Chapter 2: Digital Infrastructure

1. State of the Philippine Internet Access, Quality and Affordability

Rapid advancements in digital technology combined with adoption of information and communications technology (ICT) have paved the way for digitalization—a shift to Internet-enabled processes and activities, which displaces old ways of doing things.[1] The COVID-19 pandemic has served as a catalyst for accelerated digitalization in key sectors of the Philippine economy and society. With mobility restrictions and physical distancing in place for much of 2020 and 2021, millions of Filipinos relied on Internet connectivity and digital devices for their day-to-day lives.

This digital shift is especially apparent in the areas of commerce, health, and education. Since the pandemic began, the Bangko Sentral ng Pilipinas (BSP) has seen adoption of its PESONet and InstaPay electronic settlement systems surge by 376 percent and 459 percent year-on-year, respectively, moving a total of over PHP 1.4 trillion in 2020.[2] This trend continued into 2021, with the BSP expecting the country to conduct half of all financial transactions digitally by 2023.[3]

As schools remain closed, most of the 26.3 million K-12 and tertiary school enrollees for the 2021-2022 school year continue to rely on distance learning modalities.[4] While most enrollees (59 %) during the previous school year relied on printed modules, this still represented a sizeable number of students who were now attending classes or accessing educational materials via the Internet, along with TV, radio, and other technologies.[5] Furthermore, citing the cost benefits of reducing printed modules and shifting to digital platforms, the Department of Education (DepEd) has stated that it aims to bring more students online moving forward.[6]

Health is another key area where connectivity has taken on new importance. With hospitals and clinics overwhelmed by the pandemic, Filipinos had to turn to telemedicine for their health needs. Teleconsultations, digital prescriptions, and other Internet-enabled health services helped reduce foot traffic in medical facilities and possible exposure to the virus. One telemedicine provider partnered with the Department of Health (DoH) experienced a 170% increase in consultations compared to pre-pandemic levels, equivalent to around 70,000 virtual appointments.[7] Even

[1] World Economic Forum (n.d.). Understanding the impact of digitalization on society. *World Economic Forum.* https://reports.weforum.org/digital-transformation/understanding-the-impact-of-digitalization-on-society/
[2] Lucas, D. (2021, February 4). Digital payments surged by over 5,000 percent amid pandemic, says BSP chief. *Inquirer.net*. https://business.inquirer.net/316989/digital-payments-surged-by-over-5000-percent-amid-pandemic-says-bsp-chief
[3] Diokno, B. (2020). BSP Unbound: Central Banking and the COVID-19 Pandemic in the Philippines (Foreword). https://www.bsp.gov.ph/Media_And_Research/Publications/BSP_Unbound.pdf.
[4] Malasig, J. (2021, September 17). 'No, ma'am, it isn't': Online classes woes counter DepEd's 'successful' school reopening remark. *The Philippine Star.* https://interaksyon.philstar.com/politics-issues/2021/09/17/200360/online-classes-woes-counter-deped-successful-school-reopening-remark/
[5] Magsambol, B. (2020, September 22). Fast facts: DepEd's modular learning. *Rappler.* https://www.rappler.com/newsbreak/iq/things-to-know-deped-modular-learning
[6] Magsambol, B. (2020, September 10). *Briones says modular learning 'expensive,' has 'big effect' on environment*. Rappler. https://www.rappler.com/nation/briones-modular-learning-expensive-effect-environment?
[7] Gunasegaran, T. (2021, May 26). Telemedicine provider reports high teleconsultation uptake in the Philippines. *Healthcare IT News.* https://www.healthcareitnews.com/news/asia/telemedicine-provider-reports-high-teleconsultation-uptake-philippines

barangay health centers, such as the one in Pasig City, began offering free virtual appointments with its doctors, with prescriptions sent via Facebook Messenger or Viber.[8]

In the area of e-commerce, Google's 2021 e-Conomy Southeast Asia Report found that the Philippines was the fastest growing Internet economy in the region, with online gross merchandise value (GMV) expected to reach USD 40 billion by 2025.[9] In 2021 alone, the Philippines' GMV is expected to reach USD 17 billion – a 93 percent year-on-year increase driven by pandemic-related shifts in consumer spending patterns. This growth stems from over 12 million new digital consumers, 63 percent of whom are from non-metro areas that did not previously see significant uptake of digital transactions. For their part, 39 percent of digital merchants stated that they owed their pandemic survival to the continued business they got from digital consumers.

There are already indications that this digital transformation is the start of a permanent change. BSP's Governor Benjamin Diokno has expressed optimism that the uptake of digital payments will only continue to accelerate, beating even the central bank's original targets.[10] More generally, data collected by OpenSignal indicate that Filipinos' time connected to Wi-Fi remain consistently above pre-pandemic levels even as mobility restrictions have eased – sign of a persistent shift to a more connected way of life.

Unfortunately, not all Filipinos have been able to take part in this new digital normal due to issues in Internet access, quality, and affordability. This digital divide threatens not only to exclude millions of Filipinos from participating online, but also to prevent the Philippines from benefiting from the full economic dividend of digitalization.[11]

A 2021 report by the Asian Development Bank emphasized that in countries like the Philippines, e-commerce and digital platforms in general face significant barriers in the form of "restrictive digital regulations and inadequate ICT infrastructure.[12]" Similarly, the World Bank Philippine Digital Economy Report 2020 found that Filipinos suffer from limited digital infrastructure as a result of low market competition and outdated regulations. These are the binding constraints that lead to slow, expensive, and inaccessible Internet.[13]

Access

Data from the 2019 National ICT Household Survey (NICTHS),[14] conducted by the Department of Information and Communications Technology (DICT) in partnership with the Philippine Statistical Research Institute (PSRTI), indicates that only 46.9 percent of Filipinos used the

[8] Philippine News Agency (2021, August 30). Pasig village offers free online consultation amid health crisis. *Philippine News Agency.* https://www.pna.gov.ph/articles/1152050

[9] Ochave, R.M.D. (2021, November 11). PHL is the fastest-growing internet economy in Southeast Asia — report. *Business World.* https://www.bworldonline.com/phl-is-the-fastest-growing-internet-economy-in-southeast-asia-report/

[10] Caraballo, M. (2021, October 8). BSP bullish on digital transformation goal. *The Manila Times.* https://www.manilatimes.net/2021/10/08/business/top-business/bsp-bullish-on-digital-transformation-goal/1817509

[11] Asian Development Bank (2021). *Asian economic integration report 2021: Making digital platforms work for Asia and the Pacific.* https://www.adb.org/sites/default/files/publication/674421/asian-economic-integration-report-2021.pdf

[12] p.184, ADB (2021).

[13] World Bank (2020). *Philippines digital economy report 2020: A better normal under COVID-19: Digitalizing the Philippine economy now.* https://openknowledge.worldbank.org/handle/10986/34606

[14] The NICTHS is the first ever-household survey of its kind in the Philippines focusing on ICT use and infrastructure.

Internet.[15] About 57.3 percent of the respondents from urban communities reported using the Internet, while only 36.1 percent of rural respondents did.

This digital divide between urban and rural users was also mirrored in the regional distribution of Internet users. The NICTHS found that Internet penetration was highest in the highly urbanized regions of the National Capital Region (NCR, 66.3%), Region IV-A (60.7%), and Region III (54.1%). On the other hand, Internet use was lowest in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM, 13.2%) and in CARAGA (20.7%).

The latest International Telecommunications Union (ITU) data on Internet penetration reflects a decrease in the proportion of Filipinos using the Internet based on the NICTHS survey results.[16] As the ITU relies on submission of ICT data by state regulators, ITU's Internet penetration report for the Philippines can be seen increasing between 2009 and 2013 then showing negative growth between 2013 and 2019, the first year of the national ICT household survey. Data from previous years was obtained using a different methodology. The table below shows the year-on-year change in Internet penetration in the Philippines based on ITU data:

Table 1. ITU Internet Penetration Data, 2009-2013, 2019

Year	Internet Penetration	Year-on-Year Change
2009	9.0%	+2.8%
2010	25.0%	+16%
2011	29.0%	+4.0%
2012	36.2%	+7.2%
2013	48.1%	+11.9%
2019	46.9%	-1.2%*

Note: * -Change is computed for 2019 versus 2013 data.

The NICTHS also found that Internet use was more common among the unemployed, at 71.3 percent, than the employed, at 45.1 percent. While the survey did not explore possible reasons for this finding, these figures suggest that Internet use for employment- or productivity-related purposes in the Philippines could still be relatively low. This extrapolation is supported by NICTHS data on Internet users' most common activities: social activities/communications (94.2%), access to information (44.0%), and leisure/lifestyle (36.6%), while only a very small minority used the Internet in their professional life (5.8%).[17] While low use of Internet for work could be explained by the timing of the NICTHS, analysis from the Portulans Institute Network Readiness Index (NRI) 2020 seems to support the same observation on Internet use being more for personal rather than income-generating purposes. The Philippines scored poorly on the businesses and governments

[15] Albert, J.R.G., Quimba, F.M.A., Tabuga, A.D., Mirandilla-Santos, M.G., Rosellon, M.A.D., Vizmanos, J.F.V., Cabaero, C.C., & Muñoz, M.S. (2021). Expanded Data Analysis and Policy Research for National ICT Household Survey 2019. *Discussion Paper Series No. 2021-20*. Philippine Institute for Development Studies. https://dict.gov.ph/ictstatistics/wp-content/uploads/2021/08/NICTHS-EDAPR.pdf

[16] The 2019 figure reported by the ITU is based on the result of the NICTHS. For the full data set, see ITU (n.d.). Individuals using the Internet (% of population) – Philippines. *ITU World Telecommunication/ICT Indicators Database.* https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=PH

[17] It should be noted that the NICTHS was conducted pre-COVID-19 lockdown restrictions, which began to be imposed in March 2020.

sub-pillars of the NRI, in part due to the low online presence and ICT uptake of both public and private institutions.[18]

On the demand side, one possible explanation for this phenomenon is the predominantly mobile phone-based nature of Internet use in the Philippines. The NICTHS found that 85% of all users primarily used mobile devices to access the Internet. Mobile phones are often conducive to social media use, browsing, watching videos, and online shopping. Productive Internet use tends to be limited to members of the household with a computer, which is still a minority in the Philippines, comprising only 23.3 percent of the NICTHS respondents.[19]

The proportion of households with an Internet connection totaled 17.7 percent only, according to the NICTHS. Households with Internet connectivity were most common in highly urbanized regions such as NCR, Region IV-A and III. A notable exception is the Cordillera Administrative Region (CAR) which recorded the second-most connected region on a per-household basis, at 29.8 percent. On the other end of the spectrum, 95.5 percent of all households in BARMM did not have Internet connectivity. Similarly, more than 90 percent of households Regions IX, X, IV-B, and V remained without an Internet connection.

Device availability does not seem to be the primary bottleneck to Internet connectivity in the country. ITU data shows that there were 154.8 mobile subscriptions per 100 people as of 2019.[20] Meanwhile, the GSM Association's 2021 Mobile Economy Asia Pacific report found that 78 percent of all mobile subscriptions in the country were on smartphones.[21] Even accounting for users with multiple smartphones and subscriptions, and the uneven distribution of subscriptions among Filipinos, there remains a significant gap between those with the ability to access the Internet (e.g., smartphone owners), and the 46.9 percent who actually use the Internet.

There is even less access to and use of fixed or wired Internet connectivity. While 23.3 percent of Filipino households have a computer at home, the proportion of people with fixed broadband was much lower. ITU data shows there were only 5.5 fixed broadband subscriptions per 100 people in the Philippines in 2019.[22]

Barangay-level data suggests that poor Internet access in the Philippines is a supply side constraint. While 92.1 percent of all barangays had a cellphone signal, only 60.6 percent reported having 4G, and only 29.6 percent had 3G. [23] This meant that other barangays had to make do with the older 2G technology, which is not suited for the bandwidth requirements of content today. Similarly, only 36.3 percent of barangays had a telecommunications tower and 12.2 percent had access to a free Wi-Fi site, whether publicly or privately operated.

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[18] Dutta, S. & Lanvin, B. (2020). *The network readiness index 2020: Accelerating digital transformation in a post-COVID global economy.* Portulans Institute. https://networkreadinessindex.org/wp-content/uploads/2020/10/NRI-2020-Final-Report-October2020.pdf

[19] Albert et. al. (2021).

[20] ITU (n.d.). Mobile cellular subscriptions (per 100 people) - Philippines. *ITU World Telecommunication/ICT Indicators Database.* https://data.worldbank.org/indicator/IT.CEL.SETS.P2?locations=PH

[21] GSM Association (2021). *The mobile economy Asia Pacific 2021*. https://www.gsma.com/mobileeconomy/wp-content/uploads/2021/08/GSMA_ME_APAC_2021_Web_Singles.pdf

[22] ITU (n.d.). Fixed broadband subscriptions (per 100 people) – Philippines. *ITU World Telecommunication/ICT Indicators Database.* https://data.worldbank.org/indicator/IT.NET.BBND.P2?locations=PH

[23] Department of Information and Communications Technology (2019). *National ICT Household Survey 2019*. As cited in Mirandilla-Santos, M.G. (2021 September). Bridging the digital infrastructure gap: Policy options for connecting Filipinos. *PIDS Policy Notes* 2021 (07). PIDS. https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidspn2107.pdf

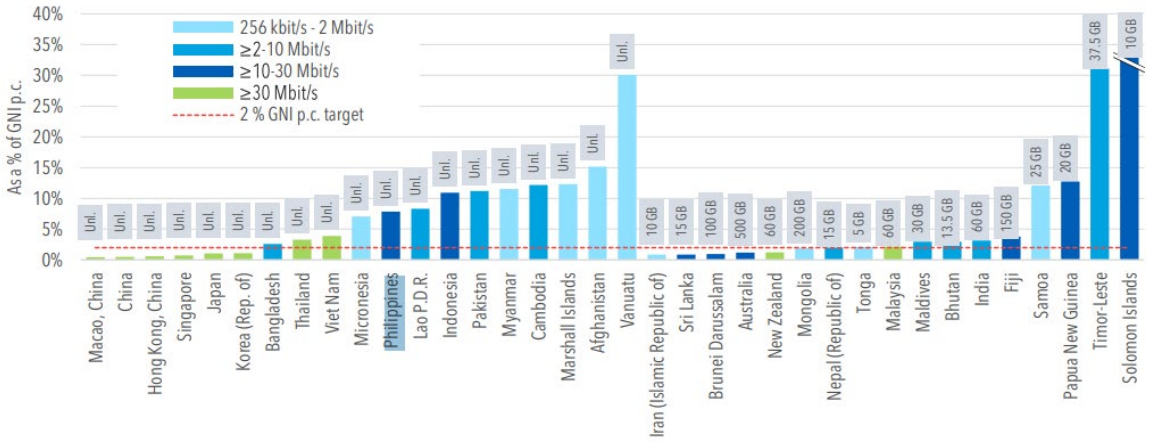
While a high proportion of barangays (79.6%) reported having an Internet service provider (ISP) in their community, only 28.8 percent of barangays reported having access to a fiber optic cable (FOC) network, and primarily from the urban areas. It should be noted, however, that the NICTHS reported on the large ISPs only and did not include cable operators, which are the only other entities allowed to own and operate wired infrastructure.

Affordability

Broadband affordability is a significant constraint to Internet access in the Philippines. The Alliance for Affordable Internet (A4AI)[24] set a new target from '1 to 2' (i.e., 1GB of broadband not to cose more than 2% of average monthly income) to 'Journey from 1 to 5' (i.e., "the cost of 5GB of broadband, both mobile and fixed, should not be more than 2% of the average monthly income by 2026").[25]

By this threshold, both fixed and mobile broadband remain unaffordable in the Philippines. ITU data shows that 5 GB of fixed broadband in the country stands at 7.85 percent of gross national income (GNI) per capita as of 2020, or almost four times A4AI's affordability threshold. Indeed, fixed broadband subscription in the country remains "above the 2 per cent threshold even for the top 10 per cent of consumers in the Philippines.[26]" Among its peers in the ASEAN sub-region, fixed broadband in the Philippines is less expensive only compared to Lao P.D.R., Indonesia, Myanmar, and Cambodia.

Figure 1. Fixed broadband prices as a percentage of GNI p.c., speeds and allowances, Asia and the Pacific, 2020



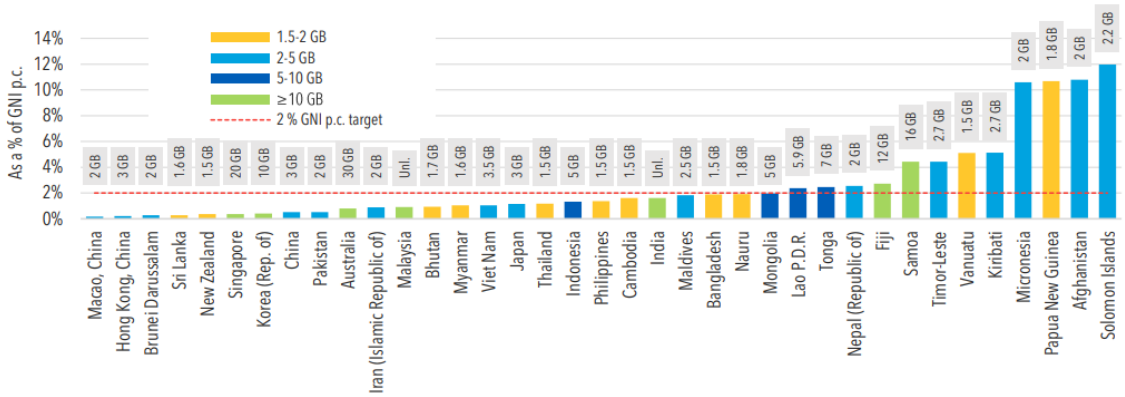
Source: Vertesy et. al. (2021), p. 26.

While mobile broadband is less expensive than fixed in the Philippines, it falls short of the 1 for 5 affordability target. A basic mobile broadband package costs 1.36 percent of GNI p.c., nominally below the 2 percent cost threshold.[27] However, Philippine mobile broadband suffers when it

[24] A4AI is a civil society advocacy coalition supported by the World Wide Web Foundation, and whose affordability targets have previously been adopted by the United Nations via the ITU.
[25] Alliance for Affordable Internet (2021). *Affordable Internet – Journey from 1 to 5*. https://a4ai.org/affordable-internet-journey-from-1-to-5/
[26] p.48, Vertesy, D., Geiger, T., & Schaaper, M. (2021). *Measuring digital development: ICT price trends 2020*. ITU Publications. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2020/ITU_ICTPriceTrends_2020.pdf
[27] Vertesy et. al. (202).

comes to data allocation, with only 1.5 GB of data. In other words, a mobile subscriber consuming 5 GB of data per month will still have to spend around 4.5 percent of GNI p.c. – or more than twice the acceptable cost. This is increasingly relevant in a COVID-19 world where data-hungry applications such as video conferencing and streaming are much more common. Indeed, on a cost-per-GB basis, the Philippines is the second-most expensive in ASEAN, behind only Cambodia.

