

What COVID-19 Means for Digital Infrastructure in Emerging Markets

By Davide Strusani and Georges V. Hounobon

The COVID-19 pandemic shows that digital connectivity is critical to societal resilience and business continuity in times of crisis. For digital infrastructure providers in emerging markets, higher demand for connectivity may be counterbalanced by a series of negative shocks. These could affect broadband operators and smaller companies, leading to less competition, limited availability of open-access broadband infrastructure, and reduced technological innovation. However, the perceived value of digital connectivity is likely to rise, creating opportunities to implement policy reforms to accelerate the rollout of 4G and 5G. Digital infrastructure companies, however, may accelerate their migration toward diversified business models. Against a background of funding withdrawal from emerging markets, financing for smaller or independent companies in the poorest economies may require substantial support from development finance institutions to preserve competition, improve resilience, and promote digital inclusion for the poorest.

This note discusses the potential implications of the COVID-19 crisis for private sector investors in the digital infrastructure sector, with a focus on emerging markets. Digital infrastructure—the physical infrastructure of connectivity—consists of undersea, underground, and above-ground cables; tower sites, data centers, and satellites; the invisible spectrum used for wireless communication; and the variety of equipment that interconnects the world through the Internet.

Key findings

- The COVID-19 crisis underscores the critical nature of digital connectivity and digital services in supporting

societal resilience and business continuity—these are founded on a robust and well-functioning digital infrastructure.

- For digital infrastructure providers in emerging markets, rising demand for connectivity may be partly offset by negative demand and supply shocks caused by income loss among individuals and businesses as well as disruptions to digital infrastructure supply chains.
- The broadband sector is likely to be more exposed than the data hosting sector (such as data centers or Cloud services) due to differences in levels of maturity and more complex supply chains. Integrated companies, that is, those that control two or more segments of the

About the Authors

Davide Strusani is IFC's Principal Economist for Telecom, Media, Technology, Venture Capital and Funds. Davide has worked extensively for private sector organizations, industry associations, and governments on the role of technology, digital services, and communications to deliver economic and social growth. He has led numerous in-country campaigns to focus governments and sector regulators on the benefits of ICT. His email is dstrusani@ifc.org.

Georges Vivien Hounobon is an Economist for Telecom, Media, Technology (TMT) at IFC. He has studied the impacts of digital technology in Africa and Europe for both academia and the private sector. His email is ghounobon@ifc.org.

digital infrastructure value chain, are likely to be better positioned to weather supply shocks than specialized independent companies.

- Specialized companies and smaller but fast-growing broadband network operators may face survival challenges, leading to more concentrated and therefore less competitive markets, limited availability of open-access broadband infrastructure, or less technological innovation. This creates concerns that rural and gender connectivity gaps may widen further in emerging markets—and may slow expansion of 4G and 5G networks.
- On the other hand, the perceived value of connectivity is likely to increase—consumers may consider it an even greater necessity (or even a right). As a result, public policy could accelerate universal digital connectivity and services, and governments could implement regulatory changes to align connectivity with electricity or water utilities. This could present opportunities to implement policy reforms to accelerate the rollout of 4G and 5G.
- Digital infrastructure companies can accelerate their migration to diversified business models by monetizing digital data or venturing into new areas such as digital payments, digital content, and Cloud services.
- Against a background of funding withdrawal from emerging markets, the digital infrastructure industry may fare better than others in attracting funding, given expectations of increased demand in the medium- to long-term. However, financing for smaller or independent companies in the poorest economies, or innovative products and technologies, may require substantial support from development finance institutions (DFIs). Such support would be critical to preserve competition, improve resilience, and promote digital inclusion for the poorest.

