cloud powered digital marketplace for transactions.[20]

Mobile Pay

As governments attempt to curb cash circulation, which can act as a carrier of the virus, wireless mobile broadband facilitates a significant increase in the use of mobile payments, including person-to-person (P2P) transfers and contactless transactions worldwide.

For example, in Rwanda, where high levels of mobile money penetration exist, wireless mobile broadband was essential in sustaining a 450% increase in value and a 397% increase in the volume of P2P transfers in the first week after lockdown measures were implemented.[21] In Togo, the increasing use of mobile payments has encouraged the government to launch social assistance scheme *Novissi*, which provides mobile money transfers in support of Togolese informal workers.[22]

Elsewhere, Mastercard has indicated that in March 2020, contactless payments grew by 25% in comparison to the previous year, and noted in a survey that 79% of people worldwide and 91% in Asia Pacific say that they are now using tap-and-go payments as an alternative to cash.[23]

The Role of TowerCos in Providing the Foundation for Mobile Connectivity

The function of TowerCos in the digital transformation ecosystem, and the essential role they have played in helping deliver reliable mobile connectivity across the globe during COVID-19, is often underestimated and not well understood.

The infrastructure that is owned, operated, and developed by TowerCos is known as "passive" infrastructure. In broad terms, these are all the parts of a base station that are not energized and do not carry communications signals. Passive parts are elements like the mast and the buildings that hold network equipment. Conversely, "active" parts are antennas or network equipment that generate the radio signals that are beamed out from the antennas to deliver the mobile service. A typical network base station with passive and active parts is shown in Figure 4.

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[18] Facebook (2020). "State of Small Business Report."
[19] Ministry of Micro, Small, and Medium Enterprise (2019). "Annual Report."
[20] Accion (2020). "How Small Business Are Thriving During the Covid-19 Crisis in India."
[21] Next Billion (2020). "When Digital Payment Goes Viral: Lessons from Covid-19's Impact on Mobile Money in Rwanda."
[22] Togo First (2020). "Government to Pay a Universal Minimum Income to Most Vulnerable Households."
[23] Mastercard (2020). "Contactless Payments will be the New Normal for Shoppers in the Post Covid-19 World."

Figure 4: Typical mobile network base station showing passive and active parts
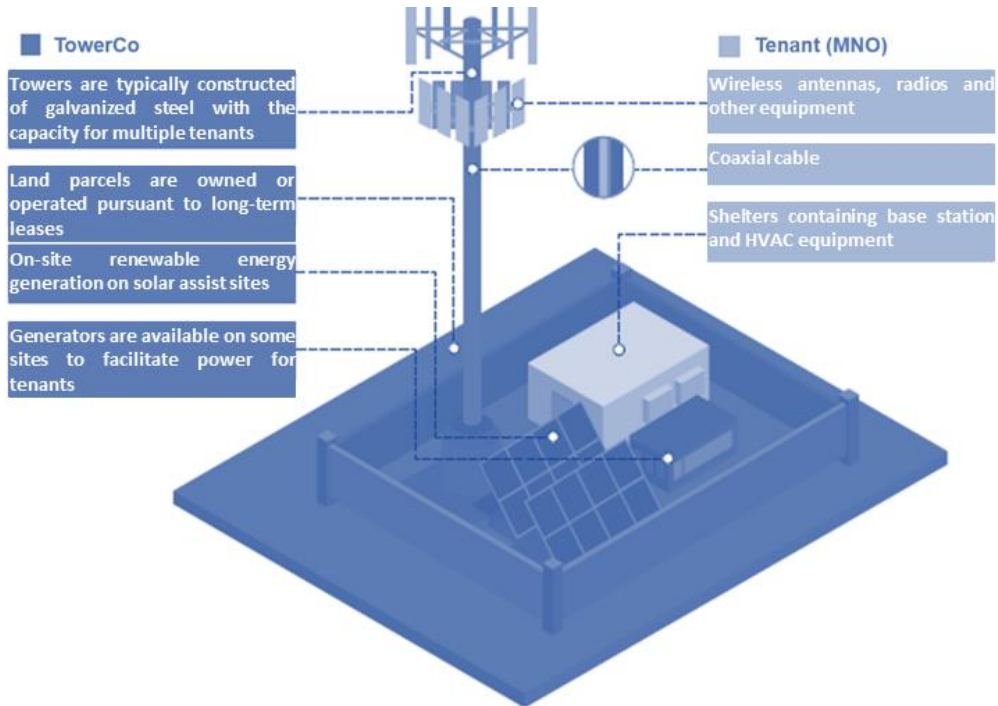
Passive infrastructure provided by TowerCos is the foundation of the mobile connectivity value chain. TowerCos lease space on their towers to multiple MNOs (commonly known as passive infrastructure sharing or "tower sharing") to install their own active network equipment, which the MNOs then use to provide mobile telecommunications services to businesses and consumers. TowerCos assume responsibility for all site services, including maintenance, repairs, upgrades, security, and energy supply. TowerCos also play an important role in providing the passive infrastructure for other wireless services with internet service providers, TV broadcasters, emergency services and private mobile radio all using (where permitted and possible) the same sites that MNOs do.