Figure 2. Mobile broadband prices as a percentage of GNI p.c., and allowances, Asia and the Pacific, 2020



Note: Height of bars indicate the price of a mobile broadband basket as a percentage of monthly GNI per capita. Labels above bars and bar colours indicate the data allowance in GB. Unl. = unlimited data allowance.
Source: ITU and A4AI.

Source: Vertesy et. al. (2021), p. 16.

Globally, the 2020 edition of A4AI's affordability report ranks the Philippines 37th out of 72 countries, falling 9 places compared to 2019. The Philippines scored particularly poorly on A4AI's infrastructure sub-index, once again suggesting that the country's connectivity woes are primarily a problem in the supply side. The same report also suggests that policies aimed at improving Internet infrastructure are critical to making broadband more affordable.[28]

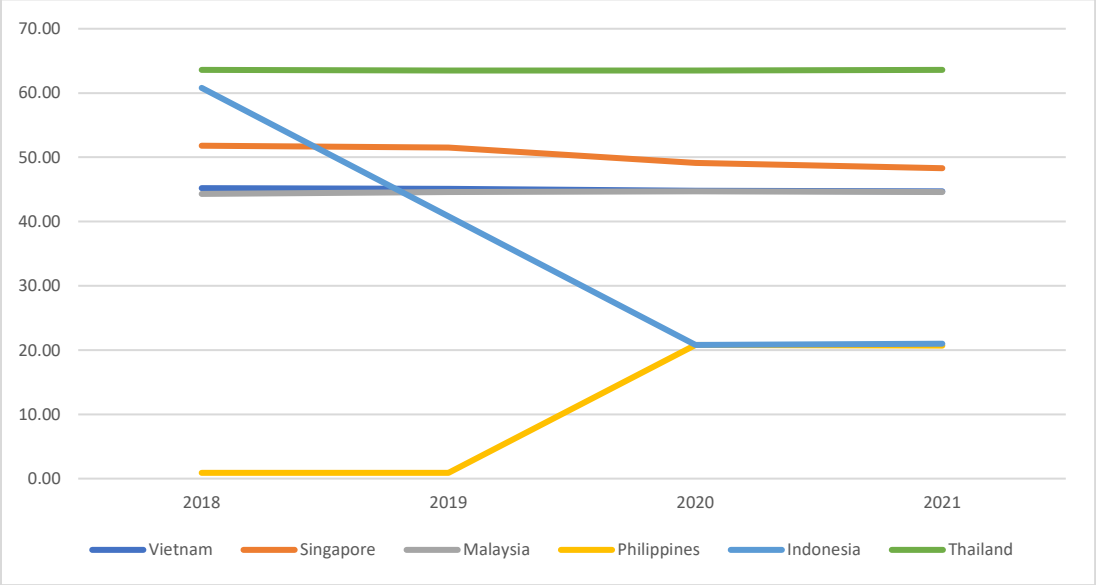
Another measure of broadband affordability is provided by the Economist Intelligence Unit's Inclusive Internet Index, commissioned by Facebook. The Index measures affordability alongside four other categories of indicators that contribute to a strong environment for "the adoption and productive use of the Internet.[29]" In assessing affordability, the Index considers not only the cost

[28] A4AI (2020). *2020 affordability report.* https://a4ai.org/affordability-report/report/2020/
[29] Economist Intelligence Unit (2021a). *The Inclusive Internet Index 2021: Methodology report.* The Economist. https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-methodology.pdf

of subscriptions and devices relative to income, but also the presence of initiatives to promote access, and the level of market competition among broadband service providers.

It is in the area of competition that the Philippines suffers the most, with the 2021 Index describing the country as among the region's weaker economies due to a "weak wireless operators' market and outdated broadband buildout initiatives.[30]" In fact, despite a substantial increase in market competition reflected in the Index's competitiveness scores for 2020 and 2021, the Philippines remains at 93rd place out of 120 countries. By the Index's assessment, the Philippines has one of the least competitive broadband sectors in the world, and in last place in the Southeast Asia region.

Figure 3. EUI Inclusive Internet Index Competitiveness Score (0-100, higher is better)



Source: Author's visualization, based on historical EIU Inclusive Internet Index Competitiveness Scores.[31]

Out of a highest possible score of 100, the Philippines scored an abysmal 0.9 for competitiveness in 2018 and 2019, some of the lowest scores globally in the history of the index. The Philippines' score improved to 20.8 and 21.0 for 2020 and 2021, respectively – but which still puts the Philippines behind the rest of the region in market competitiveness. Lack of competition has dragged down the country's overall performance in the affordability category of the Index.

The Index also provides Herfindahl-Hirschman Index (HHI) scores for each country, a measure of the level of market concentration in a sector. In the HHI system, a score between 1,500 and 2,500 describes a moderately concentrated market, while a score above 2,500 describes a highly concentrated market.[32] The Inclusive Internet Index uses a slightly modified system of categorizing countries using HHI scores, with countries scoring below 3,000 being fully

[30] Economist Intelligence Unit (2021b). Philippines country result. *The Inclusive Internet Index 2021.* https://theinclusiveinternet.eiu.com/explore/countries/PH/

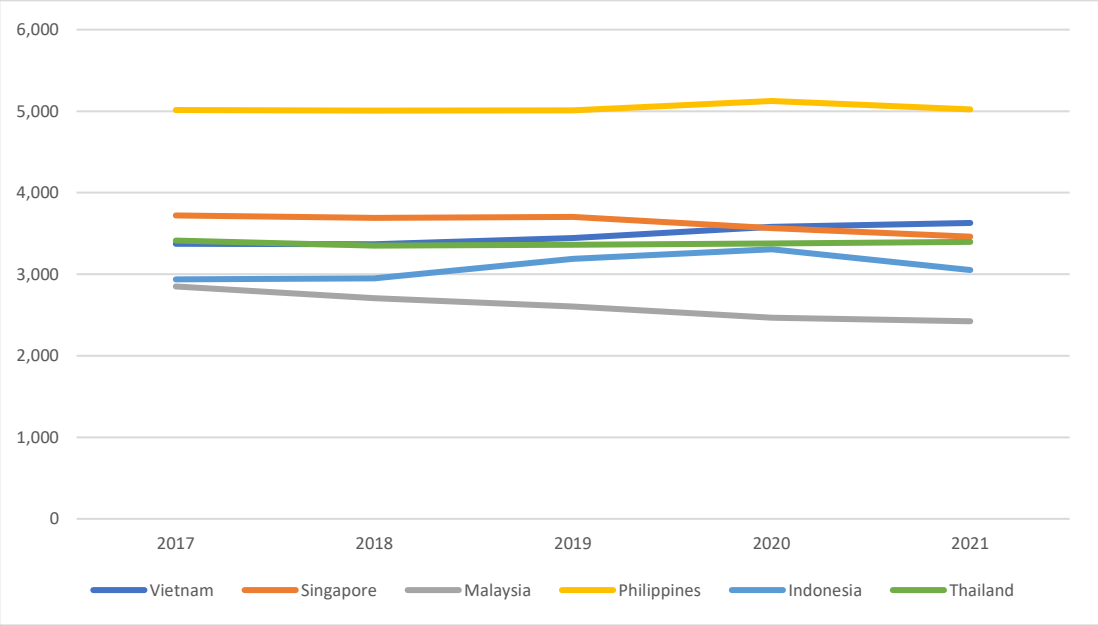
[31] The EIU Inclusive Internet Index dataset is publicly available here: https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-index-data.xlsm

[32] DOJ Anti-Trust Division (2018, July 31). *Herfindahl-Hirschman Index.* United States Department of Justice. https://www.justice.gov/atr/herfindahl-hirschman-index

competitive, between 3,000 and 4,000 as moderately competitive, and scores above 4,000 as uncompetitive, equivalent to a score of zero out of 100 on its competitiveness indicator.

In the mobile segment, the Philippines is the only country with HHI scores above 4,000, making it the least competitive country in the region for the past five years. In fact, with a 2021 mobile HHI score of 5,022, the Philippines fared worse not only compared to other middle-income countries such as Malaysia, Vietnam, Indonesia, and Thailand, but also compared to lower-income countries such as Myanmar (2021 HHI at 2,744), Cambodia (2021 HHI at 3,361), and Laos (2021 HHI at 3,766).

Figure 4. HHI Scores, Mobile Broadband (0-10,000, lower is better)



Source: Author's visualization, based on historical EIU Inclusive Internet Index Competitiveness Scores.

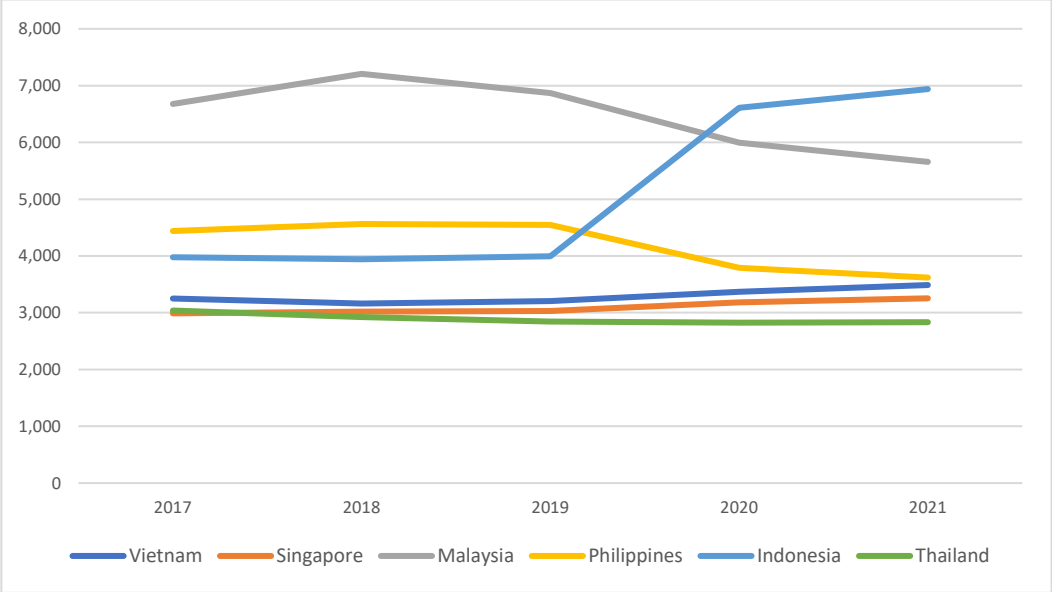
Globally, the Philippines ranked 104th out of 120 countries for mobile competitiveness, and at second to last place in the entire Asia-Pacific region, performing better only compared to Papua New Guinea. The highly concentrated nature of the mobile broadband market in the Philippines has likely contributed to the poor affordability of broadband overall, as over 95 percent of Filipinos access the Internet via mobile devices. With Dito Telecommunity commencing operations in 2021, it remains to be seen whether subscribers' shift to the new player will have a significant impact on market concentration in the mobile space.[33]

For fixed broadband, meanwhile, the Philippines has seen one of the biggest improvements in HHI scores in Southeast Asia, significantly beating out Malaysia and Indonesia, and on trend to close the gap with Vietnam, Singapore, and Thailand. This means that among fixed (predominantly wired[34]) Internet subscriptions, the level of competition has markedly improved, a trend discussed further in Section 2 of this chapter. The improvements in Philippine fixed

[33] The Inclusive Internet Index's 2021 assessment for mobile is based on Q2 2020 data, meaning it does not yet measure the impact of Dito Telecommunity's commencement of operations on market competition.
[34] The Inclusive Internet Index considers the following technologies together for the fixed segment: fiber, DSL, cable, non-cellular fixed wireless (satellite, WiMax, and others), and other technologies such as broadband over powerline.

broadband competition can be attributed to the rapid expansion of fixed broadband service providers, such as Converge ICT, Sky Broadband, Radius, and cable broadband operators, particularly during the pandemic.[35] Unfortunately, however, fixed connections represent a small minority of the total broadband market in the Philippines, such that competition in the mobile space is the primary determinant of competition in the overall sector. As such the Philippines' good performance in fixed broadband competition had little impact on the Index's overall assessment of Internet competitiveness in the country.

Figure 5. HHI Scores, Fixed Broadband (0-10,000, lower is better)



Source: Author's visualization, based on historical EIU Inclusive Internet Index Competitiveness Scores.

Quality of Service

Internet quality refers to a broad range of technical metrics, including jitter, speed, and latency, that capture how 'smooth' or 'fast' a connection is. Most commonly, however, quality is measured in terms of download speed, in megabits per second (Mbps).

The pandemic forced people to embrace online platforms, such as virtual classrooms, virtual meeting, digital banking, and e-commerce platforms. While virtual classroom and virtual meeting are actually video conferencing tools where participants engage with each other, video become the main vehicle for the above areas. For e-commerce, online live shopping has also become a trend in retailing, such as Taobao Live in China and Grip in South Korea, which are actually video businesses. So the resolution of video decided the quality of digitalization.

While these digital solutions did not necessarily require high bandwidth, they did require better performance metrics that were not in demand before, such as higher upload speeds.[36] The main challenge was also using these online platforms in a household of several members all at the same time, for online activities.

[35] Converge ICT reported net income of nearly PHP 5.2 billion as of end September 2021 or a 136-percent growth from its net earnings a year ago. The company attributed the increase to the "continued strong growth of [its] subscriber base and sustained recovery of [its] business segement, led by SMEs. https://corporate.convergeict.com/news/converge-reports-industry-leading-record-earnings-with-9-month-net-income-surging-136-yoy-to-p5-2b/.

[36] Zoom, for example, requires 2.0 Mbps up and 4.0 Mbps down for dual screen. See https://support.zoom.us/hc/en-us/articles/204003179-System-requirements-for-Zoom-Rooms.

There is no official measurement tool for broadband quality of service in the Philippines. Hence, the country relies on third-party commercial Internet data analytics companies, such as Ookla and Opensignal.

Of the 138 countries for which Ookla has data on mobile broadband download speeds, the Philippines ranked 72nd globally and 5th in ASEAN as of September 2021. With an average download speed of 35.03 Mbps and an average upload speed of 8.54 Mbps, this represented a significant year-on-year improvement, from an average of 16.89 and 5.57 Mbps for download and upload, respectively. This also represents a jump of almost 50 places globally compared to September 2020, from 120th place.

Table 2. Average mobile broadband download speeds in select ASEAN countries (Ookla, September 2021)

Country	Average Mobile Download Speed	ASEAN Rank
Singapore	105.51 Mbps	1st
Brunei	67.32 Mbps	2nd
Thailand	56.9 Mbps	3rd
Vietnam	43.32 Mbps	4th
Philippines	35.03 Mbps	5th
Malaysia	31.34 Mbps	6th
Lao PDR	30.93 Mbps	7th
Myanmar	28.19 Mbps	8th
Cambodia	23.75 Mbps	9th
Indonesia	23.12 Mbps	10th

Source: Ookla (2021, September). Global speeds September 2021. *Speedtest Global Index*. https://www.speedtest.net/global-index

As for fixed broadband download speeds, Ookla ranked the Philippines 64th globally and 5th in the ASEAN region as of September 2021. This represented an average download speed of 71.85 Mbps, and average upload of 70.32 Mbps. A year before, the Philippines ranked 106th globally, with average speeds of 26.08 and 26.07 Mbps for download and upload, respectively.

Table 3. Average fixed broadband download speeds in select ASEAN countries (Ookla, September 2021)

Country	Average Fixed Download Speed	ASEAN Rank
Singapore	255.83 Mbps	1st
Thailand	225.17 Mbps	2nd
Malaysia	107.55 Mbps	3rd
Vietnam	78.34 Mbps	4th
Philippines	71.85 Mbps	5th

Lao PDR	48.16 Mbps	6th
Brunei	34.59 Mbps	7th
Cambodia	28.32 Mbps	8th
Indonesia	27.83 Mbps	9th
Myanmar	20.69 Mbps	10th

From Ookla (2021, September).

It should be noted, however, that results on Ookla's index may not accurately reflect the general quality of Internet in a country. The index is based on the results of voluntary tests conducted by users on Ookla's speedtest.net website. Sample sizes vary for each country, with only "670 unique user results for mobile and 3333 for fixed broadband" per month necessary for a result to be displayed on the index. Furthermore, speed itself is not the only factor affecting perceptions of Internet quality; different applications may rely more heavily on other technical metrics such as latency or packet loss to deliver a smooth experience.[37]

As such the results of Ookla's index are more useful for tracking improvements in a country's Internet quality, than they are for strictly comparing inter-country performance. Based on past results, fixed broadband download speeds in the country have improved by almost 800 percent since July 2016, and mobile download speeds improved by 353 percent during the same period.[38]

To gain a clearer picture of the state of Philippine Internet quality it is helpful to look at findings from other sources as well. Opensignal's 2021 Mobile Network Experience Report found that mobile download speeds were consistently faster on PLDT-Smart's network, with an average of 14.8 Mbps, compared to Globe's 8.5 Mbps.[39] Similarly, mobile upload speeds were faster for Smart, at 3.8 Mbps versus Globe's 2.3 Mbps. On the other hand, measurements from recent entrant Dito's subscribers in Metro Manila conducted between May and August 2021 showed that the network provided download speeds either around or below the average of all operators – between 17 and 20 Mbps.[40] Dito's upload speeds were better than average in the capital region, between 7 and 8 Mbps.

With the digital shift apparent in the areas of commerce, health, education and in-home entertainment , Filipino users are spending more time on videos and videos are among their leading online activities.

Opensignal's Video experience quantifies the quality of video streamed to mobile devices by measuring real-world video streams over an operator's networks. Filipino operators to place in the Fair (40-55) and Poor category (under 40). Poor ratings means that Filipino on their networks did not have a good experience even for lower resolution videos across all providers. Very slow loading times and frequent stalling were common.41

[37] Gonsalves, T.A., & Bharadwaj, A. (2009, August). *Comparison of AT-Tester with Other Popular Testers for Quality of Service Experience (QoSE) of an Internet Connection*. LIRNEasia. http://lirneasia.net/wp-content/uploads/2009/09/AT-TesterComparison.pdf

[38] Cordero, T. 2021. DICT chief Honasan boasts improvement in Philippine internet speeds. *GMA News Online*. https://www.gmanetwork.com/news/news/nation/802904/dict-chief-honasan-boasts-improvement-in-philippine-internet-speeds/story/ (accessed 12 September 2021).