The COVID-19 Crisis is Increasing the Importance of Digital Connectivity

Digital connectivity has become critical to societal resilience and business continuity. The crisis and the social distancing measures taken in reaction to it—stay-at-home orders in particular—have made it clear that quality Internet and telephony access are necessary to maintaining social interactions and enabling the continuity of government and the private sector. Individuals have been able to work, attend classes, get medical advice from home, order food and goods, and connect with family and friends via the Internet. Governments have relied on digital connectivity to deliver critical public services such

as healthcare and social transfers, as well as important information such as health alerts. Digital connectivity is supporting the enforcement of mitigation measures via contact tracing, and is critical to research and the development of cures or vaccines via information pooling on Internet platforms.¹

As a result, many markets are seeing increased use of digital infrastructure compared to pre-crisis levels.² The magnitude of this increase varies significantly from one country to another, and most existing evidence so far pertains to high- and middle-income countries.³ For instance, Vodafone reports increased European usage—15 percent for mobile Internet and 44 percent for fixed broadband. In Ghana, MTN reports an increase in traffic of 15 percent to 20 percent.⁴ This increased usage mainly reflects higher use of videoconferencing, uploading of data into the Cloud, and video-gaming. In the United States, T-Mobile reported a 77 percent increase in multimedia messages (MMS) and a 45 percent increase in video game traffic. Google Meet’s day-over-day growth surpassed 60 percent. The maximum number of daily meeting participants on Zoom, the videoconferencing app, increased from 10 million at the end of December 2019 to 200 million by the end of March 2020. This often translates into lower-quality Internet access. Ookla, which measures Internet performance, reported a significant but temporary decline in download speeds and an increase in network latency in China, especially in Hubei, during the lockdown.⁵ In Europe, Netflix adjusted video quality from high to standard definition to cope with network traffic load.⁶

There is still limited evidence about the impact of COVID-19 on digital infrastructure in emerging markets (Table 3 on page 6). Levels of digital infrastructure in emerging markets vary greatly, with large gaps persisting especially in low-income countries (LICs), which are characterized by low levels of Internet penetration, low digital usage, large gaps in coverage between urban and rural areas, and high affordability barriers, especially for mobile Internet.

Most COVID-19 analysis to date focuses on government interventions or specific digital infrastructure subsectors. For instance, GSMA Intelligence analyzes the usage and resilience of mobile networks as well as implications for mobile operators and regulators.⁷ TowerXchange provides experts views of the implications for tower companies,⁸ while Telegeography highlights the impact on broadband network operators, including submarine cable operators.⁹ GlobalData analyzes the impact on digital infrastructure subsectors, especially Cloud services providers.¹⁰ However, these industry analyses have not yet covered emerging markets, differences between short- and medium-run

effects, or the business models of companies. While the health and economic consequences in emerging markets are still unfolding at the moment,¹¹ anticipating the impact on the digital infrastructure subsector will enable private sector participants—especially digital infrastructure operators, regulators, commercial investors—and DFIs such as IFC to take immediate action and plan interventions for the post-COVID-19 era. Economic analysis can offer a framework for anticipating such impacts.

A Review of Demand and Supply Shocks Induced by the COVID-19 on Digital Infrastructure

For digital infrastructure companies, the COVID-19 crisis is primarily a positive demand shock (Table 1). Changes in consumer behavior as a result of social distancing measures and increased demand for healthcare services are typically short-term demand shocks, featuring higher demand for data-intensive services like videoconferencing, video calls, live streaming, and file uploading. These shocks are expected to be temporary—occurring at the peak of the outbreak, as suggested by observed usage patterns in China, Italy, and Spain. However, there is a possibility that these shocks will remain in the longer term. For example, the outbreak could lead to a permanent shift in consumer behavior—individuals may upgrade their broadband speeds, subscribe to online news and entertainment plans, and participate in more online shopping and schooling/tutoring. And businesses may gradually virtualize critical operations to enable home-based working and strengthen business continuity plans in anticipation of similar outbreaks in the future.¹² While these are positive demand shocks, digital infrastructure companies may

also experience negative demand shocks in the short-to-medium-term as a result of adverse macroeconomic outcomes such as higher unemployment, lower disposable incomes, and lower business demand, especially from small and medium businesses (SMEs).¹³

The COVID-19 crisis is also likely to generate a number of supply shocks for digital infrastructure companies. Most of these shocks are expected to occur in the short term as a result of supply chain disruptions and organizational changes (Table 1). Social distancing measures in major manufacturing countries like China have led to the closure of factories and delays in shipments of critical IT equipment, resulting in higher costs of inputs and delays in investment projects.¹⁴ For instance, while submarine cables are critical for delivering high-speed Internet access, telecommunications research firm Telegeography reports at least one supplier closing two factories to comply with quarantine in March.¹⁵ Submarine cable maintenance companies are particularly at risk as they cruise across oceans in an environment where social distancing is difficult to enforce. Also, many digital infrastructure companies have resorted to home-based work, generating higher operating expenditures as they invest in additional, quality teleconferencing as well as data hosting services, shifting from office-centric to home-centric organizations. These negative short-term supply shocks may be compounded with long-term shocks due to the potential exit of critical suppliers or distributors post-crisis because of increased financial distress.