Figure 5: Mobile connectivity value chain and role of TowerCos
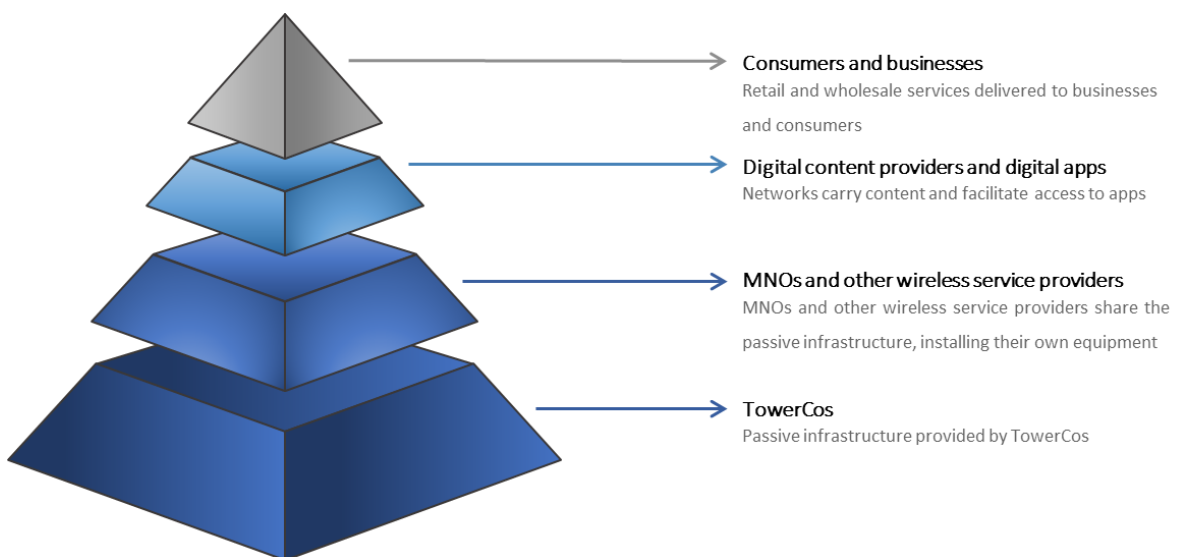
TowerCos deliver their value through their ability to support mobile and other wireless services. By apportioning the fixed costs of passive infrastructure among multiple tenants, alongside the economic efficiency that comes with specializing in a single area of business, TowerCos deliver many benefits:

- **Cost**: Tower sharing reduces the overall investment and operating costs for MNOs and optimizes their allocation of capital, enabling them to focus on their core business of acquiring and servicing customers, expanding network coverage and providing high quality of service.

- **Coverage**: Open and accessible shared infrastructure enables MNOs to expand their networks cheaper and faster into low-income and rural areas, increasing the availability of connectivity and contributing to bridging the digital divide.