[39] Opensignal (2021, April). *Mobile network experience report April 2021: Philippines.* https://www.opensignal.com/reports/2021/04/philippines/mobile-network-experience

[40] Fenwick, S. (2021, August 31). A first look at DITO's mobile network experience. *Opensignal*. https://www.opensignal.com/2021/08/31/a-first-look-at-ditos-mobile-network-experience

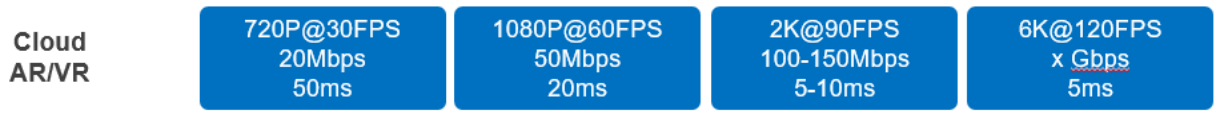
[41] Philippines mobile network experience report, October 2022, opensignal

Figure: Video Experience in Philippines

YouTube provides background information on connection speeds required by various video sources. This is one of the input elements for determining broadband connectivity. The speed of 10 Mbps or higher can provide users with high-definition video experience on mobile screens. Meanwhile, for 4K video content on large screens, the download rate requirements increase to 20 to 50 Mbps[42]

- 4K at 60fps: 20,000 - 51,000 Kbps
- 4K at 30fps: 13,000 - 34,000 Kbps
- 1440p at 60fps: 9,000 - 18,000 Kbps
- 1440p at 30fps: 6,000 - 13,000 Kbps
- 1080p at 60fps: 4,500 - 9,000 Kbps
- 1080p at 30fps: 3,000 - 6,000 Kbps
- 720 at 60fps: 2,250 - 6,000 Kbps
- 720p: 1,500 - 4,000 Kbps
- 480p: 500 - 2,000 Kbps
- 360p: 400 - 1,000 Kbps
- 240p: 300 - 700 Kbps

AR and VR are among services that 5G's capabilities will make more attractive to end users because of its lower latency as well as its greater capacity and faster speeds. South Korea's LGU+ is seeing AR and VR services drive usage on 5G networks. For AR/VR, the downlink rate requirement increase to 50-100Mbps.



The video experience of most users in the Philippines is lower than 720p. However, in Thailand and Malaysia, the video experience of most users is 720p or even 1080p.

	Philippines	Thailand	Malaysia	Cambodia
Online duration (hour per day)	10.45	9.1	9.17	7.06

[42] https://restream.io/integrations/youtube/best-streaming-settings-for-youtube-live/

SD video proportion ⩾ 720p	31%	70%	66%	26%
HD video ratio ⩾ 1080p	13%	33%	29%	10%

To make Philippine users feel better, the network need support 1080p and 4K video now and AR/VR in future. The means that in near term the connect downlink speed should not less than 10Mbps and in the long term, the downlink speed should reach 100Mbps.

2. Philippines digital infrastructure deployment and investment

The relative underdevelopment of the Philippines' ICT infrastructure has hampered Internet inclusion in the country. The Economist Intelligence Unit's Inclusive Internet Index 2021, for example, notes that the Philippines is among the weakest in the Asia-Pacific region, ranking 18th out of 27 countries, due to poor competition and "outdated broadband buildout initiatives.[43]" The WB's Philippine Digital Economy Report (2020) observes:

- The country's limited digital infrastructure has generated a digital divide, contributing to unequal access to Internet-enabled services.
- The growth of digital infrastructure is hindered by low competition and regulatory constraints.
- Reduction of the digital divide in the Philippines entails lowering regulatory constraints and barriers to market entry

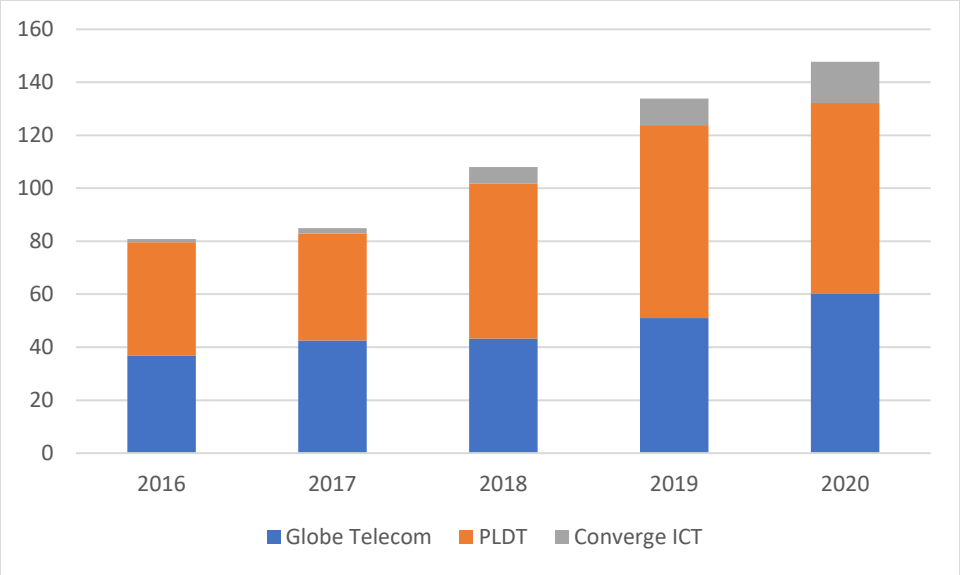
A significant challenge therefore is identifying which parts or segments of the Philippine ICT infrastructure need the most focus, particularly in the form of policy intervention.

IMD's World Digital Competitiveness Report for 2021 ranks the Philippines 40th out of 64 countries worldwide on the Capital sub-factor, which is significantly higher than its rank on the Regulatory Framework sub-factor of 62nd globally.[44] This low score implies the lack of responsive policies and regulations, which would have allowed for the efficient allocation of capital for investing in ICT infrastructure.

The Philippine telecommunications sector's capital expenditures (capex) had a compound annual growth rate of around 30 percent between 2017 and 2019.[45] This increase in capex stands in stark contrast to Internet penetration growth during the same period, which seems to have regressed or remained stagnant between 2013 and 2019. As of 2020, the total capex of Globe, PLDT, and Converge ICT, a fast-growing fiber broadband provider, stood at PHP 148 billion; this figure is only expected to increase by 22% to 180 billion pesos by end-2021. Despite the pandemic-induced global economic slowdown reducing the sector's YoY capex growth in 2020 to just 10%, average capex growth for the period 2018-2020 stood at 21%.

Figure 6. Capex of Major Philippine Telecom Companies (in billion pesos)

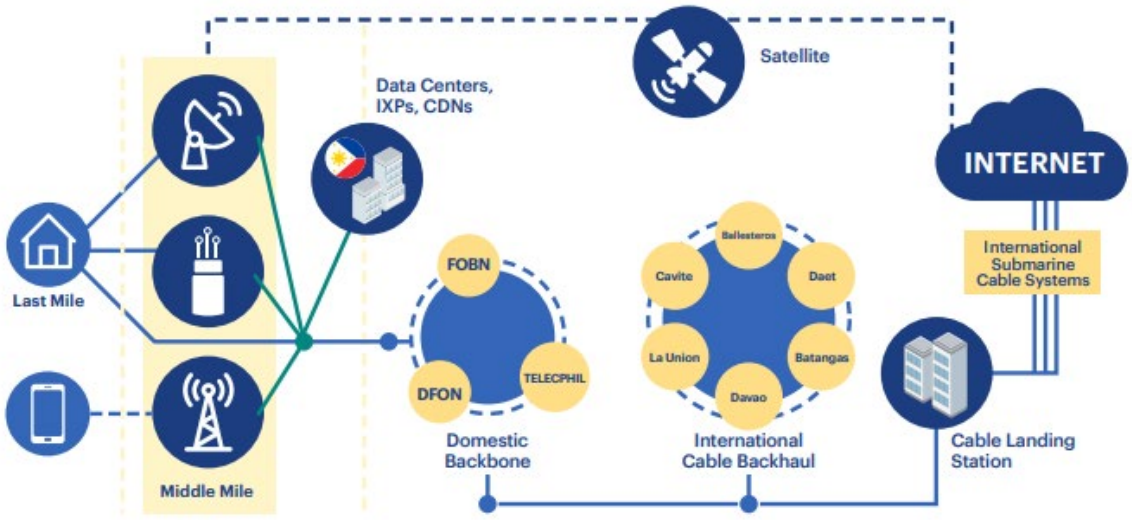
[43] Economist Intelligence Unit. 2021. *The Inclusive Internet Index – Philippines.* https://theinclusiveinternet.eiu.com/explore/countries/PH/
[44] IMD (2021). Digital competitiveness ranking – 2021. *IMD world competitiveness online.* https://worldcompetitiveness.imd.org/countryprofile/PH/digital
[45] Ang, A.J. (2020, August 7). PLDT, Globe seen to hike 2021 investments amid looming competition. *Business World.* https://www.bworldonline.com/pldt-globe-seen-to-hike-2021-investments-amid-looming-competition/



Source: Based on publicly available annual financial statements (SEC Form 17-A) and press releases (for pre-2020 Converge ICT figures) for the period 2016-2020.

The Philippine telecoms sector, however, is far from monolithic. It is composed of multiple segments or sub-sectors, each subject to particular regulations, contributing to varying levels of investment and development. Investment in each sub-sector has varying impacts on improving Internet connectivity; the same dollar-figure investment in one segment can be significantly better for connecting more Filipinos than if it were spent on another segment. This emphasizes the need for efficient allocation of capital, supported by market-enabling policy.

Figure 7. Philippine Information Infrastructure



2.1. International submarine cable systems and cable landing stations

Most of the Philippines' international bandwidth travels through systems of undersea fiber optic cables that connect countries or multiple countries.[46] Known as *international submarine cables*, these span thousands of kilometers and are normally owned by consortia composed of telecom operators and other big users of data. Notable non-telco consortium members include Facebook, Google, and Amazon, to name a few.

An entity looking to send and receive data to and from overseas, who does not have a stake in their own submarine cable, will pay a toll to course their traffic through international submarine cables. This toll constitutes the *price of international bandwidth.* There is no standardized rate for international bandwidth; rather, rates are negotiated between a consortium and the entity looking to *lease capacity* on the submarine cable.[47] Generally speaking, the more capacity an entity is looking to lease, the better the rate they can get from submarine cable owners.

International bandwidth is one of the big cost drivers of Internet connectivity, and one of the main areas where players can benefit from economies of scale. That said, the price of international bandwidth has been steadily falling in recent years. However, it is actually cheaper to send traffic overseas than it is to course data from the Philippine countryside to Metro Manila.[48]

This complication is due to the limited availability of backhaul: for service providers without their own national fiber networks, around 75% of the cost of international bandwidth comes from distributing the landed bandwidth throughout the Philippines.[49] International bandwidth providers, for their part, must enter into commercial agreements with enfranchised national telecommunications entities to sell bandwidth to Philippine customers. A sample breakdown of the cost of international bandwidth is provided below.

Table 4. Cost of Connecting from PH to HK at 10Gb

Backhaul originating in the Philippines	Submarine Cable	Backhaul terminating in Hong Kong
USD 3 million	USD 500-800k	USD 150k
75.9%	20.3%	3.8%

Source: Mirandilla-Santos (2016).

In practical terms, this means it is more expensive for smaller service providers to course bandwidth from aggregation points in metropolitan areas like Cebu and Manila to the countryside, than it is to get bandwidth from abroad to Philippine shores. This is despite international bandwidth having to travel thousands of trans-oceanic kilometers, and local distribution traveling distances an order of magnitude smaller.

[46] Albert, J.R.G. et. al. (2021).
[47] Dabao, J. (Personal communication, 2021, October 21).
[48] Dabao, J. (2021).
[49] Mirandilla-Santos, M.G. (2016). Philippine broadband: A policy brief. *Arangkada Philippines Policy Brief No.4: February 2016.* http://www.investphilippines.info/arangkada/wp-content/uploads/2016/02/BROADBAND-POLICY-BRIEF-as-printed.pdf

Table 5. Wholesale price of business-grade bandwidth (1 Gbps)

Country/Point of Origin	Price per Mbps (USD)
USA	0.35 to 2
Hong Kong	1.50 to 6
Australia/New Zealand	6 to 9
Manila	18 to 45
Cebu	25 to 50

Source: Mirandilla-Santos (2016).

For any given submarine cable to be of use, it must connect to a facility on shore called a *cable landing station.* Landing stations serve as termination points of submarine cables (although a cable normally has multiple termination points in different countries) and house equipment to connect the local network to the cable. These stations are therefore also known as *international gateway facilities* (IGFs).

The concept of IGFs was originally used for international long distance switched voice (landline) communications. Republic Act No. 7925 or the Public Telecommunications Act of 1995 restricted the ownership and operation of IGFs to telcos operating local exchange services, and who through their IGFs would serve as international landline telephone carriers. At the time, IGFs were used strictly for analog telecom (primarily switched telephony) services, hence the restriction on their ownership to telcos. The application of this legacy law to modern communications networks has led to today's situation where telcos remain the exclusive owners and operators of IGFs, despite most of the traffic passing through them being used for digital broadband services, and not the switched telephone traffic contemplated by RA 7925.

It should be noted that some international gateway facilities do not involve cables at all. Instead, they use *satellites* to relay information to some other point on the planet. A discussion of broadband satellites is provided further into this section, including its applications, and its benefits and drawbacks compared to terrestrial (i.e., cable-supported) networks. Because of their location, international bandwidth rates are generally more expensive, and capacity much more limited on satellite networks.

BOX – Data Centers and Keeping Traffic Local

Not all Internet traffic needs to travel through international bandwidth. In many cases, users can access content located in the domestic network and stored in what are called *data centers*. Data centers are banks of computers that run websites, host multimedia, or provide users with services over an Internet connection. In some cases, popular foreign content is stored or *cached* in local data centers to reduce the need for international bandwidth to serve the content which is otherwise hosted abroad. This helps keep the overall costs of connectivity down. Since local data centers are also physically closer to users and have direct connections to core networks, they are also a faster way of serving content to consumers.

The Philippines still has an emerging data center industry. The World Economic Forum's 2020 Network Readiness Index ranked the Philippines 98th out of 134 countries worldwide for secure Internet server density. There are opportunities for data centers in the horizon. The local data center market is already valued at USD 280 million, spread across 20 unique data center properties mainly in Manila, Cebu, and Mindanao, and with an additional USD 535 million in investments expected between 2021 and 2026. With the Internet of Things expected to increase demand for data processing even further, data center providers are poised to cater to the surge in local traffic.

The government, through the Department of Information and Communications Technology, is establishing a central government data center (GDC) under the Integrated Government Philippines (iGovPhil) program. With more public services shifting online, the government sees the establishment of the GDC as a way to go online more efficiently and securely. As more activities converge online, public and private data centers will become even more critical parts of the Philippine digital infrastructure.

Sources:

Hani, A. (2021, October 28). The Philippines Pushing for More Data Centres. *OpenGovAsia.* https://opengovasia.com/the-philippines-pushing-for-more-data-centres/

BusinessWire (2021, September 22). *Philippines Data Center Market Investment Analysis & Growth Opportunities Report 2021-2026 - ResearchAndMarkets.com.* https://www.businesswire.com/news/home/20210922005645/en/Philippines-Data-Center-Market-Investment-Analysis-Growth-Opportunities-Report-2021-2026---ResearchAndMarkets.com

As of 2021, the Philippines is connected to nine (9) international submarine cable systems, landing in ten (10) cable landing stations. Eight (8) cables terminate in Luzon with only one (1) terminating elsewhere, in Mindanao. A further five (5) cable systems are expected to launch in the near- and medium-term, connecting to at least seven (7) landing stations across the country.

Below is a summary of the latest available information on the Philippines' international submarine cables.

Table 6. International submarine cables and landing stations in the Philippines

Cable System	Route (km)	Landing Station	Host	System Capacity (Gbps)	
				Lit Capacity	Designed Total Capacity
In Service					
1. SEA-ME-WE-3 (Sep 1999)	39,000	Batangas	PLDT	133	1,100
2. EAC-C2C (Nov 2002)	36,500	Cavite & Batangas	Telstra	3,260	30,550
3. AAG (Nov 2009)	20,318	La Union	PLDT	5,162	11,000
4. APCN-2 (Dec 2001)	19,000	Batangas	PLDT	7,360	13,200
5. SJC (Jun 2013)	8,900	Batangas	Globe	1,200	28,000
6. ASE (Aug 2012)	7,800	Camarines Norte	PLDT	1,580	4,900
7. TGN-IA (Mar 2009)	6,700	Cagayan	Globe	1,900	9,600
8. SEA-US (Aug 2017)	15,000	Davao	Globe		20,000
9. Jupiter (2020)	14,557	Camarines Norte	PLDT		60,000
10. National Broadband Plan Resiliency Route		La Union & Baler	DICT, Bases Conversion	100[50]	

[50] Expected capacity by 2022. From Mercurio, R. (2021, September 28). DICT launches National Broadband Program Resiliency Route. *The Philippine Star.* https://www.philstar.com/business/2021/09/28/2130104/dict-launches-national-broadband-program-resiliency-route

			Development Authority (BCDA)		
Planned					
10. PLCN (no date)	12,791	La Union & Baler	DICT, Bases Conversion Development Authority (BCDA)		144,000
11. CAP-1 (Q4 2022)	12,000	Ilocos Norte	Amazon, Facebook		108,000
12. ADC (Q4 2022)	9,400	Batangas	PLDT		140,000
13. Apricot (2024)	12,000	Locations in Luzon and Mindanao	PLDT		190,000
14. Bifrost (2024)	15,000	Davao	Converge ICT		180,000 estimated (15,000 controlled by Converge)[51]

Source: Telegeography, Submarine Cable Network, the Philippine National Broadband Plan, as cited in Albert, J.R.G. et. al. (2021), with edits from the author, and DICT (2021, September 28).[52]

It should be noted that the DICT has also activated the National Broadband Plan Resiliency Route, connecting the Philippines to Singapore. The route is intended to serve as redundant back-up to the PLCN cable should the latter encounter any issues.[53] Part of Phase 1 of the DICT's National Broadband Program, which would see the construction of a government-owned broadband network, the cable ensures international connectivity for government offices and other users in Metro Manila, Metro Cebu, and Metro Davao.