A further positive shock may come from the consideration that the value of digital connectivity may experience an upward shift as a result of the COVID-19 crisis. It is likely

	Demand for digital connectivity and services	Supply of digital connectivity and services
Short-term (during lockdown)	Change in consumer usage patterns , including new data-intensive applications for individuals (such as video conferencing or streaming) and organizational change from business (including Cloud storage and computing, home-based work)	Disruption in the digital infrastructure supply chain , resulting in a higher cost of inputs (such as IT equipment and energy) and delays in investment projects Organizational changes stemming from social distancing of workers, resulting in higher costs of operations
Long-term (after lockdown)	A shift in consumer behavior , including permanent change in usage patterns for individuals and increased virtualization of business operations—both public and private—to strengthen resilience Income loss resulting from unemployment and the exit of private sector businesses	Exit of critical suppliers and distributors resulting from financial distress

TABLE 1 Potential Demand and Supply Shocks of COVID-19 on Digital Infrastructure

Source: IFC.

	Emerging markets vs. high-income countries	Broadband vs. data-hosting sector	Integrated vs. specialized/independent companies
Demand shocks (positive)	–	–	=
Demand shocks (negative)	+	–	=
Supply shocks (negative)	+	+	–
Upward shift in the value of digital connectivity	+	=	=

TABLE 2 Relative Magnitude of COVID-19 shocks on Digital Infrastructure

Source: IFC.

Note: Large (+), small (–), or limited (=) magnitude of shock. Emerging markets include middle- and low-income countries. The data hosting sector includes data center colocation and cloud service providers. Integrated companies control two or more segments of the digital infrastructure value chain. For instance, a mobile network operator controls both the last mile connectivity segment, towers, and wholesale broadband networks. Specialized companies focus on a specific segment of the value chain, such as a tower company or an independent data center operator.

that governments and consumers will consider connectivity a necessity, and may even begin to identify Internet access as a basic human right. Prior to COVID-19, digital connectivity was often viewed as a “good to have,” a second-order priority compared to other infrastructure. The COVID-19 crisis may induce an upward shift in the value of connectivity, one that is likely to affect consumer demand as well as public policies, particularly toward digital inclusion for the poorest.

The magnitude of these shocks will vary significantly across countries according to their income levels, across digital infrastructure sub-sectors, and across companies—depending on their business model before the crisis (Table 2).

High-income countries (HICs) are likely to face bigger demand shocks and smaller supply shocks than emerging markets. Increased usage of digital connectivity is expected to be larger in HICs than emerging markets due to differences in network technologies, levels of economic development, and the development stage of their digital economies. HICs have a larger capacity and more robust networks than emerging markets to support a surge in Internet traffic due to higher access to fixed network technologies (copper, fiber optic, and TV cables).¹⁶ The capacity of mobile networks, which are the dominant broadband access technology in emerging markets, is shared among users and is therefore more sensitive to surges in demand. The informal sector accounts for a larger share of economic activity in emerging markets—86 percent of workers in Africa and 68 percent in Asia-Pacific, according to the International Labour Organization (ILO)—limiting the enforcement of social distancing (especially stay-at-home orders).¹⁷ As a result, the increase in network traffic is expected to be more limited in emerging markets.

In middle-income countries, where social distancing can be more effectively enforced, nascent digital ecosystems and lower levels of digital skills (especially in lower-middle-income countries) could prevent a significant increase in Internet usage at levels comparable to those observed in high-income countries. Emerging markets may, however, experience larger supply shocks due to less integration into global value chains and limited opportunities for local manufacturing to substitute exports. Emerging markets could also gain from an increase in the value of digital connectivity as they tended to prioritize other utilities before the COVID-19 crisis struck.