- **Deployment**: TowerCos enable quicker rollout of new technology and faster innovation by allowing MNOs to free up capital which can be invested in new technologies like 5G.

- **Competition**: TowerCos improve competition between MNOs and reduce barriers to entry for smaller operators by offering non-discriminatory open access to sites, thereby allowing all MNOs to deliver high quality networks and services more cost-effectively for the benefit of consumers.

- **Environment**: Tower sharing reduces the overall number of sites needed to meet service demand, leading to more efficient land use and a decrease in the overall aesthetic impact and carbon footprint of mobile networks. This particularly applies in developing countries where towers are often powered by diesel generators due to unreliable electrical grids.

Regulatory Responses: What Happened and What Was Needed?

As the COVID-19 crisis continues, regulatory responses relating to telecommunications services have been implemented. However, it has often been the case that passive infrastructure was not properly considered or was even completely omitted. The table below sets out examples of responses from a range of countries and organizations. We then suggest certain issues we would have expected governments to consider.

Country	COVID-19 Policy Response
Brazil[24]	- *Joint Public Commitment to Keep Brazil Connected published on 20 March 2020.* [25] - ANATEL and a group of MNOs presented a public commitment guaranteeing that services will continue to function, health and public security services will have special support, consumer difficulties will be addressed, and the population will be kept well informed.

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[24] Although not a COVID-19 policy response as such, it is worth highlighting that on 1 September 2020, the Brazilian government issued a decree (No. 10.480) containing measures to stimulate the development of telecommunications network infrastructure. The decree facilitates the deployment of passive infrastructure through measures such as the introduction of a "positive silence rule", pursuant to which municipalities have 60 days to approve permit applications, and if no decision is made in that time, approval is automatically granted. Further measures include permit exemptions in urban areas for small infrastructure and no charges for rights of way over public spaces and public infrastructure.

[25] Anatel (14 March 2020) "Anatel and the telecom sector sign a public commitment to keep Brazil connected."

- *Decree No 20.795 adopted by the Campinas local government on 30 March 2020.*[26]
- The decree declares telecommunication in the Campinas municipality an essential activity and enables infrastructure providers to request authorizations from the local planning secretariat for the immediate deployment of infrastructure.[27]
- **The decree includes measures to address the deployment of additional base stations.**

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Chile		• *Decree 192 by the Ministry of Transport and Telecommunications published in May 2020.*[28]

- *Decree 192 by the Ministry of Transport and Telecommunications published in May 2020.*[28]
- The decree eases some of the regulatory requirements for deploying infrastructure by establishing that telecommunications infrastructure providers may initiate building work after obtaining a permit from the respective municipality, thus dispensing with the requirement to obtain a second approval from the Undersecretary of Telecommunications (Subtel).
- **The decree was envisioned prior to COVID-19 and includes measures to facilitate the roll-out of passive infrastructure.**

Colombia

- *Decree No. 54/2020 of 13 April 2020 by the Ministry of Communication and Technologies.*[29]
- The decree mandates municipalities to review and approve infrastructure construction, connection, installation, modification and operation permits within a maximum of 10 days. If no decision is communicated to the operator within this timeframe, it shall be treated as "positive silence", implying that the permit is deemed approved.
- **The decree addresses the need to accelerate infrastructure rollout.**

France
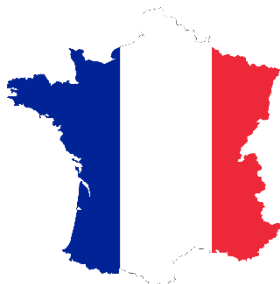
- *Legislative Order No. 2020-320 of 25 March 2020 (as modified by another legislative order of 13 May 2020).*[30] [31]
- The order included the temporary easing of measures relating to electronic communications installations aimed at enabling operators to perform urgent works to ensure the proper functioning of networks.
- Infrastructure specific measures included:
  o Simplifying information and consultation procedures for constructing new base stations.