While the government-owned network is primarily intended to support GovNet, the online platform for connecting agencies and providing public services online, the DICT has stated that it is also planning to "provide Filipinos faster, wider-reaching, and more affordable Internet services.[54]" This involves the construction of provincial broadband networks that will be connected to the government's own core network. To begin with, these provincial networks will deliver bandwidth to "government offices of national government agencies, local government units, state universities and colleges, public schools, rural health units and public hospitals.[55]"

Given the sheer size of the Philippines' population and demand for internet services, there is much room for competition in the international gateways. According to the UNESCAP and the ITU (2018), opening international gateways to competition can have various direct and indirect benefits, such as lower cost of international bandwidth in the country, lower cost of retail broadband services, better quality of service for end users, more content hosted locally, and a more dynamic telecom sector with more diverse players and offers for end users. ESCAP

[51] As a consortium partner, Converge ICT has access to a single full fiber pair, with capacity of up to "15 terabits per second," as stated by Converge CEO Dennis Anthony H. Uy. See Camus, M. (2021, April 22). Converge to tap Bifrost undersea cable system via $100-M deal with Keppel, Facebook. *Inquirer.net*. https://business.inquirer.net/321509/converge-to-tap-bifrost-undersea-cable-system-via-100-m-deal-with-keppel-facebook Total cable system capacity is author's estimate based on Converge's statement of a single fiber pair's capacity, and Bifrost's expected 12-pair space division multiplexing (SDM) fiber. See Submarine Cable Networks (n.d.). *Bifrost*. https://www.submarinenetworks.com/en/systems/trans-pacific/bifrost

[52] DICT (2021, September 28). *DICT accelerates NBP resiliency route build-up.* https://dict.gov.ph/dict-accelerates-nbp-resiliency-route-build-up/

[53] DICT (2021, September 28).

[54] DICT (2021, September 28).

[55] Mercurio, R. (2021, September 28).

economies that introduced competition policies for international gateways also have the best performing broadband markets in terms of fixed and mobile broadband subscription compared to those with partial competition and monopoly (ESCAP, 2018).

2.2 Fiber Optic Cables

From the cable landing stations, bandwidth is distributed throughout the country by *fiber optic cables* or fiber, for short.[56] These fiber cables transmit data using frequencies of light (that is, *optically*) coursed through glass fibers. The fiber used for international cables and for domestic bandwidth distribution are fundamentally the same technology; they differ in purpose, not in operation.

The fiber networks used to distribute bandwidth domestically through the core network. As with international submarine cables, operators who do not have their own domestic backhaul must lease capacity from one of the country's national backbone operators. As of 2021, the Philippines has five backbone network operators:

Table 7. Philippine backbone network operators

Operator	Backbone Network	Backbone Network Length
PLDT	Domestic Fiber Optic Network (DFON)	11,000 km
Globe Telecom	Fiber Optic Backbone Network (FOBN), FOBN-2, and TELECPHIL's National Digital Transmission Network[57]	12,000 km
National Grid Corporation of the Philippines	Private Fiber Optic Network (FON)	6,154 km
Converge ICT	Private Fiber Optic Network (FON)	85,000 km[58]
Dito Telecommunity	Private Fiber Optic Network (FON)	undisclosed[59]

BOX – Other Backbone Technologies

Fiber is the predominant technology for core networks due to its high speed, flexible bandwidth, and reliability. However, fiber deployment can be a challenge. The underground and aerial installation of FOC networks is a huge

[56] Albert, J.R.G. et. al. (2021).

[57] TELECPHIL is a nationwide backbone network run by a consortium of national telcos, including both incumbents PLDT and Globe Telecom. Following Globe's acquisition of TELECPHIL majority owner BAYANTEL in 2015, Globe acquired the controlling interest in the network. For more information, see p.16, Albert, J.R.G. et. al. (2021).

[58] From Converge (2021, October 29). Converge completes P6-billion domestic submarine cable project to connect Visayas, Mindanao to its national fiber backbone. *Converge Corporate News.* https://corporate.convergeict.com/news/converge-completes-p6-billion-domestic-submarine-cable-project-to-connect-visayas-mindanao-to-its-national-fiber-backbone/ Note that this figure likely refers to the total of Converge's national backbone and middle mile networks. Earlier in the year, in May 2021, Converge ICT reportedly had 69,000 km of fiber backbone and distribution network (middle mile). See Abadilla, E.V. (2021, May 11). Converge ICT expands fiber assets. *Manila Bulletin.* https://mb.com.ph/2021/05/11/converge-ict-expands-fiber-assets/

[59] Dito Telecommunity has deployed just over 19,000 km of fiber optic cable in the country as of September 2021. Of this, 953 km are domestic (inter-island) submarine cables, and 18,074 km encompass its terrestrial core and middle mile networks. The portion of this figure pertaining to the core network specifically is not publicly available as of writing. From Amojelar, D.G. (2021, September 9). DITO Telecom to spend P4 billion in undersea cable. *Manila Standard.* https://www.manilastandard.net/business/it-telecom/364531/dito-telecom-to-spend-p4-billion-in-undersea-cable.html

constraint in geographically isolated areas. Fiber is more expensive to deploy in remote or rural areas with difficult terrain, such as across islands, and communities with lower population density.

To avoid these technical and cost hurdles, operators can complement their fiber backbone networks with *wireless backhaul.* This involves using radio spectrum or frequencies (normally in the microwave bands) to transmit data over the air, which can be a cheaper and less cumbersome alternative to deploying fiber. In this approach, a radio or *base station* is connected to the nearest fiber PoP, and another radio deployed in the target location to receive the bandwidth. This effectively extends the range of the core network.

A special exception to the need for a core network connection is by using *satellites*. In this case, a transmitter called a *Very Small Aperture Terminal* (VSAT) can be used to connect to a satellite and transmit data directly to an international network. Using satellites, it is technically possible to circumvent domestic core networks and international submarine cables entirely, connecting directly to a network overseas. However, satellite bandwidth is limited and more expensive compared to fiber, making it an appealing option mainly for areas where fiber deployments are not feasible.

At a PoP, middle mile networks pick up bandwidth using fiber or other alternative technologies. In addition to the telcos' own networks, smaller provincial or community telcos (members of the Philippine Association of Private Telecommunications Companies and known as PAPTELCOs), Internet Service Providers (ISPs), and Cable TV (CATV) operators connect to the middle mile to bring bandwidth to the last mile.[60]

Fiber-as-a-service is now an emerging market. Globe Telecom, for example, launched a new subsidiary in October 2021 aimed at providing fiber deployment services, both for its parent company and to other operators who have increased demand for fiber rollout.[61]

Middle mile networks will ideally use fiber due to their role aggregating and transmitting large amounts of local data traffic. In other instances, however, wireless middle mile (primarily microwave radio) can also be used. Furthermore, it is possible that some areas still see the use of PLDT's and Globe's legacy copper (landline telephone) network assets. It should be noted, however, that fiber middle mile is necessary to support high-bandwidth transmission, including the links to 4G/LTE and 5G cellular sites (discussed further in the next sub-section). Microwave, copper, and satellite middle mile connections are mostly suitable for lower bandwidth requirements.

Recent advancements in satellite technology, particularly the emergence of Low Earth Orbit (LEO) satellite constellations, may mean they can be used for high-bandwidth middle mile connections in the near future.[62] SpaceX's Starlink satellite service, for example, has reportedly been able to serve speeds of up to 222 Mbps downlink and 24 Mbps uplink, suitable for middle

[60] PAPTELCOs refer to small, local telcos (primarily in the countryside) that are members of the Philippine Association of Private Telecommunications Companies Inc. (PAPTELCO). Originally dedicated to the provision of landline telephone services, many of these small operators now also offer Internet services to their subscribers. Similarly, CATV operators have expanded their offerings to include broadband Internet.
Compared to the national telcos, any single PAPTELCO or CATV operator has a relatively small subscriber base. Taken together, however, these small operators represent a substantial number of fixed wired Internet subscriptions. By one estimate, the members of the Philippine Cable and Telecommunications Association (PCTA) alone account for at least two million home Internet connections (from Dabao, J. 2021).

[61] Marasigan, L. (2021, October 21). Globe launches new unit. *Business Mirror.* https://businessmirror.com.ph/2021/10/21/globe-launches-new-unit/

[62] Low Earth Orbit (LEO) satellites sit much closer to earth than traditional Geostationary (GEO) or Medium Earth Orbit (MEO) satellites. The reduced distance allows for faster transmission from ground to space and vice-versa, making them more suitable for critical applications including middle mile service. LEOs are also launched much more frequently, allowing them to rapidly adopt new technologies that increase satellite broadband bandwidth. Both factors combined make LEO-enabled satellite backhaul more attractive for some applications.

mile applications in remote, sparsely populated areas.[63] Growing pains continue to plague the technology as it matures, however, with Starlink's own network often suffering from frequent dropouts due to line of sight and atmospheric interference issues. As satellite and other technologies continue to develop, wired technologies remain the highest capacity and most reliable option in the near-term for most cases.

Indeed, development of wired technology continues in parallel, particularly as operators aim to make the most use of legacy copper networks. Although fiber is preferable for its ability to carry data at high speed across hundreds of kilometers, the copper-based Digital Subscriber Line (DSL) technology has seen improvements that give it near-fiber performance in some applications, potentially making it viable for middle mile and other uses. Through the years, DSL has used increasingly higher frequencies to deliver faster speeds, evolving from ADSL, ADSL2+, VDSL, VDSL2, to the latest technology G.fast, which uses frequencies up to 212 MHz and reaches near-gigabit speeds.[64] That said, copper remains limited by its relatively short range before performance falls off, making it most suitable for relatively small, high-density areas with existing copper networks, as opposed to new deployments.

Finally, fiber is also used in the last mile segment, called *Fiber to The Home* (FTTH), *Fiber to The Premises* (FTTP), or more generally *Fiber to The X* (FTTX).

In recent years, both Globe and PLDT have invested heavily in their FTTX segments, perhaps in response to the selection of Dito as the third major telco in 2018 and Converge ICT's announcement of an ambitious 5-year nationwide rollout plan.[65] Average annual capital spending for the incumbents amounted to 40 percent of revenues, some of the highest in the Asia-Pacific region.[66] Globe, for example, reportedly increased its FTTX investments by 189 percent year-on-year in 2020, translating to 600,000 more FTTX subscribers[67] and a "158% increase in broadband fiber capacity lines as of end September 2020 versus full year 2019.[68]" The operator is reportedly on target to build 1.4 million fiber ports by the end of 2021, compared to 600,000 in 2020 and 50,000 ports in 2019.[69]

PLDT, on the other hand, expanded its fiber network by 31,000 km in 2020.[70] The operator's FTTH business reportedly gained 324,000 customers at the end of Q3 2021, bringing its total fiber

[63] Patel, N. (2021, May 14). Starlink review: Broadband dreams fall to Earth. *The Verge.* https://www.theverge.com/22435030/starlink-satellite-internet-spacex-review

[64] Mirandilla-Santos, M.G., Brewer, J., & Faustino, J. (2018). From analog to digital: Philippine Internet policy and emerging Internet technologies. *The Asia Foundation*. https://asiafoundation.org/wp-content/uploads/2018/10/From-Analog-to-Digital_Philippine-Policy-and-Emerging-Internet-Technologies.pdf

[65] Venzon, C. (2018). Philippine telecoms on offensive as foreign competition looms. *Nikkei Asia.* https://asia.nikkei.com/Asia300/Philippine-telecoms-on-offensive-as-foreign-competition-looms

[66] Camus, M. (2020, November 10). PLDT, Globe capex to remain high in 2021 as competition heats up. *Inquirer.net.* https://business.inquirer.net/311424/pldt-globe-capex-to-remain-high-in-2021-as-competition-heats-up

[67] Globe Telecom (2021, August 5). *Quarterly Results Press Release.* https://www.globe.com.ph/content/dam/globe/brie/About-us/investor-relations/documents/SEC-PSE-Disclosures/2021/Quarterly/Quarterly-Results-Press-Release/GLO-2Q21-Press-Release.pdf

[68] Globe Telecom (2020, October 29). Globe Ups Investments in Fiber to the Home By 189%. *Globe Newsroom.* *https://www.globe.com.ph/about-us/newsroom/corporate/fiber-to-the-home-investments-189-percent.html#gref*

[69] The number of fiber ports deployed is a measure of a network's ability to take in new connections. Information on Globe's fiber ports from Valmonte, K.C.G. (2021, October 15). Globe on track to end the year with 1.4M fiber lines. *Business World.* https://www.bworldonline.com/globe-on-track-to-end-the-year-with-1-4m-fiber-lines/

[70] Figure represents PLDT's aggregate fiber deployment for all segments (backbone, middle mile, and last mile) in 2020. See Newsbytes.PH (2020, October 29). PLDT, Globe expand fiber investments as Converge ICT seeks market dominance. *Newsbytes.PH.* https://newsbytes.ph/2020/10/29/pldt-globe-expand-fiber-investments-as-converge-ict-seeks-market-dominance/

subscribers to 2.09 million.[71] With a deployment target of 1.7 million fiber ports for 2021, PLDT is expected to have 5.29 million fiber ports at the end of the year – a significant bump in their network's fiber capacity. These and other investments are expected to cost Globe and PLDT 90 billion pesos and 92 billion pesos, respectively, on capex for 2021.[72]

Converge for its part has stated that its end-to-end fiber network was already serving a million customers as of April 2021,[73] and in position to serve 8.3 million households as of end of Q2 2021.[74] As of October 2021, Converge ICT reported that it covered 32.5% of all Filipino households, a result of aggressive expansion including the deployment of 565,848 fiber ports in Q2 2021 alone.[75] The pandemic no doubt increased demand for FTTX services, as other connectivity options (primarily mobile data, but also including some users on legacy copper/DSL connections) proved too slow and expensive for prolonged online activities, such as online classes.

Even before COVID-19, however, increasing competition in the FTTX space from smaller players such as Sky Cable, Radius, Streamtech, Infinivan, and cable TV operators put pressure on incumbents to expand their fiber subscriber base, and convert their legacy copper/DSL connections to fiber optic technology. In fact, new entrant Dito Telecommunity signed an agreement with Sky Cable, among others, in 2019 to utilize the latter's spare fiber capacity for its own network.[76]

According to Joel Dabao, a cable operator from Negros Occidental in the Visayas, cable TV operators have been heavily investing in fiber since the 1990s. The first incarnations of cable internet required them to deploy fiber to the neighborhood. The smaller CATV operators have transitioned to FTTH, which is much easier to maintain than the hybrid fiber coaxial plant. It can be assumed that where there are CATV operators, fiber is available in the area. A recent survey estimated some 1.8 million homes served by smaller CATV operators for internet service, the strong majority of which is FTTH.[77]

Table 8. Fiber optic cable networks of select fiber broadband providers

Operator	Route (km)*	Notes
PLDT	524,000 km (Jun 2021)[78]	PLDT's fixed broadband network (encompassing fiber and other technologies) covered 48 percent of all 1,634 cities and municipalities in the country as of March 2021.79

[71] Balinbin, A.L. (2021, November 10). PLDT Home on track to achieve over 1M customers this year. *Business World.* https://www.bworldonline.com/pldt-home-on-track-to-achieve-over-1m-customers-this-year/

[72] Figures represent projected capex by year-end 2021. Capex here encompasses all capital spending, including but not limited to fiber network infrastructure. See Baclig, C.E. (2021, January 25). PH internet speed for mobile jumps 14 notches in Speedtest Global Index. *Inquirer.net*. https://technology.inquirer.net/107420/ph-internet-speed-for-mobile-jumps-14-notches-in-speedtest-global-index

[73] Abadilla (2021).

[74] Converge ICT (2021, October 29).

[75] Converge ICT (2021, October 29).

[76] Amojelar, D.G. (2019, October 3). DITO Telecom signs deal to use Sky Cable fiber assets. *Manila Standard.* https://www.manilastandard.net/business/it-telecom/306516/dito-telecom-signs-deal-to-use-sky-cable-fiber-assets.html

[77] Dabao, J. (2021, November 10). What's the best measure of fiber optic cable network in the country? https://medium.com/@betterinternetph/whats-the-best-measure-of-fiber-optic-cable-network-in-the-country-65bf757052a4

[78] Mercurio, R. (2021, September 23). PLDT seeks to maintain lead in home connectivity. *Philippine Star.* https://www.philstar.com/business/2021/09/23/2128978/pldt-seeks-maintain-lead-home-connectivity

[79] Iglesias, M. (2021, March 18). PLDT to expand fiber by 30%; Globe gets 495 tower permits. *Malaya Business Insight.* https://malayaph.com/news_business/pldt-to-expand-fiber-by-30-globe-gets-495-tower-permits/

		PLDT signed up almost half a million new fiber subscription in H1 2021, and stated it was on track to sign up a total of one million fiber subscribers by year end.[80] As of Q3 2021, it had over 2 million FTTH subscribers, with additional capacity to cater to 3 million more.[81] PLDT's fiber network now passes "more than 11.3 million" homes in the country and is ready to accommodate an additional 4.8 million households on its network.[82] As of September 2020, PLDT's backbone network capacity stood at 55 terabits per second (Tbps).[83]
Globe Telecom	67,414 km (2020)[84]	Globe's fiber deployments as of October 2020 were mainly concentrated in "Metro Manila, Bulacan, Cavite, Batangas, Cebu, and Davao del Sur."[85] For 2020, Globe rolled out 13,414 km of fiber.[86] Globe signed up around 600,000 new FTTX subscribers in 2020 and surpassed that same figure in H1 2021.[87] By October 2021, Globe had already deployed one million FTTX subscriptions.[88] It also built an additional 1.4 million fiber ports in 2021 alone.[89]
Converge ICT	370,000 km (Sep 2021)[90]	Converge's fiber network is "on track to cover 55 percent of Philippine households by 2025."[91] It reportedly already covered 32.5% of all households as of October 2021, passing more than 8 million homes.[92] Of the 370,000 km comprising Converge's fiber network, over 69,000 km make up the operator's backbone and middle mile segments, while the remaining 300,000 km are in the last mile/FTTX segment.[93] In 2021, it completed its domestic sub-sea fiber project, bringing its total backbone and middle mile network to 85,000 km.

[80] Mercurio (2021).
[81] Balinbin, A.L. (2021).
[82] Mercurio (2021).
[83] Newsbytes.ph (2020)
[84] Baclig, C.E. (2021).
[85] Globe Telecom (2020).
[86] Baclig (2021).
[87] Globe Telecom (2021).
[88] Marasigan (2021).
[89] Valmonte (2021).
[90] Abadilla (2021).
[91] Abadilla (2021).
[92] Converge ICT (2021).
[93] Abadilla (2021).

		As of May 2021, Converge officially operates in Luzon, with 'soft launches' in Cebu and Davao.[94]
Dito Telecommunity	19,027 km (Sep 2021)95	As of September 2021, Dito's fiber network was composed of 953 kilometers of inter-island (domestic) submarine cable, and 18,074 km of land-based fiber optic cable.96 As of Q3 2021, Dito does not yet offer retail fiber broadband subscriptions. However, it has begun discussions with smaller operators (ISPs, Cable TV operators) about offering Dito's backbone and middle-mile segments.97
Radius Telecoms	5,200 km (2020)98	As of April 2021, Radius' fiber network operated in Metro Manila, Pampanga, and Cebu.99

Note: * - Total length of fiber network, encompassing core, middle mile, and last mile networks.