The broadband sector, including submarine cable and satellite operators, fixed broadband operators, tower companies, and mobile network operators, is likely to be more exposed than the data hosting sector (for example, data centers and Cloud facilities) to the COVID-19 crisis due to different levels of maturity and more complex supply chains. The data hosting sector is more nascent than the broadband sector and, as such, is expected to benefit more from the increased usage of digital connectivity and services—beyond higher Internet traffic. Retail broadband operators—mobile network operators (MNOs) and Internet service providers (ISPs)—typically offer a flat tariff for generous data packages and minimum quality, limiting their ability to benefit from increased data usage. Yet, they may need to incur higher operating expenditures to maintain their networks during traditional off-peak hours, and higher capital expenditures to maintain network quality, thereby potentially experiencing larger supply shocks.

Integrated companies, such as those that control two or more segments of the digital infrastructure value chain,

are likely to be better positioned to weather the supply shocks than specialized independent companies such as retail operators (for example, ISP, MNOs, and mobile virtual network operators) and retail data center operators. Integrated network operators can internalize costs resulting from the upstream segment of their value chains. For instance, integrated broadband operators would not have to purchase additional wholesale transmission capacity (national or international) or access network capacity from wholesalers to maintain the quality of connectivity delivered to end users. Likewise, integrated Cloud services providers with their own data centers may be better positioned to respond to increased demand for data hosting services than specialized Cloud services providers.

Digital Infrastructure in Emerging Markets: Summary of Risks and Opportunities

Based on a review of the shocks discussed above, the following risks and opportunities may arise in the digital infrastructure sector.

Risk 1: The COVID-19 crisis could widen the gap in digital connectivity between and within emerging markets as quality degrades further and affordability worsens in the most challenging markets

In the short run, emerging markets, which mainly rely on mobile networks for connectivity, could experience a decline in broadband quality—with lower speeds and higher latency—because of the substantial increases in demand for digital connectivity. Such a decline in quality could be greater in nascent digital economies, landlocked or island countries, as well as in rural areas and for women. These impacts could be worsened by negative supply shocks resulting from disruptions in digital infrastructure supply chains and organizational changes in broadband infrastructure companies. The higher cost of inputs such as IT equipment and delays in investment projects could limit the ability of broadband operators to respond to increased demand. Likewise, the social distancing of digital connectivity workers could also limit response to increased usage.

In the medium run, consumers in emerging markets, including individuals and businesses, may suffer from the lower affordability of digital connectivity resulting from income losses (due to a potential rise in unemployment or underemployment, and poor business performance)—especially in sectors such as hospitality, travel, and offline entertainment. This impact would be larger for workers and businesses that are more exposed to the macroeconomic effects of the outbreak. As a result of lower affordability, access to the new generation of broadband

technologies (fiber or 5G for businesses and 3G/4G for individuals) may be limited, as the return on investment could be lower than it was before the crisis.

Access to and usage of data hosting services in emerging markets may not be affected negatively in the short run as Cloud services providers can rely on data centers outside their local markets.

Risk 2: The digital infrastructure sector could become less competitive, with potential concerns about its resilience and inclusiveness due to negative supply shocks on specialized/independent operators

Negative supply shocks such as disruptions to digital infrastructure supply chains and organizational changes, as well as the exit of critical suppliers, could result in the limited growth of specialized companies, the potential exit of smaller but fast-growing broadband network operators, or the suspension of wholesale data center projects. This may lead to more concentrated markets, limited availability of open-access broadband infrastructure, or less technological innovation (for example fiber networks). Digital infrastructure companies with lower margins, typically new entrants or players in contestable markets, are likely to be affected by short-term demand shocks, potentially weakening market competitiveness.

Less-competitive digital connectivity markets and reduced affordability could result in fewer incentives to invest, thereby limiting the resilience of digital infrastructure—especially in markets that mainly rely on mobile networks. Also, the exit of smaller network operators or Cloud service providers from some emerging markets resulting from negative supply shocks could limit access to digital connectivity for low-income individuals and micro, small, and medium businesses (MSMEs).