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[26] Official Journal of Campinas (30 March 2020), "Decree No 20.795 of 30 March 2020." (pdf).
[27] Official Journal of Campinas (30 March 2020), "Decree No 20.795 of 30 March 2020." (pdf).
[28] Decreto 192 Modifica Decreto Nº 99, De 2012, Del Ministerio De Transportes Y Telecomunicaciones, En Las Materias Que Indica.
[29] Decreto 540 Del 13 Abril de 2020. (pdf)
[30] Legifrance (2020). "No 2020-320".
[31] Legifrance (2020). "No 2020-560".

- Granting road permit for requests relating to electronic communications installations within 48 hours under a "positive silence" regime; ordinarily, such requests are required to be determined within two months with no decision being deemed a refusal.
- Exempting from planning permission any temporary construction or installation necessary to ensure the continuity of electronic communications networks and services.

- **The order facilitated the construction and installation of telecom infrastructure, albeit on a temporary basis.**
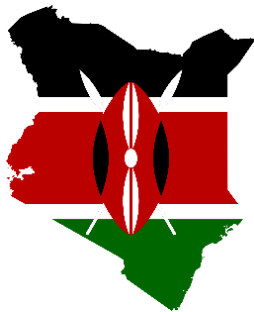
Kenya	• *Leveraging ICTs In the Fight Against COVID-19 Pandemic Plan*, issued by the Communications Authority of Kenya on 30 April 2020.[32]
	• Additional spectrum was made available to telecommunications operators and service providers to meet increased demand for mobile.
	• The Ministry of ICT, Innovation and Youth Affairs established a COVID-19 ICT Advisory Committee to identify, support and scale local ICT solutions during the pandemic, stimulate economic development in the sector, and increase digital employment.
	• *Public Health (COVID-19 Restriction of Movement of Persons and Related Measures) Rules 2020*[33] and *Public Order (State Curfew) Order 2020.*[34]
	• These rules and order designate ICTs (including postal/courier, telecoms and media services) as essential services and exclude them from national movement restrictions.
	• **The plan did not include specific policies for passive infrastructure.**
Mexico	• *Official letter issued the Secretary of Communications and Transportation and the Secretary of Interior on 2 April 2020.*[35]
	• The letter calls on state governments to facilitate the deployment of telecommunications, broadcasting infrastructure and services. The recommended measures included classification of telecommunications infrastructure workers as critical.[36]
	• **The letter defines telecommunications infrastructure as critical.**

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[32] Communications Authority of Kenya (30 April 2020), "Leveraging ICT in the fight against COVID-19 Pandemic."
[33] Ministry of Health, Kenya (6 April 2020) (pdf).
[34] Ministry of Interior and Co-ordination of National Government, Kenya (25 March 2020) (pdf).
[35] Government of Mexico (2 April 2020), "Proponen SCT y SEGOB a gobernadores y Jefa de Gobierno, medidas para la continuidad de los servicios de telecomunicaciones y radiodifusión."
[36] Ibid.

South Africa

- *Electronic Communications, Postal and Broadcasting Directions issued under Regulation 10(8) of the Disaster Management Act, 2002 (Act No. 57 of 2002), issued by the Minister of Communications and Digital Technologies on 26 March 2020.*
- The directions set out to facilitate the availability and use of digital technologies. They provide for the relaxation of spectrum regulations and temporary licensing of certain available spectrum bands, and for electronic communication service (ECS) and electronic network communication service licensees to provide location-based services to support governmental efforts in monitoring the spread of COVID-19. ECS licensees are required to zero-rate access to local educational content websites and COVID-19 websites identified by the Department of Health. In addition, licensed entities may seek the Minister's approval to deploy infrastructure without delay. Ministerial interventions in this regard may include temporary deferment of wayleaves.
- **The directions include limited measures to facilitate the rollout of passive infrastructure.**