Having reliable and redundant backbone and middle-mile networks is important for a resilient digital infrastructure. On the other hand, the growth of the FTTX segment will help enable more productive connectivity among Filipinos. Overall, analysis by UK firm GlobalData forecasted robust growth in the fixed-line telecommunications sector in the Philippines driven by the demand for broadband, from USD 3.6 Billion in 2021 to an expected USD 4.7 Billion by 2026, for a compound annual growth rate (CAGR) of 5 percent.[100] Fiber broadband in particular is expected to have a CAGR of 17.2 percent from 2021-2026, with PLDT remaining the market leader in terms of fixed broadband subscriptions. That said, GlobalData expects copper-based Digital Subscriber Line (DSL) to remain the dominant fixed broadband technology, even as it will gradually lose market share through 2026, from 36.7 percent in 2021.

As of writing however, fiber middle- and last-mile infrastructure remain largely concentrated in urban areas. The NICTHS report found that while 53.3 percent of urban barangays had fiber optic cable installations, only 11.9 percent of rural barangays did.[101] All in all, only 28.8 percent of barangays nationwide had fiber optic cables – no doubt contributing to the low fixed broadband penetration rate of 5.5 percent in the country. Similarly, only 18.9 percent of rural barangays reported having telco towers, compared to 61.3 percent in urban areas, and 36.3 percent across all barangays.

[94] Abadilla (2021).
[95] Amojelar (2021).
[96] Amojelar (2021).
[97] Dabao (2021).
[98] Conoza, A.P.B. (2021, April 23). A more connected path for the nation. *Business World.* https://www.bworldonline.com/a-more-connected-path-for-the-nation/
[99] Conoza (2021).
[100] Balinbin, A.L. (2021, November 3). PHL fixed-line telco market projected at $4.7B in 5 years. *Business World.* https://www.bworldonline.com/phl-fixed-line-telco-market-projected-at-4-7b-in-5-years/
[101] Albert, J.R.G., et.al. (2021).

Table 3. Proportion (%) of surveyed barangays with electricity, ICT infrastructure, and service providers

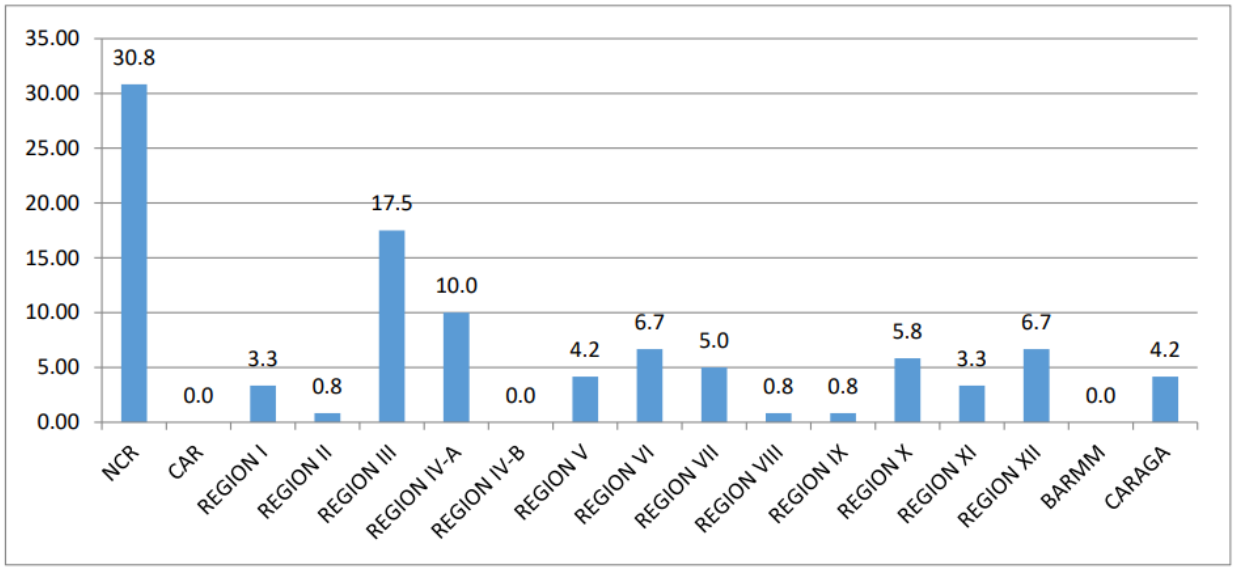
	Urban	Rural	Total
Electricity	99.6	97.7	98.5
Free-to-air Digital TV signal	50.6	34.2	40.9
Cellphone Signal	97.8	88.1	92.0
4G Signal	82.6	43.8	60.6
3G Signal	15.2	40.6	29.6
Telecom company	72.5	42.0	54.5
Telco tower	61.3	18.9	36.3
Internet service provider	92.1	71.1	79.6
Free Wi-Fi	23.9	4.1	12.2
Fiber optic cable	53.3	11.9	28.8

Source: Albert, J.R.G. et. al. (2021), pp.61-62.

A telco tower in a barangay is a likely indicator that fiber backhaul, if not FTTX, is present in an area; conversely, the lack of a telco tower, along with the lack of reported FTTX, is a strong indicator that there is no fiber infrastructure in the barangay.

Here it is important to quality what it means for fiber to be 'present' in an area. A fiber cable running hundreds of kilometers can pass through many barangays. However, simply passing through an area does not qualify as presence. Instead, the fiber must be accessible to households or *delivering bandwidth* to a specific location, whether as backhaul for a cell site or directly to consumers through FTTX.

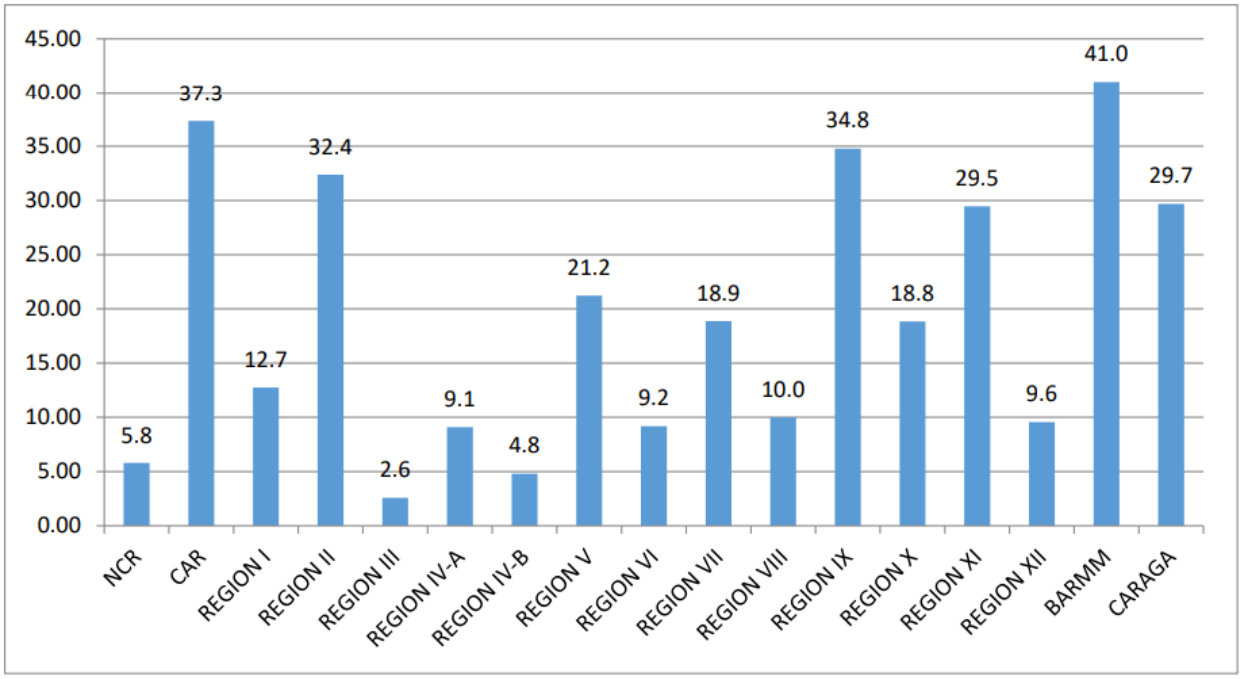
Figure 3. Proportion (%) of surveyed barangays with presence of all broadband infrastructure



Source: Albert, J.R.G. et. al. (2021).

Similarly, the presence of Cable TV operators in a barangay is likely evidence that fiber optic technology has been deployed in that area.[102] This is because most cable TV operators now use fiber technology to deliver digital pay TV services to their customers. With their own fiber infrastructure already in place, Cable TV operators can pursue the option of delivering broadband services as well to make the most out of their capital spending on infrastructure.

Figure 4. Proportion (%) of surveyed barangays with absence of all broadband infrastructure



Source: Albert, J.R.G. et. al. (2021).

Some electric utilities also use fiber for their supervisory control and data acquisition (SCADA) systems. In both cases, however, fiber optic technology does not necessarily equate to *fiber broadband,* unless bandwidth is being distributed to the community. There are multiple reasons why this may not be the case, such as the lack of a PoP in the area, technical and business concerns regarding the sale of broadband services, and regulatory concerns.

That said, cable TV operators together represent a major player in the provision of fiber Internet in the country. According to Mr. Dabao, the Visayan Cable TV operator, broadband subscriptions among cable TV operators grew 20-30 percent since the start of the pandemic, with the majority of this growth in Visayas and Mindanao. Many of these new broadband subscribers were already Cable TV subscribers, and their uptake of fiber broadband was a response to greater bandwidth needs. Altogether, cable TV providers now serve fiber broadband to more than 2 million homes – a number equivalent to the subscription figures of Globe, PLDT, and Converge ICT.

[102] Albert, J.R.G., et.al. (2021).

Dabao also stated that much of the infrastructure and subscription growth over the past year has been to less-affluent areas, as high-income areas are already relatively saturated with Internet infrastructure. As higher-income households tend to already have Internet subscriptions, the growth trend for these users have been an increased demand for bandwidth, and therefore for higher speed plans. Together these paint the picture of a two-track development of Internet infrastructure, with existing subscribers learning to use more bandwidth, and new users just beginning to get connectivity.

A significant bottleneck to further expansion of FTTH services by non-telcos (such as Cable TV providers) is the lack of middle mile facilities in many areas in the countryside. Even if, for example, a Cable TV operator already had a fiber distribution network in a community, it would need access to Internet bandwidth delivered via middle mile in order to serve broadband through its fiber. Unfortunately, current regulations restrict the operation of middle mile networks to holders of Congressional telecommunications franchises. It is possible therefore that there already exist last mile fiber networks in many areas of the country, but without the ability to deliver broadband, due to gaps in the middle mile infrastructure.

Enabling FTTH and broadband deployment in general therefore requires parallel development in all segments of the Internet infrastructure. As the diversity of last mile players outstrips that of the middle mile and core network segments, policy reform may be necessary to keep up with the bandwidth demands of expanding last mile networks.

As things stand, fixed line infrastructure (and fiber in particular) remains relatively rare among Filipino households. As the discussion in Section 1 indicates, however, there are many more Internet users in the Philippines than there are fixed broadband subscriptions. For the majority of Filipinos, their primary or even only mode of Internet access is mobile broadband.

2.3 Mobile Cellular Networks

Mobile technologies are the most pervasive means of accessing the Internet in the Philippines. The NICTHS report found that 85.1 percent of Filipinos with connectivity accessed the Internet using their mobile phones; in comparison, only 29.8 percent used desktop computers, the second most common device for Internet access.

This means that the vast majority of Filipino Internet users rely on fiber only indirectly at best: fiber is mostly relevant to them only in so far as it underpins fast, modern cell sites. Examining the NICTHS' findings on the top reasons why households did not access the Internet revealed that the top reasons were: the high cost of Internet subscriptions; the high cost of equipment; and the lack of Internet availability in their areas. The table below shows the NICTHS' findings in more detail.

Table 9. Proportion (%) of households without Internet access, by reason for not having access

Reason for not having home Internet connection	Urban	Rural	Total
High cost of Internet subscription (service charges, installation fees, maintenance fees)	60.3	45.4	52.5
High cost of equipment	33.0	34.6	33.8
Internet is not available in the area	11.3	26.6	19.4
Do not know how to use it	11.9	20.0	16.2
Do not need the Internet (not useful, not interesting, lack of local content)	11.1	7.0	8.9
Members have individual/personal connection	9.2	8.5	8.8
Poor quality and speed	3.8	10.3	7.2
Don't know what the Internet is	4.6	7.1	5.9
Have access to the Internet elsewhere	6.2	3.1	4.6
Others	2.6	1.6	2.1
Privacy or security concerns	1.5	0.8	1.1
Exposure to harmful content	0.3	0.2	0.3
Not allowed to use the Internet	0.5	0.3	0.4

Source: Albert, J.R.G., et.al. (2021).

In many areas, other choices for an Internet connection (i.e., fiber and free Wi-Fi) are just not available. The lack of Internet infrastructure is particularly a problem for areas in the countryside, such as BARMM and Region V, where 53 percent and 40 percent respectively of non-connected households pointed to the lack of infrastructure as their main barrier to access.[103] A significant reason for this is the uneven distribution of mobile cellular technologies in the country.

While 92 percent of all barangays surveyed by the NICTHS reported having a cellphone signal, with 97.8 percent of urban and 88.1 percent of rural barangays having access to a cellular network, this does not necessarily translate to Internet connectivity. There is a wide disparity in the availability of modern cellular networks – those that actually allow for Internet access – between urban and rural areas, and between different regions.

BOX – Mobile Cellular Technologies

The ability of a mobile cellular network to support broadband depends on its technology 'generation.' The oldest cellular technology in use today is 2G, which stands for 2nd generation. While 2G technically supports Internet services, it can only transmit at a speed of a few kilobits per second (Kbps) – below the International Telecommunication Union's standard for broadband.

In practice, a 3G network is the minimum required for Internet connectivity. With speeds ranging from a few hundred Kbps to Megabit (Mbps) speeds in the low tens, 3G enables smartphone applications such as web browsing, chat, and music streaming.

For high-definition videos and other bandwidth-intensive media, however, a 4G network is essential. With ideal condition speeds in the hundred Mbps range, 4G also allows users to transition from merely consuming content to creating them: uploading videos and other multimedia, as well as engaging in applications such as video conferencing.

[103] Albert, J.R.G., et.al. (2021).

The newest cellular technology being rolled out today, dubbed 5G, is designed not just for phones but for other smart devices as well, in what is called the Internet of Things (IoT). With theoretical maximum speeds in the Gigabit (Gbps) range, 5G promises to enable a whole new paradigm of connectivity.

Sources: Vora, L.J. (2015). Evolution of mobile generation technology: 1G to 5G and review of upcoming wireless technology 5G. *International Journal of Modern Trends in Engineering and Research*, 2(10), p. 281-290. http://www.danspela.com/pdf/p113.pdf
Telecom Regulatory Authority of India (May 2018). Evolution of Mobile Communications (4G and 5G). *Technology digest: bulletin of telecom technology*. https://www.trai.gov.in/sites/default/files/TechnologyDigestMay2018.pdf
Qualcomm (June 2014). *The evolution of mobile technologies.* https://www.qualcomm.com/media/documents/files/download-the-evolution-of-mobile-technologies-1g-to-2g-to-3g-to-4g-lte-qualcomm.pdf

About 82.6 percent of urban and 43.8 percent of rural barangays surveyed for the NICTHS reported having a 4G signal, equivalent to 60.6 percent of all barangays. It is notable that Opensignal's Mobile Experience Network report shows 4G availability at above 80 percent for users across all networks – higher than the national barangay availability of 60.6 percent.[104] This discrepancy can be explained by Opensignal's methodology, which relies on volunteers to use their Opensignal network benchmarking app. It is possible that Opensignal's data comes predominantly from urban users, which would track the 4G availability for urban areas found by NICTHS. It should also be noted that the NICTHS data is from 2019, while the most recent Opensignal data is from October 2021.

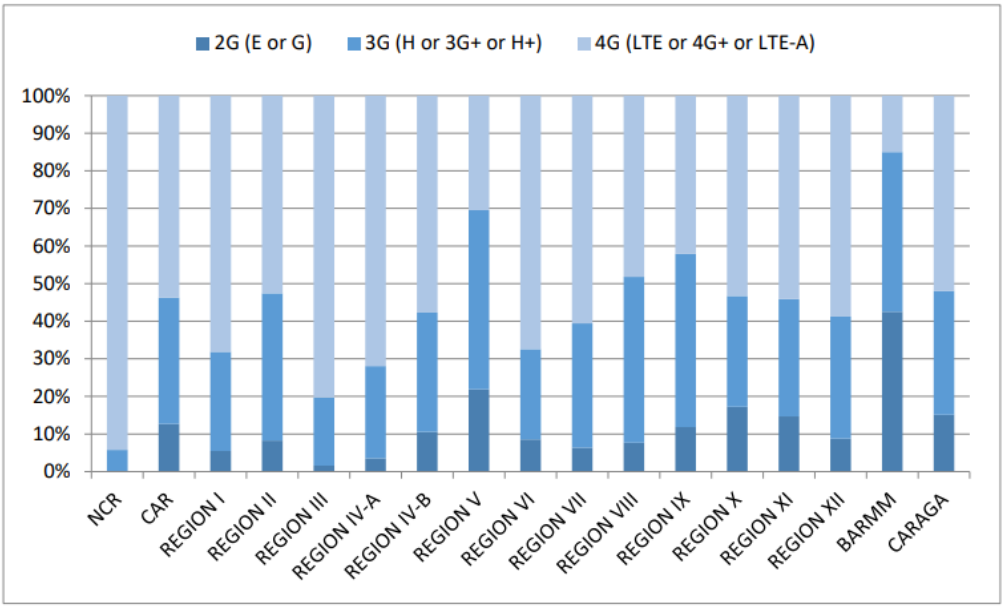
Meanwhile, 15.2 percent of urban and 40.6 percent of rural barangays reported having a 3G signal, equivalent to 29.6 percent of all barangays. The disparity between these figures and the reported availability of a cellular signal in general (92 percent) indicates that a number of barangays still rely on older 2G technology.

Furthermore, 4G availability seems to be heavily concentrated in urban barangays, with more than half of rural barangays not having 4G. These users without 4G connections are unlikely to have a fast and smooth experience with high-bandwidth applications, such as videoconferencing. As for 3G, there are significantly more rural than urban barangays on the older 3G technology which, while capable of supporting light Internet use, is slower than 4G. This could have significant implications on access disparities, as mobile broadband data usage is expected to grow from 3.7 gigabytes (GB) in 2021 to 4.8 GB in 2026.[105]

Both Globe Telecom and Smart Communications have stated that an increasing number of their users are migrating to 4G technology.[106] What the NICTHS findings indicate is that migrating users are primarily concentrated in urban locations. 4G rollout in rural communities has been much slower, leaving the countryside behind when it comes to mobile broadband access.