Risk 3: Reduced access to finance for digital infrastructure companies

Against the background of a general reduction in funding to emerging markets following the COVID-19 crisis, the negative medium-run impact on demand for digital connectivity, compounded with the greater fragility of specialized/independent broadband operators, may make them less attractive to commercial investors. This risk may be exacerbated by increased country risks for low-income countries. A lack of financing may also delay investment in 4G/5G in emerging markets, which in turn could slow the expansion of the digital economy. However, the increased value of connectivity and the robustness of certain sector segments (such as incumbent operators, integrated companies, and data hosting facilities) may buck the negative financing trend.

Opportunity 1: The value of digital infrastructure increases and connectivity is seen as a necessity or a right

The upward shift in the value of digital connectivity may drive increased demand for connectivity. High-income consumers would be willing to pay more for digital connectivity, potentially limiting the decline in average revenue per user observed in most emerging markets.

The long-term shift in consumer behavior toward more resilient technologies could support higher demand for Cloud computing and therefore for data center capacity. As businesses, both public and private, increase the use of online services in their operations, emerging markets could experience a surge in data center capacity. Long-term financing may support this change—although with the risk of large incumbents benefitting the most. If Internet access is perceived as a right, the digital sector may experience an increase in public subsidies to support more aggressive universal access policies, with an emphasis on the underserved, including women.

Opportunity 2: Digital infrastructure companies migrate toward diversified business models

Demand and supply shocks from COVID-19 may drive broadband operators to monetize revenue upside from digital payments, digital content, and digital data (for example, credit scoring, human mobility tracking, targeting of social policies). Cloud services providers could integrate with data center

providers and monetize digital data (for example, smart cities, or smart-grid applications using artificial intelligence).

Opportunity 3: Public policies become more supportive of investment in digital infrastructure and more pro-digital

Governments may accelerate policies for connectivity, and the sector may become a policy priority. Accelerated policies may result in direct public interventions in the rollout of digital infrastructure, especially at the wholesale level and in hard-to-reach areas.

Changes that could lead to increased investment opportunities may include: (a) fast-track availability of radio spectrum (like in South Africa),¹⁸ (b) policies supportive of infrastructure sharing, (c) reductions in sector-specific taxation on digital infrastructure companies and equipment, which are often seen as “cash-cows” by governments, (d) implementation of asymmetric regulations to support smaller operators, and (e) promotion of flexible data sovereignty law to enable offshore data hosting for certain sectors. Fiscal pressure from COVID-19 and lower oil prices may also drive some countries to embrace sector reform.

Opportunity 4: Development finance has an opportunity to step up financing for an industry with strong, long-term potential but also requirements for substantial upgrades and innovation in emerging markets—including support for 5G technologies that could increase resilience across multiple sectors

Analyst	GMSA	TowerXchange	Telegeography	GlobalData
Main focus	MNOs & Regulators	Tower companies	Broadband network operators	Data storage & Cloud*
Regional focus	Global	Global (U.S. at present)	Global	Global
Key challenges	<ul style="list-style-type: none"> Churn down, usage up Increasing requirements for network resilience Delays in network rollout A potential slowdown in consumer 5G adoption 	Broadly resilient—similar to the 2008 financial crisis: critical infrastructure, consume a fairly modest share of carrier Opex, and long-term contracts	Increased data traffic along the broadband value chain, including submarine cables	Depends on verticals: <ul style="list-style-type: none"> Decline in demand due to delays in key IT projects Surge in demand for Cloud and edge computing
Sources	GSMAi (a), GSMAi (b), GSMA	TowerXchange	Telegeography	GlobalData

TABLE 3 COVID-19 Impacts on Digital Infrastructure—Summary of External Analyst Reports

* The focus of the GlobalData report is beyond the data storage and cloud.

Immediate actions may include the provision of working capital or equity investment, especially for independent operators, in broadband sectors in the most challenging emerging markets. Such actions could help soften the shocks and preserve the competitiveness of the digital sector. Financing support could enhance market competitiveness as operators in need will be those that are ensuring market contestability.

Medium- to long-term plans could seek to strengthen resilience and inclusiveness of the digital infrastructure sector by supporting investment in redundant digital infrastructure and enabling expansion of Cloud services providers and broadband operators in hard-to-reach areas. More public-private partnership (PPP) projects could require financing as a result of increased government interventions in the digital sector.