International Organizations

Organization	COVID-19 Policy Response
African Union	*COVID-19 Action Plan issued by African Union in April 2020.* - The multi-tiered plan sets out to mitigate the impact of COVID-19, including financial support to member states for infrastructure deployment through the African Development Bank, World Bank and International Monetary Fund. Member states were invited to relieve network capacity constraints, decrease fees, increase spectrum availability and encourage infrastructure sharing. **The plan did not include specific policies for passive infrastructure.**
CITEL/OAS	*Action Plan unveiled by the Inter-American Telecommunications Commission (CITEL) of the Organization of American States (OAS) in mid-April 2020.*[37] - The plan encourages the prioritization of telecommunications deployment, particularly for strategic infrastructure like hospitals and power plants. **CITEL called for the protection of telecommunications infrastructure, which many countries did not adopt in their policy response despite seeing a number of attacks on**

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[37] CITEL (2020). Covid-19 Action Plan.

	infrastructure due to conspiracy theories linking COVID-19 to 5G.
GSMA/ITU/World Bank/World Economic Forum	• *Digital Development Joint Action Plan and Call for Action*,[38] *presented by the International Telecommunications Union, the World Bank and World Economic Forum, in partnership with GSMA on 21 April 2020.*
	• The plan sets out to increase bandwidth, ensure access to digital services, and support telecommunication ministries.
	• **The plan includes recommendations on best practices for infrastructure regulation, including revising measures to accelerate deployment and infrastructure sharing.**

Key Observations

• Countries were caught off guard by the impact of COVID-19 on telecommunications networks and did not have the structures or frameworks in place to act immediately, having to react and improvise in real time instead.

• Policy responses have tended to consider the telecommunications sector with a focus on consumers and retail service providers. This fails to recognize the unique and vital role of passive infrastructure and the specific regulatory approaches needed to protect and support it.

The role of passive infrastructure in delivering mobile networks is often not appreciated or fully recognized by governments and regulators. As a result, policy responses in the pandemic have not accurately captured the range of actions needed to support, promote and protect passive infrastructure. While regulatory and policy approaches vary from country to country depending on their relative stages of wireless development, the following core measures relating to passive infrastructure can be identified to support the role TowerCos play in delivering wireless broadband and to encourage investment in independent network infrastructure:

I. *Recognizing the benefits of tower sharing by boosting the efficient use of available resources and increasing the pace of infrastructure rollout.*

Federal and local emergency response guidelines should encourage tower sharing, particularly in rural and remote areas. Besides facilitating infrastructure rollout, tower sharing frees up capital for MNOs which in turn can be used to respond to the demands of a disaster or boost innovation.

II. *Designating telecommunications networks, including passive infrastructure, as critical/vital infrastructure and affording them the relevant protection.*

Acts of vandalism against telecommunications infrastructure stifle infrastructure rollout and significantly increase the operational costs related to infrastructure maintenance. Increasing the legislative protection afforded to telecommunications networks would help prevent unauthorised interference with, and attacks against, infrastructure, such as those driven by misinformation linking

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[38] The World Bank (2020), "COVID-19 Crisis Response: Digital Development Joint Action Plan and Call for Action" (pdf).

the spread of COVID-19 to 5G technology. For example, in Belgium, Cyprus, Italy, Ireland, Netherlands, United Kingdom, Bolivia, Peru, Colombia and Paraguay, misinformation which linked the spread of COVID-19 to 5G resulted in destruction of towers sites and impacted quality of service in the regions where those towers were located.[39] [40] This should be supported by efforts to actively engage and educate the public to counteract false information around the health risk of 5G and mobile signals. In a lockdown, mobile connectivity is even more important than normal, so these false claims must be addressed to protect mobile infrastructure.

III. *Introduction of measures to facilitate the free movement of personnel charged with upholding network resilience and maintenance.*

During periods of national or regional lockdown, it is vital that engineers, field staff and contractors providing critical site services are able to access infrastructure sites in order to continue essential services, such as repairs, maintenance upgrades and fueling, to ensure critical parts of already burdened networks can be maintained and, where possible, extended.

IV. *Easing of restrictions on the importation of infrastructure equipment.*

As the demand for mobile broadband spiked due to COVID-19, infrastructure providers and network operators were required to secure extra equipment and stock spare parts to support network resilience and continue ongoing projects. This process can be facilitated through expedited customs processes, guaranteeing that additional equipment can be accessed swiftly when required, and temporary reductions in import duties.