[104] Opensignal (2021 October). Philippine mobile network experience. *Open Signal.* https://www.opensignal.com/reports/2021/10/philippines/mobile-network-experience
[105] Balinbin, A.L. (2021, November 3).
[106] See Manila Bulletin (2019, September 27). Smart LTE users up amid network improvement, LTE migration programs. *Manila Bulletin.* https://mb.com.ph/2019/11/27/smart-lte-users-up-amid-network-improvement-lte-migration-programs/ and Globe Telecom (2021, June 29). Globe Sees Faster 5G Rollout; Customers Migrating to 4G LTE and 5G on Full Swing. *Globe Newsroom.* https://www.globe.com.ph/about-us/newsroom/corporate/globe-sees-faster-5g-rollout.html#gref

Figure 8. NICTHS 2019 distribution of surveyed barangays (%) by highest cellular signal available, per region



Source: Albert, J.R.G., et.al. (2021).

On a regional level, BARMM recorded the lowest level of 4G coverage at 41 percent of urban and 8 percent of rural barangays. On the other hand, 3G was the most predominant technology in the Bicol region, covering 38 percent of urban and 50 percent of rural barangays. For these and other regions, large scale upgrades of mobile networks are necessary for communities to catch up to the 4G coverage of regions such as NCR, Regions III, and IV-A.

In BARMM, more than 40 percent of barangays still rely on 2G. The fact that Region V and BARMM represent both the lowest 4G and highest 2G coverage may be evidence that for these regions at least, cellular deployment has been slow for at least two successive mobile technology generations (3G and 4G).

This reflects the fact that the huge and continuously growing demand for broadband service nationwide is outpacing the expansion and upgrading of mobile networks across the country. Compared to its ASEAN neighbors, the Philippines has low cell tower density. Cell towers are physical infrastructure that host mobile radio equipment, along with supporting infrastructure for power and adequate security. As of 2019, the Philippines had 17,850 towers – behind Malaysia at 32,412, Thailand at 52,483, Vietnam at 90,000, and Indonesia at 95,556.[107] By 2021, the number of towers increased only modestly to 22,834 according to the National Telecommunications Commission (NTC).[108] Even accounting for differences in country size, terrain, and population distributions, it is clear that the Philippines is a regional laggard when it

[107] TowerXChange (2019). *TowerXChange Asia Dossier 2019*. Accessed from: https://www.towerxchange.com/wp-content/uploads/2019/10/TX_AsiaDossier_2019.pdf
[108] Abadilla, E.V. (2021, January 22). PH now has 23K cell sites, still behind in ASEAN. Manila Bulletin. https://mb.com.ph/2021/01/22/ph-now-has-23k-cell-sites-still-behind-in-asean/

comes to cellular network deployment. Globe has stated that it is targeting a ratio of 100 to 200 households per tower, even as its current ratio is 4,000 households per tower.[109]

There is an important relationship between cell tower density, and Internet availability and quality. With cellular (as with other wireless) technologies, there is an inverse relationship between the capacity or speed supported by networking equipment, and its coverage radius.[110] In other words, faster technologies such as 4G and 5G which are suitable for Internet connectivity require denser network deployments – hence, the need for more towers. Data from the NICTHS seems to support this: 81 percent of barangays with towers reported having a 4G signal, while only 48 percent of barangays without a tower had 4G. Unfortunately, only 36 percent of barangays surveyed by the NICTHS reported having a tower in their community, with significantly more in urban (61 percent) than in rural (19 percent) barangays.

Table 10. Barangays with telecom tower, with cellphone signal

Region	Average number of towers per barangay	Total number of towers
NCR	2.62	404
CAR	1.50	51
REGION I	1.48	37
REGION II	1.41	41
REGION III	1.65	155
REGION IV-A	2.98	188
REGION IV-B	1.55	93
REGION V	1.45	32
REGION VI	2.08	104
REGION VII	2.52	174
REGION VIII	1.53	49
REGION IX	1.61	50
REGION X	2.15	129
REGION XI	1.79	104
REGION XII	2.35	120
BARMM	1.92	25
CARAGA	1.43	43
Total	**2.06**	**1799**

Source: Albert, J.R.G., et.al. (2021).

Data also indicates that telcos tend to cluster their network deployment, perhaps due to population density or other considerations relating to location. Among all barangays with a tower and a cellphone signal, the average number of towers per barangay was 2.06. The DICT, for its part, issued a common tower policy aimed at accelerating the rollout of passive infrastructure in the country.[111] The Department of Interior and Local Government (DILG) also stated that LGUs had

[109] Galvez, D. (2021, September 23). One cell tower currently serves 4,000 households — telco official. *Inquirer.net.* https://technology.inquirer.net/104264/one-cell-tower-currently-serves-4000-households-telco-official

[110] Albert, J.R.G., et.al. (2021).

[111] For more on DICT's common tower policy, see Department Circular No. 8, s. 2020, *Policy Guidelines on the Co-Location and Sharing of Passive Telecommunications Tower Infrastructure for Macro Cell Sites.*

approved 2,220 permits for cell towers as of December 2020, leaving only 712 pending applications.[112]

Current countries such as Thailand, Malaysia and China, tower density is more than 1 tower per thousand people. For Philippine, to increase internet access and quality, the number of physical towers should increase by 10%~20% each year and in five years for site density should set to 1 tower per thousand people.

BOX – Facilitating timely infrastructure deployment

Streamlined planning and administrative new site approval processes. Administrative efficiency is key to ensuring that mobile operators can meet coverage and connectivity expectations. In order to improve administrative efficiency, it is recommended that the Government improve the digital administrative channel. Making forms and processes digital will save valuable time and support operators in their efforts. Governments are also encouraged to centralize all statistical and geographic information suitable to support mobile broadband deployment.

Site approval time can also be further shortened in those improvements to improve the efficiency in the process of network site deployment.

The post and telecommunications department takes the lead in coordinating with related departments of site construction, for example, Department of Information and Communications Technology coordinate with the Ministry of energy to provide sufficient power supply for mobile site.. The Ministry of Housing and Construction designs and reserves the site construction location during the construction planning process.

BOX- Non-discriminatory access to public infrastructure.

Public infrastructure such as government buildings, roads, railways, and canals for public services plays an important role in the cost and speed of network expansion projects. Operators should be given access to state-owned facilities to establish base stations. Such access can be easily implemented and thereafter, significantly speed up the network deployment process.

BOX – Common Towers and Infrastructure Sharing

Internet infrastructure must strike a balance between being *redundant* for resiliency's sake and being *efficient* to accelerate deployment and expand coverage. Particularly for the last mile segment, where infrastructure tends to be easier to replace and maintain (compared to other segments) and redundancy is less of a necessity, *infrastructure sharing* is an effective way to accelerate network buildouts.

Infrastructure sharing involves multiple operators using the same *passive infrastructure* - physical structures, such as masts, towers, and conduits, on or through which ICT networking equipment (called *active infrastructure*) is installed or deployed. At its simplest, passive infrastructure is just a way to hold network equipment up or for it to pass through. With infrastructure sharing, operators need only to focus on deploying active infrastructure, thereby reducing costs and accelerating rollout.

To date, the only infrastructure sharing initiative in the Philippines is the DICT's Common Tower Policy, which encourages independent tower companies to put up passive infrastructure, which it can then lease to mobile network operators. While the policy explicitly refers to the "co-location and sharing of passive telecommunications tower infrastructure for macro cell sites," the policy also covers any other construction, such as ducts, mounts, cable entrances, and even shared fiber known as *dark fiber* associated with the operation of a telecom tower.

Through the policy, all installation of active cellular equipment must be co-located on common towers, except where otherwise approved by the DICT. To date however, the majority of new towers constructed remain owned (directly or via a subsidiary) by mobile network operators. The first common tower in the country became operational only on July 2021, more than a year after the DICT released guidelines on its policy.

[112] Caliwan, C.L. (2020, December 1). LGUs approve 2.2K telco tower permits: DILG. *Philippine News Agency.* https://www.pna.gov.ph/articles/1123445

That said, there are signs that the policy has led to increased interest from foreign investors in local tower companies. In November 2021, Japan's Sojitz Corp. invested more than USD 60 million in LBS Digital Infrastructure Corp., a Filipino tower company. For the DICT's part, it expects to complete a total of 300 common towers by the end of 2021.

BOX- The government invests in site passive infrastructure construction，especially in rural areas.

The regulator cooperator with local government and tower providers to construct site and rent it to the operators to build mobile networks. For example, the Malaysian Communications and Multimedia Commission (MCMC), with cooperation from the Sabah government through Sabah Parks, identified the location for the construction of a telecommunication tower in Pulau Sipadan near here.Once completed, four telecommunication companies (telcos) — Celcom, Maxis, Digi and U-Mobile — will provide services on the island.

References:

Reyes, R.D. (2021, July 26). The country's first activated shared Telecom Tower inspected by DICT. *Manila Bulletin.* https://mb.com.ph/2021/07/26/the-countrys-first-activated-shared-telecom-tower-inspected-by-dict/

Villanueva, V.A. (2021, November 10). Japan's Sojitz infuses multi-million dollar investment in PHL tower builder. *Business Mirror.* https://businessmirror.com.ph/2021/11/10/japans-sojitz-infuses-multi-million-dollar-investment-in-phl-tower-builder/

The long-term effects of new entrant Dito Telecommunity on mobile cellular development remains to be seen. Dito uses exclusively 4G and 5G frequencies, with 3,096 4G and 604 5G towers as of September 2021.[113] In comparison, Globe Telecom had 10,395 cell towers in December 2020, with a total of 7,065 4G and 5G cell sites as of April 2021, and a further 2,000 towers planned for 2021.[114] Smart, meanwhile, had 10,079 towers as of December 2020, with more than 3,500 5G sites in May of the same year.[115] Globe and Smart have also been upgrading their legacy equipment: in 2020, PLDT converted 3,700 2G sites on the 1800 MHz frequency to 4G, while Globe upgraded 8,100 3G sites to 4G in H1 2021.[116]

The two incumbent telcos have also been steadily increasing their 5G rollout, with Globe reaching 8.4 percent and Smart reaching 11.9 percent availability, as of October 2021.[117] 4G availability was also quite high for both networks among Opensignal users, with 4G availability averaging above 80 percent as of October 2021.[118]

2.4 Other Internet Technologies

FTTX and mobile cellular (particularly 5G) are expected to be the focus of the telco sector's investments in the coming years. However, not all contexts may be suitable for fiber or mobile cellular, due to reasons that include terrain, wireless frequency congestion, income levels, and

[113] Amojelar (2021).

[114] See Abadilla (2021 January 22) and Balinbin, A.L. (2021, April 21). Globe reports 152% increase in cell sites built. *Business World.* https://www.bworldonline.com/globe-reports-152-increase-in-cell-sites-built/ ; Globe Telecom (2021, August 3). Globe Installs 641 New Cell Towers, Completes Over 8,100 Site Upgrades in 1H 2021. *Globe Newsroom.* https://www.globe.com.ph/about-us/newsroom/corporate/new-cell-towers-site-upgrades-1h-2021.html#gref ; and Iglesias (2021 March 18).

[115] Rappler (2021, May 29). Smart's 5G network now has over 3,000 sites in the Philippines. *Rappler.* https://www.rappler.com/brandrap/announcements/smart-5g-network-sites-philippines-may-2021

[116] See PLDT (2020). *Annual Report.* https://www.pldt.com/docs/default-source/annual-reports/2020/main_pldt-2020-ar.pdf?sfvrsn=2 and Globe Telecom (2021, August 3).

[117] Availability refers to the proportion of time that users with a 5G smartphone spent connected to a 5G network. See Open Signal (2021 October). Philippines 5G experience report. *Open Signal.* https://www.opensignal.com/reports/2021/10/philippines/mobile-network-experience-5g

[118] Opensignal (2021 October).

population density, among others. For these areas, alternative technology implementations exist to help deliver connections to users.

One such alternative examined by the NICTHS is access to free Wi-Fi hotspots. Wi-Fi is a viable alternative for last mile connectivity because it uses low-cost equipment that can be deployed easily and quickly.[119] It can also be accessed directly using mobile phones and other devices, reducing the need for additional equipment (such as a modem or dongle). In areas where fiber or cellular will be prohibitively expensive, a Wi-Fi hotspot can be connected to the backhaul and used to deliver bandwidth directly to end users, or to other hotspots located farther away.[120]

Another reason why Wi-Fi is an attractive option is because it uses unlicensed frequencies in the 2.4 and 5 GHz bands. An *unlicensed frequency* does not require permission from the NTC for use.[121] In contrast, licensed frequencies, such as mobile cellular, are granted by the NTC only to holders of a Congressional franchise. This means entities with access to bandwidth but without permission to use licensed frequencies, such as CATV providers and wireless ISPs, can provide public Wi-Fi services.[122]

Among all barangays surveyed by the NICTHS, only 12 percent reported having free Wi-Fi, whether publicly- or privately-run. Most public Wi-Fi sites are run by the DICT under the Free Public Wi-Fi Program, instituted by Republic Act No. 10929, otherwise known as the "Free Internet Access in Public Places Act." The NICTHS reveal that majority of barangays with free Wi-Fi already also have a telco operating in their community. In these cases, free public Wi-Fi is a complement to existing ICT infrastructure.

However, the coverage of free public Wi-Fi service remains limited. Among barangays with telcos, only 1.6 percent reported having free public Wi-Fi. Barangays without telcos and with free public Wi-Fi were also more common in urban locations, at 2.9 percent of all urban barangays, versus 0.8 percent among rural barangays. This indicates that as a last-mile access solution, free Wi-Fi is so far available where telcos are already operating.

For the Free Public Wi-Fi program at least, the challenge is in meeting the target of 200,000 sites online by 2026. As of December 2020, the program had 7,556 live hotspots; by August 2021, 10,527 sites were online, a 39 percent increase.[123] This figure represents 5.3 percent of the planned sites. The DICT previously stated it was targeting a total of 23,100 live sites by the end

[119] Garrity, J., & Garba, A.A. (2020). *The last-mile Internet connectivity solutions guide: Sustainable connectivity options for unconnected sites.* ITU Publications. https://www.itu.int/dms_pub/itu-d/opb/tnd/D-TND-01-2020-PDF-E.pdf

[120] Garrity & Garba (2020).

[121] The use of frequency bands 240MHz to 2483.5MHz, 5150MHz to 5350MHz, and 5470MHz to 5850MHz is "open and unprotected," meaning no specific grant of spectrum license is required for their use. As radio equipment, all Wi-Fi enabled equipment, including mobile phones, still need type certification from the NTC to be legally sold in the Philippines. The NTC also prohibits the use of external/outdoor antennas for Wi-Fi equipment without the appropriate permit and radio station license fees. In addition, registered 'outdoor radio stations,' or those equipment with more than 250mW effective radiated power and/or with external antennas, are subject to an annual spectrum user fee. See NTC (2003, September 12). Wireless data networks and devices. *NTC Memorandum Circular No. 09-09-2003.* https://ntc5.ntc.gov.ph/wp-content/uploads/2019/09/MC-09-09-2003-WIRELESS-DATA-NETWORKS-AND-DEVICES.pdf

[122] Asian Vision (n.d.). Asian Vision Public Wi-Fi. *Asian Vision*. https://www.asianvision.com.ph/news/asian-vision-public-wifi-10

[123] Camus, M. (2021, August 19). DICT activates free wifi sites in Mindanao military camps. *Inquirer.net*. https://business.inquirer.net/329276/dict-activates-free-wifi-sites-in-mindanao-military-camps

of 2021, or 11.6 percent of the total target.[124] For perspective, Globe claims its own free Wi-Fi hotspots are available in just over 2,000 locations nationwide.[125]

Service providers are also looking at satellite broadband as a solution for low density, geographically isolated and disadvantaged areas (GIDAs). Prior to 2021, at least three satellite broadband service providers operated in the Philippines: Delco Telecoms, We are IT Phils. Inc, and Transpacific Broadband Group Inc.[126] In May 2021, PLDT subsidiary Cignal TV launched its Connect Satellite Broadband, which is aimed at "areas that are difficult to reach through land-based networks.[127]" In the same month, Converge ICT said it was in talks with SpaceX's satellite broadband unit Starlink.[128] Globe Telecom also announced that it was considering satellite broadband for delivering services to low density rural areas.[129] The increase in local players accessing satellite broadband can create sustained demand for this Internet connection and help bring down the price in the Philippines, which is much more expensive compared to its peers in the region.[130]

In March 2021, President Rodrigo Duterte signed Executive Order No. 127 deregulating access to satellite broadband.[131] Prior to the new satellite policy, EO 467 s. 1998 limited access to international satellites to telcos who held a Congressional franchise. With EO 127, telcos and anyone registered as a Value Added (VAS) or Internet Service Provider (ISP) can directly access satellites to offer broadband services to the public.

The *Bangko Sentral ng Pilipinas* is one of the early proponents of the potential of satellites to expand digital connectivity, especially in the countryside. The central bank, along with the Financial Inclusion Steering Committee, hopes to leverage satellite broadband to deliver digital financial services across the country.[132] Elsewhere, educational and other institutions are looking to follow the lead of the Ateneo de Davao University's Community Connectivity Empowered by Satellite Service for Mindanao (ACCESS Mindanao) project. The initiative, launched in October 2020, had 11 previously unconnected sites across Mindanao linked to satellite broadband as of September 2021.[133] Business groups, such as the Philippine Chamber of Commerce and Industry, also saw the potential opportunity that the satellite policy can bring in addressing the connectivity needs of micro-, small- and medium enterprises (MSMEs) in the unserved and underserved areas.[134]

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[124] DICT (2020, July 17). *DICT allocates PHP7.7 billion for Free Wi-Fi for All Program*. https://dict.gov.ph/dict-allocates-php7-7-billion-for-free-wi-fi-for-all-program/

[125] Globe Telecom (n.d.). GoWiFi FAQs. *Globe.com.ph.* https://www.globe.com.ph/gowifi.html

[126] Garrity, J. & Husar, A. (2021 April). Digital Connectivity and Low Earth Orbit Satellite Constellations: Opportunities for Asia and the Pacific. *ADB Sustainable Development Working Paper Series No. 76.* https://www.adb.org/sites/default/files/publication/696521/sdwp-076-digital-connectivity-low-earth-orbit-satellite.pdf and Transpacific Broadband Group (2017). *Our Services*. http://www.tbgi.net.ph/our%20services.html

[127] Ibañez, J.P. (2021 May 14). Cignal launches satellite broadband service. *Business World.* https://www.bworldonline.com/cignal-launches-satellite-broadband-service/

[128] Rodriguez, B. (2021, May 17). Converge ICT, Starlink satellite internet service unlikely this year. *ABS-CBN News.* https://news.abs-cbn.com/business/05/17/21/converge-ict-starlink-satellite-internet-service-unlikely-this-year

[129] Waring, J. (2021 May 17). Globe assesses satellite internet options. *Mobile World Live*. https://www.mobileworldlive.com/asia/asia-news/globe-asseses-satellite-internet-options

[130] Garrity & Husar (2021 April).