ACKNOWLEDGMENTS

The authors would like to thank the following colleagues for their review and suggestions: Issa Faye, Director, Sector Economics and Development Impact, Economics and Private Sector Development, IFC; within Global Infrastructure, IFC: German Cufre, Manager, TMT; Ferdinand Van Ingen, Senior Industry Specialist, TMT; Carlo Maria Rossotto, TMT Upstream; Alexa Roscoe, Digital Economy Lead, Gender

Business, Economics, and Private Sector Development, IFC; Tom Kerr, Manager, Global Industries and Thematic Engagement, Communications and Outreach, IFC; and within Thought Leadership, Economics and Private Sector Development, IFC: Neil Gregory, Chief Thought Leadership Officer; and Thomas Rehermann, Senior Economist.

Please see the following additional reports and EM Compass Notes about technology and its role in emerging markets and private investments in infrastructure:

Artificial Intelligence in the Power Sector (Note 81, April 2020); *Accelerating Digital Connectivity Through Shared Digital Infrastructure* (Note 79, February 2020); *Artificial Intelligence and 5G Mobile Technology Can Drive Investment Opportunities in Emerging Markets* (Note 76, December 2019); *How Artificial Intelligence is Making Transport Safer, Cleaner, More Reliable and Efficient in Emerging Markets* (Note 75, November 2019); *Bridging the Trust Gap: Blockchain's Potential to Restore Trust in Artificial Intelligence in Support of New Business Models* (Note 74, October 2019); *Artificial Intelligence: Investment Trends and Selected Industry Uses* (Note 71, September 2019); *The Role of Artificial Intelligence in Supporting Development in Emerging Markets* (Note 69, July 2019); *Reinventing Business Through Disruptive Technologies—Sector Trends and Investment Opportunities for Firms in Emerging Markets* (Report, March 2019); *Blockchain: Opportunities for Private Enterprises in Emerging Markets* (Report, January 2019).

¹ IFC plans to discuss the impacts of COVID-19 crisis on digital businesses in a separate note.

² For more information, see evidence collected by Telegeography at <https://www2.telegeography.com/network-impact>.

³ Economist. 2020. "Can mobile networks handle becoming stay-at-home networks?" April 4. <https://www.economist.com/science-and-technology/2020/04/03/can-mobile-networks-handle-becoming-stay-at-home-networks>.

⁴ Citi Newsroom <https://citinewsroom.com/2020/03/covid-19-data-usage-up-by-15-20-mtn-ghana-ceo/>

⁵ Speedtest. 2020. "Tracking COVID-19's Impact on Global Internet Performance." March 13, updated April 27. <https://www.speedtest.net/insights/blog/tracking-covid-19-impact-global-internet-performance/>.

⁶ Hartmans, Avery. "Netflix is reducing its streaming quality in Europe to avoid straining the internet during COVID-19." *World Economic Forum*. March 20. <https://www.weforum.org/agenda/2020/03/netflix-is-reducing-the-quality-of-its-streams-in-europe-to-avoid-straining-the-internet-during-the-coronavirus-outbreak/>.

⁷ Hatt, Tim et al. 2020. "Covid19 impact: testing the resiliency of mobile networks." *GSMA Intelligence*.

⁸ TowerXchange. 2020. "Exploring the impact of the Coronavirus on towercos and on towerco valuations." March 31. <https://www.towerxchange.com/exploring-the-impact-of-the-coronavirus-on-towercos-and-on-towerco-valuations/>.

⁹ Mauldin, Alan. 2020. "The COVID-19 Impact on the Submarine Cable Industry." *TeleGeography* (blog), March 29. https://blog.telegeography.com/covid-19-impact-on-the-submarine-cable-industry?utm_source=account_homepage.

¹⁰ GlobalData. 2020. "Tech, Media, & Telecom Trends 2020." Report, March 20.

¹¹ As of April 15, EMs still account for less than 25 percent of confirmed cases, but are already being hit by deteriorating trade and financial environment: \$96 billion, or 0.4 percent of GDP, left emerging markets between January 21 and March 31, UNCTAD forecasts that this could cause a 40 percent drop in FDIs during 2020-21, and balance of payment pressures have led to depreciations of up to 20 percent in major currencies relative to the U.S. dollar since the crisis, while spreads on sovereign and corporate debt instruments have significantly risen following recent ratings downgrades.