V. *Allocation of financial incentives for MNOs and TowerCos to further improve infrastructure rollout in rural and remote areas.*

Universal Service Funding allocations can be designed to play a role during a crisis as a source of first resort funding until sector-specific federal or local stimulus is allocated. This allows existing frameworks in these funds to be reused, ensuring government money is spent effectively and appropriately.

VI. *Establish a focal point of contact within the regulatory authority to address challenges faced by operators and infrastructure providers during a lockdown.*

Having a designated point of contact within the regulator would allow TowerCos and MNOs to communicate with relevant stakeholders to avoid significant delays in carrying out vital work on sites. Similarly, a central authority or "one-stop-shop" to manage all planning and construction-related activities would reduce delays that impact the speed of new infrastructure rollout, both in a crisis and in normal times.

VII. *Establish a streamlined, digital framework for the granting of permits for the deployment of telecommunications infrastructure and encourage digital transformation across government.*

During lockdown, the rollout of new sites has been slowed down due to government departments working from home and being more focused on other COVID-19-related challenges. In many countries, these delays are compounded by underlying barriers to deployment, such as heightened need for wayleaves, the recurrence of excessive requirements by government agencies to secure rights of way, spurious fees and charges, and legacy bureaucracy. Many of these barriers stem from administrative

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[39] The New York Times (2020). "Burning Cell Towers, Out of Baseless Fear They Spread the Virus."
[40] Intelligence Fusion (2020). "Threats to the Telecom Sector in South America: From 5G Towers to Cable Laying Ships."

bottlenecks within municipalities who, in the absence of national policies harmonizing processes and standards for wayleaves, have legislative autonomy over such matters.

The establishment of a streamlined, deployment-friendly permitting framework would facilitate faster network rollout in times of crisis and beyond. Permit applications should be digitized and fully completed online to reduce social contact, allow processes to be executed when staff are based at home, and speed up the granting of permits. In addition, a focal point (single window) for all permitting and deployment-related inquires will further facilitate network resilience.

More generally, governments and regulators should steer away from introducing fees or tax increases and consider postponing other legislative or regulatory measures that hinder the rollout of infrastructure deployment (e.g. restrictions on the movement of network maintenance staff and introducing new equipment type approval standards). Instead, the focus should be on issuing regulatory measures to streamline wireless deployment, such as encouraging passive infrastructure sharing and increasing availability of spectrum resources.

VIII.   *Encourage adoption of digital technologies across government entities*

As demonstrated by the COVID-19 pandemic, digital technologies are a necessary tool to ensure the provision of government services. Government agencies at federal and local levels should accelerate their adoption of digital tools, platforms and services; the mandate to do so should come from the highest level by means of a Presidential Decree or similar instrument that sets out a digital transformation policy across government (and other sectors) and timeline for implementation. Developmental organizations and international lenders should earmark resources to advance the digitization of the public sector and work hand in hand with governments to do so.

As part of this process, governments should begin digitizing administrative process that thus far have required the physical presence of interested parties. If public sector agencies are seen to be adopters of technologies, it will encourage other sectors to accelerate their own digital transformation.

Lessons to be Learned from COVID-19

The extensive adoption of digital technologies and the ability of networks to sustain the growing demand for mobile broadband connectivity during the COVID-19 crisis represent a success story and offer a clear indication of how valuable these technologies now are.

New digital habits driven by COVID-19 are here to stay, and the emerging post-COVID-19 world promises to be one where resilient connectivity is a pillar for the smooth operation and delivery of government services, healthcare, education, business and agriculture, to name just a few areas.

The experience of the last few months has served as an important series of lessons that can be used to map and strengthen our response to future pandemics or non-pandemic related crises. They will also help us build a powerful future across industries, as noted by the World Economic Forum.[41]

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[41] WEF (2020). "5 Lessons we Must Take from the Corona Virus Crisis."

Lesson 1: TowerCos are the foundation of mobile connectivity and an essential element of the digital transformation ecosystem – a vital role often unnoticed and undervalued by governments and regulators.