[131] Executive Order No. 127 (s. 2021), *Expanding the provision of Internet services through inclusive access to satellite services, amending Executive Order No. 467 (s. 1998) for the purpose.* https://www.officialgazette.gov.ph/downloads/2021/03mar/20210310-EO-127-RRD.pdf

[132] Lucas, D.L. (2021, March 15). BSP: Satellite broadband internet to boost financial inclusion. *Inquirer.net*. https://business.inquirer.net/319497/bsp-satellite-broadband-internet-to-boost-financial-inclusion

[133] Jara, M.S. & Balinbin, A.L. (2021 September 6). Satellite solutions: Filling in Mindanao's digital gaps. *Business World.* https://www.bworldonline.com/satellite-solutions-filling-in-mindanaos-digital-gaps/

[134] https://ecop.org.ph/business-groups-support-eo-127-say-better-access-to-satellite-technology-to-strengthen-innovation/

The following table provides a summary of discussion on each Internet segment and the pertinent regulations applying to each segment (discussed further in section 5).[135]

Table 11. Internet segments and applicable regulation

Technology	Applicable Segments	Pertinent Regulations
Wired (Fiber, Copper/DSL, Cable/Coaxial)	International Bandwidth, National Backbone, Middle Mile, Last Mile	RA 7925: Public Telecoms Policy Act NTC MC 09-07-93: Interconnection of Authorized Public Telecoms Carriers (as updated by MC 14-07-2000) NTC MC 06-10-2008: Rules on the Mandatory Interconnection of Cable Landing Stations to Backhaul Networks NTC MC 02-05-2008: Value-Added Service (VAS) *for ISPs* Executive Order No. 436 (s.1997): Prescribing Policy Guidelines to Govern the Operations of Cable Television in the Philippines Rule 920 of the Implementing Rules and Regulation of RA 7925
Terrestrial Wireless (Microwave, Cellular, Wi-Fi)	National Backbone, Middle Mile, Last Mile	RA 7925: Public Telecoms Policy Act RA 3846: Radio Control Law NTC MC 09-07-93: Interconnection of Authorized Public Telecoms Carriers (as updated by MC 14-07-2000) NTC MC 06-10-2008: Rules on the Mandatory Interconnection of Cable Landing Stations to Backhaul Networks NTC MC 06-10-2008: Rules on the Mandatory Interconnection of Cable Landing Stations to Backhaul Networks NTC MC 09-09-2003

[135] Table adapted from Mirandilla-Santos, M.G., Brewer, J., & Faustino, J. (2018). From analog to digital: Philippine Internet policy and emerging Internet technologies. *The Asia Foundation*. https://asiafoundation.org/wp-content/uploads/2018/10/From-Analog-to-Digital_Philippine-Policy-and-Emerging-Internet-Technologies.pdf

Satellite	International Bandwidth, Middle Mile, Last Mile	Executive Order No. 127 (s.2021): Expanding the provision of Internet services through inclusive access to satellite services, amending Executive Order No. 467 (s. 1998) for the purpose. NTC MC 02-05-2008: Value-Added Service (VAS) *for ISPs*

3. Digital infrastructure and economic growth and recovery

Digital Infrastructure Investments

Investment in the Philippines' digital infrastructure has always been dominated by the private sector. The major telecommunications companies, Globe Telecom and PLDT/Smart Communications, which are also the country's largest internet service providers (ISPs), had been unrivaled in the market since 2011 when PLDT/Smart bought Digitel's Sun Cellular, the third mobile operator back then. The latest competition, DITO Telecommunity (formerly Mislatel), entered the market via a special selection process in 2018 based on a directive by President Duterte.[136] Globe, Smart, and DITO Telecommunity are all highly invested in mobile cellular technology.

Another emerging player, Converge ICT, which started out as a cable TV (CATV) operator in Angeles, Pampanga, began aggressively rolling out fiber broadband services in Metro Manila and some parts of Luzon around 2016, after which it saw its residential subscriber base grow ten-fold between 2016 and 2020.[137] Converge ICT changed the game for fixed broadband when it offered end-to-end fiber service at 40 to 50% lower cost than plans offered by Globe and PLDT.[138]

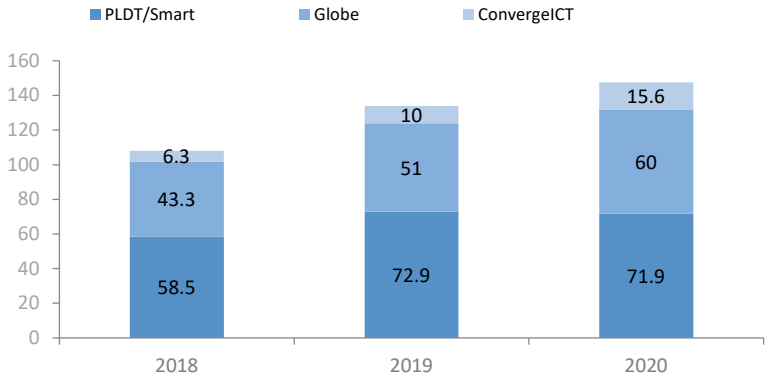
Other telcos that offer retail broadband services are Sky Broadband, Eastern Communications, and Radius Telecoms.

Private sector investment

Based on publicly available data from four companies (Globe, PLDT/Smart, and ConvergeICT), total capital expenditure (capex) for telecommunications stood at PHP147.5 billion in 2020. On average, capex increased by 21% from 2018 to 2020. Capex growth slowed down to 10% in 2020. For 2021, total planned capital investments of these three telcos are estimated to increase by 21% to PHP180 billion.

Figure 9. Capital Expenditures of select telcos, 2018-2020

[136] Balinbin, A.L. (2019, July 8). "Mislatel to rebrand as 'Dito Telecommunity' after getting license," *BusinessWorld*, https://www.bworldonline.com/mislatel-to-rebrand-as-DITO-telecommunity-after-getting-license/
[137] Go, J. (2020, October 2). "In it to win it," *Philippine Daily Inquirer*, https://business.inquirer.net/308602/in-it-to-win-it
[138] Camus, M. R. (2018, December 7). "Converge ICT slashes internet prices, improves speed," *Philippine Daily Inquirer*, https://business.inquirer.net/261780/converge-ict-slashes-internet-prices-improves-speed

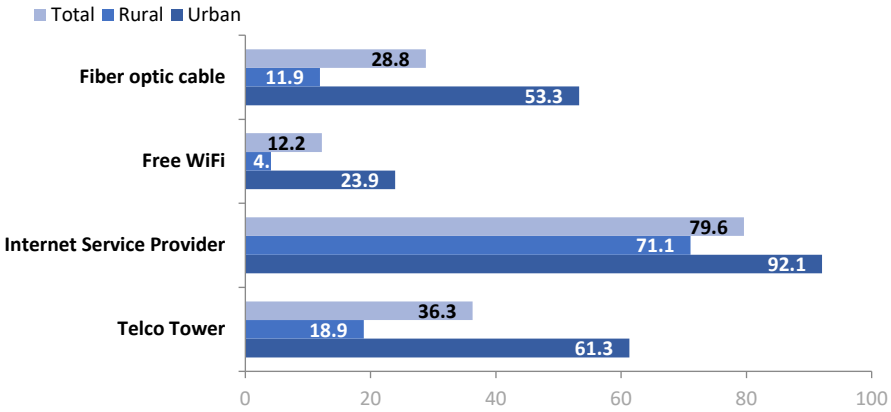


Sources: Consolidated from various telco annual reports and press releases.[139]

On average, telco capital investments is 2.8% of gross capital formation (GCF) and 0.6% of the country's GDP.

In recent years, partly as a result of competition in the fixed broadband segment but perhaps mainly because of the increased bandwidth demand during the pandemic, telcos have been fast-tracking fiber optic cable rollout. By end of 2020, 556,786 kilometers of fiber optic cables have been deployed. However, rollout of fixed broadband infrastructure is biased towards the urban areas (see Figure 2 below).

Figure 10. Proportion (%) of surveyed barangays with ICT infrastructure and service providers



Data source: PIDS DPS 2021-20, p.62

The availability of sustainable demand for internet and ICT services (e.g., population density and degree of urbanization) is often the main driver of business decisions to put up or supply the infrastructure. However, in the Philippines, another factor is the restrictions on non-telco service providers from building and operating a broadband network (see BOX). Based on the regulatory

[139] 2018-2020 capex data: ConvergeICT taken from SEC Form 17-A, page 53, https://corporate.convergeict.com/wp-content/uploads/2020/10/CNVRG_FY20_17A_vF.pdf; Globe Telecom take from Globe 2020 Integrated Report, page 8, https://www.globe.com.ph/content/dam/globe/brie/About-us/sustainability/documents/GLO_IR2020.pdf; PLDT taken from PLDT Annual Report page 4, https://pldt.com/docs/default-source/annual-reports/2020/main_pldt-2020-ar.pdf?sfvrsn=2

interpretation of existing laws, anyone who wants to connect to the Internet, classified as a value-added service, has to connect to a telco facility. As such, broadband connectivity is available only where the telcos choose to go, despite the presence of local enterprises that can operate as Internet service providers.

BOX: Regulatory constraints and legal restrictions for Philippine broadband providers

Apart from a public telecommunications entity (PTE), a CATV operator is the only other industry player that can be licensed to deploy wired infrastructure at the last mile. Executive Order 436 provides that CATV operators may lease or sub-lease excess capacity of its CATV system to a third party. Rule 920 of the Implementing Rules and Regulations of Republic Act 7925 or the Public Telecommunications Policy Act also provides that "cable TV operations shall be governed by EO 205 series of 1987," which requires cable operators to secure a certificate of authority to operate from the NTC, rather than a franchise from Congress.

In a recent survey, it was estimated that 1.8 million homes have Internet connection, thanks to small CATV operators. A good majority of the subscriptions is fiber to the home (FTTH). CATV operators have been heavily investing in fiber optic cables since the 1990s. Joel Dabao, president of the Philippine Cable Television Association, says that the smaller CATV operators have actually transitioned to FTTH because it is much easier to maintain than a hybrid fiber coaxial plant, which has many points of failure compared to pure fiber. Hence, it can be assumed that where there are CATV operators, it is likely that there is an FOC facility in the area.[1]

However, existing laws does not allow CATV operators to put up middle mile infrastructure (to connect to the nearest backbone facility) unless it secures a legislative franchise to operate as a telco. Another option is for the CATV operator to apply for a provisional authority from the National Telecommunications Commission (NTC) to operate in each of the municipalities that their facilities would pass through, even though the cable operator does not intend to offer services in those communities or despite the presence of enough players operating in the municipality.

Other types of ISPs are not even allowed to deploy a network going to their customer premises, even if just a few meters of cable. Instead, the ISP rents middle mile service through a telco, then the telco lays the cable into the ISP customer's premises (a service called metro ethernet). In short, a small ISP serves as a telco reseller. The telco, as the source of wholesale bandwidth, is not prohibited from selling retail Internet services in the same market as its client ISP's customer base.

The only way an ISP can distinguish its services and pricing from a telco is to acquire a content delivery network service (see Section for more information about CDN) or, when the ISP is big enough, purchase higher bandwidth that allows for cheaper upstream price and more flexibility in retail pricing.

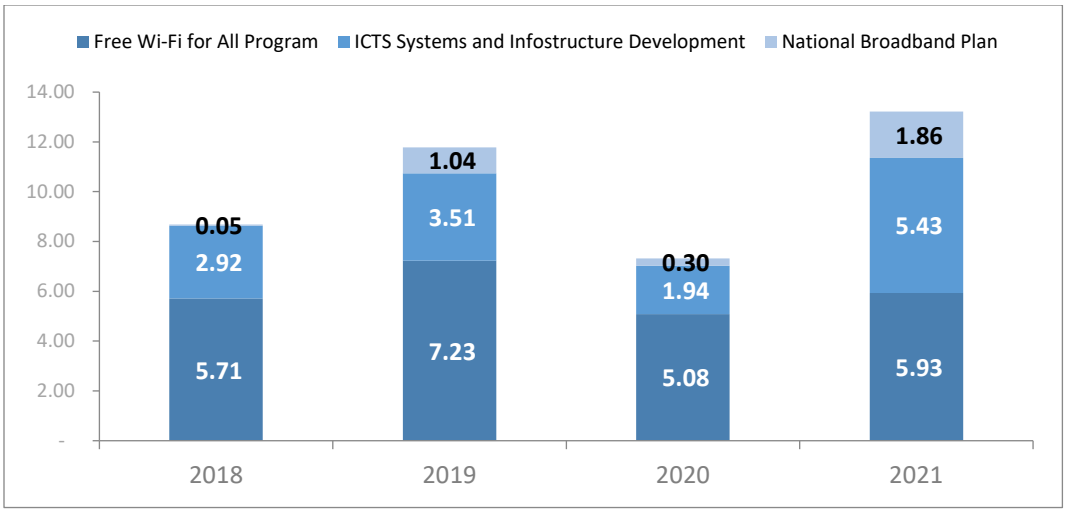
Public sector investment

Over the last four years, the government has investment PHP3.2 billion for the implementation of the National Broadband Plan (NBP), which was issued in 2017. In 2021, the budget for the NBP (for capital outlay and maintenance and other operating expenses) was PHP1.8 billion, a 500% increase from the 2020 allocation.

Government investment for the Free Wi-Fi for All Program is at PHP25.88 billion for 2017-2021. The budget allocation for the project decreased in 2020 but increased again by 17% in 2021.

Total public investment for digital infrastructure in 2020 is PHP13.22 billion. Investments noticeably dropped in 2020 but increased in 2021. This public investment on digital infrastructure represents 0.17% of gross capital formation and 0.04% of the country's GDP.

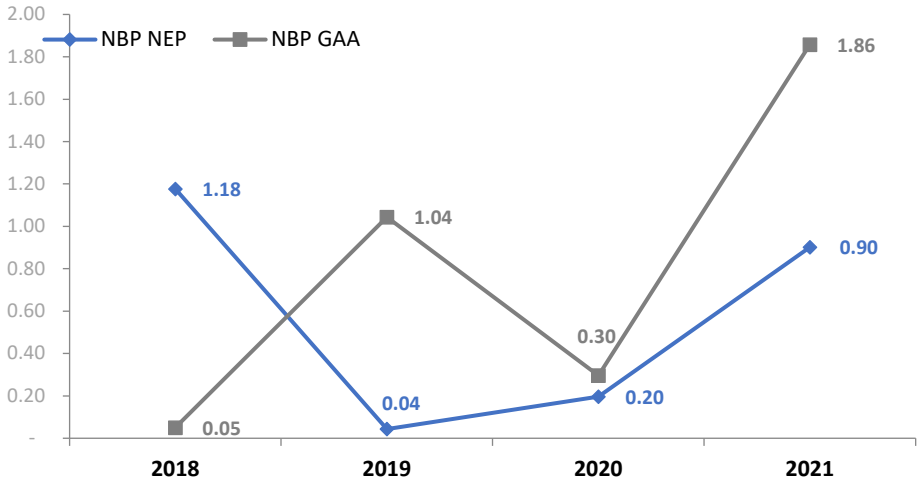
Figure 11. Public investments for digital infrastructure, 2018-2021



Data source: GAA for years indicated

For areas where the market does not see commercial viability, a long-term and consistent public digital infrastructure investment is needed in order to address the infrastructure gap. For instance, the approved budgets for NBP for 2019-2021 are much higher than what were proposed in the NEP. Though this is a positive outcome, the proposed and approved budget is not in sync with the proposed amount of the Department of Information and Communications Technology (DICT), the executive agency mandated to implement the NBP, and the final amount of budget approved seemed arbitrary.

Figure 12. Proposed and Approved Budget for National Broadband Plan (values in Billion PHP)



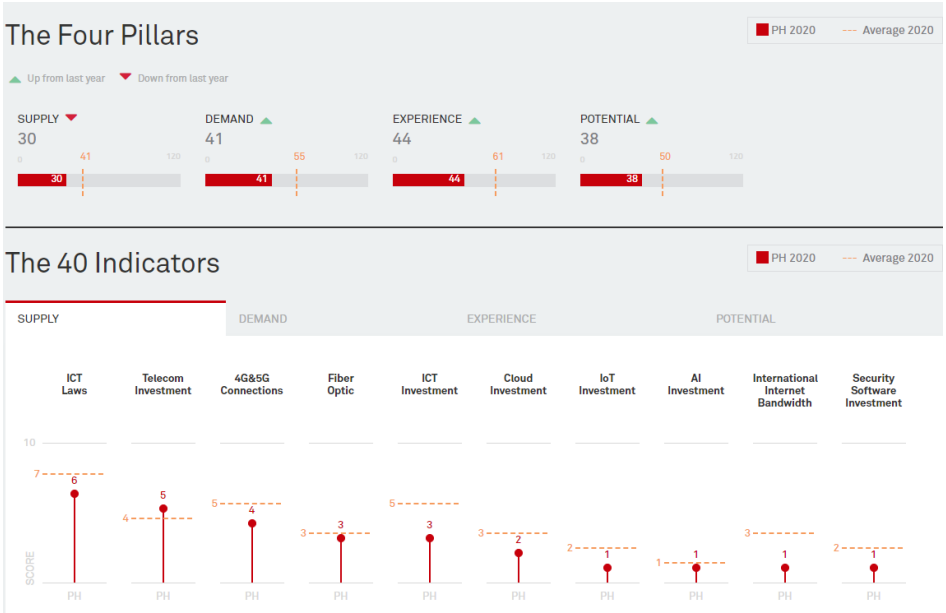
Source of data: DBM GAA and NEP

The Global Connectivity Index Report 2020 identified the Philippines as a starter in digital development.[140] It ranked 59th out of the 79 economies included in the Index. Starter economies are focused on expanding digital connectivity to increase its citizens' access to the digital

[140] GCI tracks the relationship between ICT infrastructure investment and economic growth.

economy. At the other end of the spectrum are ICT mature economies, known as frontrunners, whose priorities are in AI, 5G and IoT investments. The country scored below the global average in the four pillars of supply, demand, experience, and potential. Under the supply pillar, the country scored mostly below the global average, and scored above the global average only for telecom investments indicator. [141] Noticeably, the Philippines' scores for ICT investment [142] and international internet bandwidth[143] are much lower than the global average.