¹² While viral outbreaks may become frequent, cyber-attacks is also a major risk for the future.

¹³ In China, iPhone sales dropped to 490,000 in February from 1.27 million in the previous year (GSMAi).

¹⁴ Mauldin 2020.

¹⁵ Ibid.

¹⁶ On average, OECD member states—close to 80 percent of households—have access to fixed broadband with significant share.

¹⁷ ILO (International Labour Organization). 2018. "More than 60 per cent of the world's employed population are in the informal economy." Press Release, April 30. https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_627189/lang--en/index.htm.

¹⁸ ICASA. <https://www.icasa.org.za/news/2020/emergency-release-of-spectrum-to-meet-the-spike-in-broadband-services-demand-due-to-covid-19>

Additional EM Compass Notes Previously Published by IFC Thought Leadership

MAY 2020

Note 82: Artificial Intelligence in Agribusiness is Growing in Emerging Markets

APRIL 2020

Note 81: Artificial Intelligence in the Power Sector

MARCH 2020

Note 80: Developing Artificial Intelligence Sustainably: Toward a Practical Code of Conduct for Disruptive Technologies

Note 80a: IFC Technology Code of Conduct—Progression Matrix—Public Draft—Addendum to Note 80

FEBRUARY 2020

Note 79: Accelerating Digital Connectivity Through Infrastructure Sharing

Note 78: Artificial Intelligence and the Future for Smart Homes

JANUARY 2020

Note 77: Creating Domestic Capital Markets in Developing Countries: Perspectives from Market Participants

DECEMBER 2019

Note 76: Artificial Intelligence and 5G Mobile Technology Can Drive Investment Opportunities in Emerging Markets

NOVEMBER 2019

Note 75: How Artificial Intelligence is Making Transport Safer, Cleaner, More Reliable and Efficient in Emerging Markets

OCTOBER 2019

Note 74: Bridging the Trust Gap: Blockchain's Potential to Restore Trust in Artificial Intelligence in Support of New Business Models

Note 73: Closing the SDG Financing Gap—Trends and Data

SEPTEMBER 2019

Note 72: Blended Concessional Finance: The Rise of Returnable Capital Contributions

Note 71: Artificial Intelligence: Investment Trends and Selected Industry Uses

AUGUST 2019

Note 70: How Insurtech Can Close the Protection Gap in Emerging Markets

JULY 2019

Note 69: The Role of Artificial Intelligence in Supporting Development in Emerging Markets

JUNE 2019

Note 68: Basic Business Models for Banks Providing Digital Financial Services in Africa

APRIL 2019

Note 67: The Case for Responsible Investing in Digital Financial Services

MARCH 2019

Note 66: Blended Concessional Finance: Governance Matters for Impact

Note 65: Natural Gas and the Clean Energy Transition

FEBRUARY 2019

Note 64: Institutional Investing: A New Investor Forum and Growing Interest in Sustainable Emerging Markets Investments

JANUARY 2019

Note 63: Blockchain and Associated Legal Issues for Emerging Markets

Note 62: Service Performance Guarantees for Public Utilities and Beyond—An Innovation with Potential to Attract Investors to Emerging Markets

NOVEMBER 2018

Note 61: Using Blockchain to Enable Cleaner, Modern Energy Systems in Emerging Markets

Note 60: Blended Concessional Finance: Scaling Up Private Investment in Lower-Income Countries

OCTOBER 2018

Note 59: How a Know-Your-Customer Utility Could Increase Access to Financial Services in Emerging Markets

Note 58: Competition Works: Driving Microfinance Institutions to Reach Lower-Income People and the Unbanked in Peru

SEPTEMBER 2018

Note 57: Blockchain Governance and Regulation as an Enabler for Market Creation in Emerging Markets

JULY 2018

Note 56: A Practical Tool to Create Economic Opportunity for Low-Income Communities

JUNE 2018

Note 55: Peru's Works for Taxes Scheme: An Innovative Solution to Accelerate Private Provision of Infrastructure Investment