COVID-19 has reminded us just how important mobile connectivity is, although the role of passive infrastructure and TowerCos was often overlooked during policy responses.

- Better coverage and greater capacity are needed to ensure mobile connectivity can successfully meet the demand for services and be ready to support societies during future crises.

- This, in turn, requires an increase in the depth and breadth of cell sites. The most efficient way to achieve this is through TowerCos, whose business model makes it faster and more cost-effective for MNOs to extend coverage and increase capacity.

Lesson 2: Governments need to put in place specific and explicit measures to support passive telecommunications infrastructure in preparation for future unforeseen events, such as COVID-19.

First, policies and regulations should be designed and prepared for a crisis during the calm of normal times. This allows government and regulators to enact them instantly, safe in the knowledge that they have been designed to support the key aspects of passive infrastructure.

Second, existing policies should be reviewed to encourage greater and more extensive rollout of passive networks. Fair fees and taxes on the industry as well as increased access to spectrum resources contribute to the optimization of mobile network infrastructure to better serve the needs of communities and public service.

This means that when the next crisis happens, the base level of networks will be higher, providing more support and options to populations. In times of non-crisis, improved networks will benefit everyone from consumers to businesses.

Lesson 3: Agile frameworks and streamlined regulation deliver the best outcomes in both normal and crisis periods.

The COVID-19 pandemic has highlighted that burdensome regulation, red tape, and excessive protectionism is a deterrent to sustainable, equitable and resilient response.

- Policymakers should commit to the adoption of agile and streamlined regulatory frameworks for the granting of infrastructure deployment authorizations, such as right-of-way (including public furniture) and planning approvals. They should also reduce legacy red tape (including poor coordination between local and federal governments) by establishing a one-stop-shop for the issuance of all approvals.

- This approach allows TowerCos and MNOs to respond rapidly during a crisis without the need for emergency legislative changes and, in normal times, enables faster and more efficient network rollout at a lower cost for consumers and businesses.

Lesson 4: Digital transformation and e-government services are key to long-term resilience.

As demonstrated by the Covid-19 pandemic, digital transformation is impacting all aspects of our societies and economies. Citizens and businesses of all sizes rely on information technologies to access and provide services. More fundamentally, digital transformation is revolutionizing the nature of the relationship between public authorities and the people they serve – enhancing transparency, accountability, responsiveness, accessibility of government services, and user experience. In addition, as cities become "smarter", digital technology "thoughtfully deployed by governments, can improve three broad outcomes: the well-being of people, the strength of the economy, and the effectiveness of institutions".[48]

To increase long-term resilience in response to the global crisis, federal and local governments worldwide should digitize administrative processes, including those relating to obtaining permits, rights of way approvals and infrastructure deployment. No resource should be withheld from efforts to accelerate digital transformation, which in turn facilitates reduced social contact, allow processes to be completed when staff are based at home, and speeds up the granting of permits.

Lesson 5: Concerns about health impacts of wireless technology need to be actively addressed and anticipated.

COVID-19 demonstrated that many people are increasingly concerned about wireless technology and the potential health effects of radio waves, despite the unanimous conclusion of international public health organizations such as the World Health Organization, which reaffirm their safe use. To avoid this becoming a problem in future crises, governments need to educate the public and address their concerns, as destruction of critical infrastructure during a pandemic (as was seen in some countries) could have a substantially negative impact when demand for mobile connectivity is at its highest.

Conclusions

Our analysis highlights the importance of accelerating digital transformation in the aftermath of COVID-19. We outline how vital passive infrastructure is in the delivery of mobile connectivity and how that connectivity has become more indispensable than ever. Policy responses from governments to the pandemic have been timid in recognizing this connection and in supporting and protecting passive infrastructure.

We identified five lessons from the pandemic for governments to implement to prepare better for any future crisis. The policy initiatives that work for a crisis like COVID-19 also benefit economies in normal times, thereby providing the best of both worlds - protection and resilience during a crisis, and growth and development during normal times.