Figure 13 .Philippines Country Profile, 2020 Global Connectivity Index



Source: GCI 2020, https://www.huawei.com/minisite/gci/en/country-profile-ph.html

The infrastructure gap is also evident in the performance of internet connection in the country. Based on OOKLA's Speedtest Global Index, the Philippines' fixed broadband internet speed was 71.85 Mbps in September 2021 and ranked 64th out of 181 countries while mobile broadband speed was 35.03 Mbps and ranked 72nd of 138 countries surveyed.[144]

At the start of the global health crisis, the Philippine government imposed a strict lockdown in Metro Manila in March 2020 and then expanded this to the entire Luzon region. Ookla's tracking of internet performance for the Philippines showed a deterioration in download speeds when citizens were forced to stay indoors and go online for work, education, and commerce. Mobile download speeds started to return to pre-lockdown levels on the week starting May 18 with the gradual lifting of the quarantine status (only Metro Manila and Laguna in Luzon, and Cebu City in

[141] Telecom investment refers to "telecom service provider investment in modern network infrastructure over an aggregated five-year period." The Philippines' two major telcos have increased capex over the past few years, which began with the selection of the third major player in 2018. 'Third player' entry drives defensive capital spending by PLDT, Globe - BusinessWorld Online (bworldonline.com). For more information on Huawei's GCI 2020 Report, visit https://www.huawei.com/minisite/gci/assets/files/gci_2020_whitepaper_en.pdf?v=20201217v2.

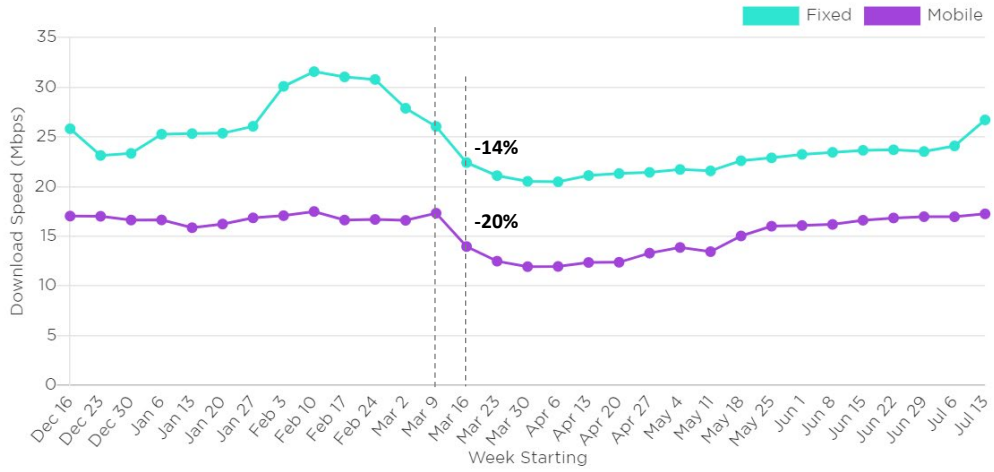
[142] ICT investment is the "overall size of the traditional ICT market in each country, as defined by the total amount of end-user spending on IT hardware (servers, storage, PCs, devices, peripherals, network equipment), software, IT services and telecom services."

[143] International Internet bandwidth is "the total used capacity of international Internet bandwidth, in megabits per second (Mbit/s)." The average bandwidth over a 12-month period is calculated per user.

[144] Philippines's Mobile and Fixed Broadband Internet Speeds. https://www.speedtest.net/global-index/philippines. Accessed on October 1, 2021

the Visayas were under modified ECQ or MECQ from May 16 to 31). It seems that while the country's digital infrastructure was able to handle the increase in demand in places where connection is already available, quality of service declined.

Figure 14. Philippine Internet Performance



Source: Ookla Speedtest, https://www.speedtest.net/insights/blog/tracking-covid-19-impact-global-internet-performance/#/Philippines

On the Week starting March 9, fixed and mobile download speeds were at 26.04mbps and 17.31mbps. Then on the Week starting March 16, fixed and mobile download speeds were at 22.4mbps and 13.9mbps, or a 14% and 20% decline.

Building a high-quality national universal service is a key part of building a nationally unified digital platform and market. The definition of broadband universal service has gradually become a global consensus.

For the majority of Filipinos, mobile communication is their main channel to access the internet. Expanding access to mobile internet and introducing mobile internet to promote digital integration is an important way to realize national digitalization. Government financial support is importrant for universal mobile coverage. As population density decreases, the commercial drivers of network infrastructure investment are getting smaller. Public investment is needed to ensure universal service. It is necessary to establish and run a mechanism of universal access and service by the government and industry, promote the effective use of the universal service fund to achieve universal connectivity especially for the residents with low-income or from the remote rural areas.

Digitalization in Key Sectors

Several studies, on the impact of internet access on both developed and developing economies done over time, show that it positively affects growth.[145] For instance, Qiang, Rosotto, and Kimura's 2009 research has shown that an additional 10 percentage points of internet penetration adds 1.2 percentage points to per capita GDP growth in high-income economies and an additional

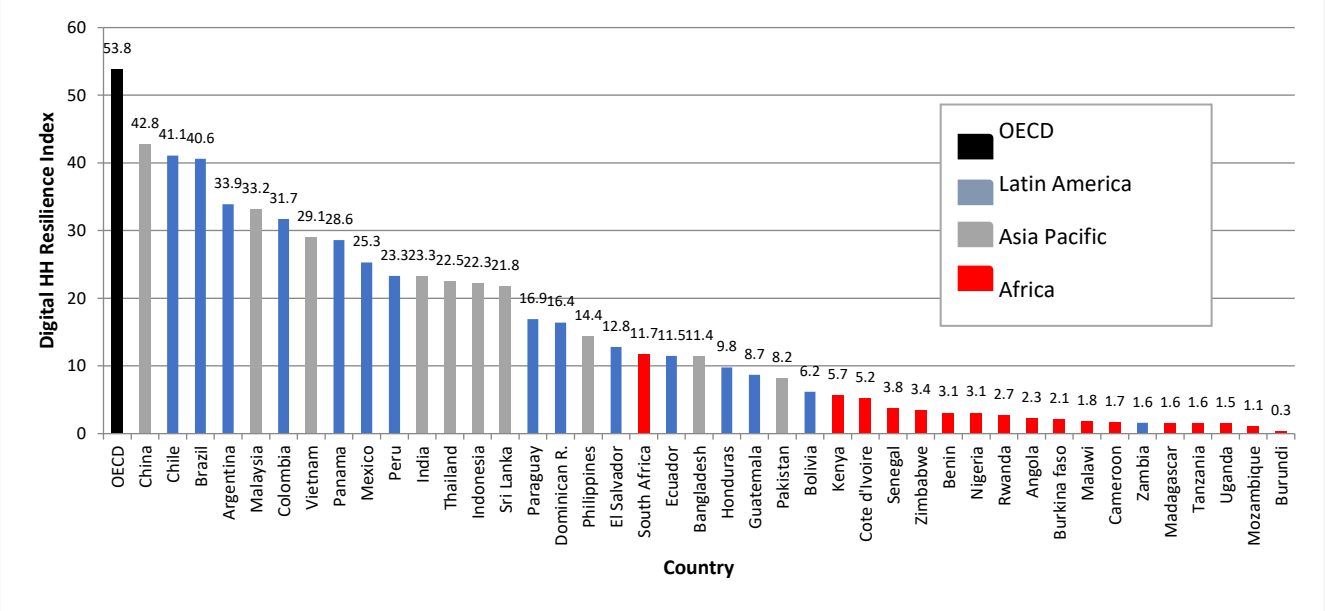
[145] Qiang et al. (2009), Czernich et al (2009), Koutroumpis (2009), Scott (2012), Zaballos, Lopez-Rivas (2012), Katz and Koutroumpis (2012), Thompson and Garbacz (2011), Chu (2013), Ericsson (2013), Koutroumpis (2018)

10 percentage points of broadband penetration adds 1.38 percentage points of per capita GDP growth in low and middle income countries.[146]

Digitalization—the use of digital technologies, which leads to fundamental changes in business processes that can result in new business models and social change[147]—plays a role in mitigating the economic effect of the global health crisis. Countries that are at a higher level of digital maturity are better able to respond and decrease the negative impact on GDP per capita by 50%.[148] An analysis of digital infrastructure and economic effect of the SARS-CoV in 2003 showed that *"good connectivity infrastructure could have mitigated approximately 75% of the economic loss."*[149]

Katz, Callorda, Martin, and Jung (2020) developed a simple index to measure the ability or preparedness of connected households to carry out activities over the internet in case of lockdowns. The higher the index, the better prepared the population.[150] The study shows that households in OECD countries are better prepared to face the pandemic than most of the developing countries included.

Figure 15. Developing Countries: Digital Household Resilience Index (2019)



Source: Katz, Raul L. and Callorda, Fernando Martin and Jung, Juan. (2020), p. 15

[146] Qiang, C. and C. Rossotto with K. Kimura, (2009). "Economic Impacts of Broadband" in Information and Communications for Development 2009: Extending Reach and Increasing Impact. World Bank, https://documents1.worldbank.org/curated/en/645821468337815208/pdf/487910PUB0EPI1101Official0Use0Only1.pdf

[147] Prause, J. (n.d.). "Digitization vs Digitalization," SAP Insights, https://insights.sap.com/digitization-vs-digitalization/

[148] GCI 2020 Report

[149] Katz, Raul L. and Callorda, Fernando Martin and Jung, Juan. (2020). Can Digitization Mitigate COVID-19 Damages? Evidence from Developing Countries. https://ssrn.com/abstract=3600829 or http://dx.doi.org/10.2139/ssrn.3600829

[150] The Household digital resilience index is composed of four indicators: Number of health apps downloaded annually per population, Number of health apps downloaded annually per population, Number of fintech platforms per million inhabitants and E-Commerce as a %age of total retail commerce. The higher the adoption levels of each of the four indicators, the better prepared the population will be in facing the pandemic.

The global health crisis has accelerated the adoption of digital service in Southeast Asia. For 2020 alone, there were 40 million new digital service users in the region and another 40 million Southeast Asians became internet users in 2021.[151] Since the start of the pandemic, the Philippines has gained 12 million new digital users. It was estimated that 2 in 3 Filipinos (63%) was a new user with more than half of new users coming from outside metropolitan areas. Almost all or 99% of these new users intend to continue using digital services post-pandemic.[152]

Measuring impact of digitalization on the different dimensions of the digital economy

E-commerce

According to a 2018 survey, there are clear benefits of digital integration for business, especially the small- and medium-sized enterprises (SMEs):[153]

- ~15% average sales increase for surveyed retail SMEs who use e-commerce;
- 5% to 20% average cost reduction when manufacturing SMEs use an enterprise resource planning system;
- 5% to 15% improvement in crop yield in agriculture SMEs using various farming apps; and
- 10% to 20% average improvement in productivity for logistics SMEs that use digital tools.

Developing the Philippines' potential in digital trade and e-commerce is identified as a strategy to improve competitiveness, innovativeness, and resilience of industries and services.[154] The country's young and technology savvy population that spend a lot of time online and its high mobile-phone penetration rate are a huge untapped market both for ecommerce and digital payments.

The Philippines is the fastest growing market in Southeast Asia in 2021. The Philippine internet economy doubled from US$ 9 billion in 2020 to US$ 17 billion in 2021 and is projected to grow by 24% or US$ 40 billion in 2025. Despite the high projected growth, the actual size is small relative to its Southeast Asian peers. Value created through e-commerce has increased by over 130% from US$5 billion in 2020 to US$12 billion in 2021, and is expected to reach US$26 billion in 2025.[155]

To continue to support the growth of e-commerce, the Department of Trade and Industry (DTI) has developed a roadmap seeking to double e-commerce share to the economy to PHP1.2 trillion by 2022 or 5.5% of the country's GDP. In 2020, the contribution of e-commerce to the economy was estimated at PHP599 billion or 3.4% of GDP.[156] There is great opportunity to grow this contribution, as people, businesses, and government continue to conduct activities online beyond

[151] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021. Retrieved from https://services.google.com/fh/files/misc/e_conomy_sea_2021_report.pdf
[152] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021.
[153] Bain & Company (2018). Advancing towards ASEAN digital integration: Empowering SMEs to Build ASEAN's Digital Future.
[154] NEDA. PDP 2017-2022, https://pdp.neda.gov.ph/wp-content/uploads/2017/01/PDP-2017-2022-10-03-2017.pdf
[155] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021.
[156] DTI. E-commerce Philippines Roadmap 2022. https://ecommerce.dti.gov.ph/madali/images/eCommerce_Philippines_Roadmap_2022.pdf

the pandemic. One projection sees the use of digital technologies to transform local businesses as creating up to PHP5 trillion in economic value annually by 2030.[157]

Under the e-Commerce Roadmap, the government will work to achieve the goal of increasing the number of e-commerce enterprises from 500,000 in 2020 to one million by 2022.[158] Towards this end, the DTI has implemented various initiatives:

- Pre-COVID-19, DTI and Google launched the Micro, Small and Medium Enterprise (MSME) Caravan to help digitize small businesses.[159]
- DTI's Business Centers (Negosyo Centers) in the rural areas are helping to promote e-commerce amongst the MSMEs.
- DTI has partnered with the Department of Science and Technology's (DOST)'s oneSTore.ph, the government's first ecommerce platform, to promote and host the products of government-assisted MSMEs online.[160]
- DTI launched "CTRL + Biz Reboot Now!", a free webinar series targeted at educating MSMEs on how to digitally change their businesses. This has been attended by over 500,000 participants.[161]
- DTI partnered with major online platforms, like Shopee and Lazada, to help online firms navigate the e-commerce platform.[162]
- DTI is conducting online business-matching sessions to help get new markets for exporters. Its Export Bureau is facilitating the onboarding of MSMEs on the e-commerce platform eCFULFILL so they can sell their products on Amazon, eBay and Etsy. [163]

In addition, the DOST Small Enterprises Technology Upgrading Program (SETUP) supports MSMEs in adopting technological innovations to improve their products and operations. The program provides MSMEs with" "(1) seed fund for technology acquisition, (2) needed equipment and equipment upgrading, (3) technical trainings and consultancy services, (4) packaging and label design, (5) database information systems, and (6) support for establishment of product standards, including testing, and calibration of equipment." The Program has transitioned to SETUP 4.0 in 2020 to support MSMEs in its digitalization and automation efforts.[164]

At the height of the pandemic in 2020, the Department of Agriculture (DA) has also launched their *Kadiwa* store online – the e*Kadiwa*. Through this online marketing platform, consumers have access to fresh and affordable farm and fisheries product and at the same time, support local

[157] Newsbyte.PH. (2021, October 19). "Report: Digital adoption of PH firms could unlock trillions in economic value," *Newsbyte.PH*, https://newsbytes.ph/2021/10/19/report-digital-adoption-of-ph-firms-could-unlock-trillions-in-economic-value/
[158] DTI. E-commerce Philippines Roadmap 2022.
[159] Gonzales, AL. (2021, October 11). "E-commerce, other sectors thrive in pandemic," *The Manila Times*, https://www.manilatimes.net/2021/10/11/tmt-anniversary/e-commerce-other-sectors-thrive-in-pandemic/1817630
[160] Crismundo, K. (2018, April 4). "DTI to promote gov't online store in Negosyo Centers," *Philippine News Agency*, https://www.pna.gov.ph/articles/1030903
[161] DTI. (2020, July 9). DTI to utilize digital strategies to help small businesses recover. https://www.dti.gov.ph/archives/news-archives/digital-strategies/
[162] DTI. (2020, July 9). DTI to utilize digital strategies to help small businesses recover. https://www.dti.gov.ph/archives/news-archives/digital-strategies/
[163] DTI. (2020, August 3). DTI-EMB chief tells MSMEs: Shift to digital amid contagion. https://www.dti.gov.ph/negosyo/exports/emb-news/dti-emb-chief-tells-msmes-shift-to-digital-amid-contagion/
[164] Arayata, M. C. (2020, July 28). "DOST to implement SETUP 4.0 before yearend," *Philippine News Agency*, https://www.pna.gov.ph/articles/1110396

farm producers and agri entrepreneurs.[165] At present, there are already 27 merchants that are part of e*Kadiwa*.[166]

The shift to more online shopping will be the new normal. Consumer demand for online shopping that was accelerated by the pandemic is sticky, with 73% of Filipinos saying that they are more likely to sustain or increase current online shopping behavior post-pandemic.[167] Google's 2021 e-Conomy Report also shows that almost all or 99% of the 12 million new online consumers in the country intend to continue using digital services post-pandemic.[168]

The DTI E-Commerce Roadmap 2022 identifies four key enablers that make it easy for buyers to purchase and sellers to market. The first enablers is **access**, which "refers to those responsible for providing fast and reliable internet that enables access to platforms for buyers and sellers, or search engines such as Google that provide information access to buyers and sellers, or social media channels such as Instagram provide product-offering access to buyers and sellers."

The e-commerce ecosystem is "a network of interconnected functions that comprise a full cycle of buying and selling goods and services electronically." **The lifecycle of an online transaction begins from accessing the Internet**. However, Internet availability and quality remains a barrier to the adoption of e-commerce in the Philippines. A rapid assessment study[169] conducted as part of the e-Commerce Roadmap 2022 formulation process from April 2020 to June 2020 found that 85% of business respondents had computers and smartphones but only 40% were satisfied with **Internet speed and reliability**. Businesses across industries and asset sizes also clamored for "greater government support on: "internet speed, cybersecurity, ease of doing business, and logistics systems and infrastructure."[170]

A 2019 Philippine Institute for Development Studies (PIDS) study showed that a firm's size, availability of computers, access to the internet, and use of ICT in other operations of the firm determines e-commerce adoption.[171] In 2020, a DTI baseline survey showed that more than half of MSMEs did not have online presence and only a quarter was aware of digitalization programs offered by the government and other organizations.[172] In early 2021, a survey conducted by the DTI showed that 70% of MSMEs have not adopted e-commerce yet.[173] Despite this, the global health crisis prompted more vendors to go online. In the Philippines, 39% of online sellers believed that adopting digital platforms has helped keep their businesses afloat.[174] Almost all the online sellers surveyed for the Google 2021 e-Conomy Report accepts digital payments and have adopted various digital tools to engage consumers.[175]

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[165] Quieta, R. (2020, May 6). "eKadiwa: Support local producers and agripreneurs through the online Kadiwa store," *GMA Network*, https://www.gmanetwork.com/entertainment/celebritylife/food/62962/ekadiwa-support-local-producers-and-agripreneurs-through-the-online-kadiwa-store/story?amp

[166] eKadiwa website. https://www.ekadiwa.da.gov.ph/

[167] Agcaoili, L. (2020, July 19). "7 of 10 Pinoys to shop more online – survey," *The Philippine Star*, https://www.philstar.com/business/2020/07/19/2028939/7-10-pinoys-shop-more-online-survey

[168] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021.

[169] Respondents came from various industries (e.g., retail trade, logistics, manufacturing, etc.). See https://ecommerce.dti.gov.ph/madali/images/eCommerce_Philippines_Roadmap_2022.pdf. (Need permission from DTI to cite survey results)

[170] DTI. E-Commerce Philippines 2022 Roadmap. https://ecommerce.dti.gov.ph/madali/images/eCommerce_Philippines_Roadmap_2022.pdf

[171] Quimba, Francis Mark A. and Sylwyn C. Calizo Jr. (2019). Determinants of E-Commerce Adoption of Philippine Businesses. PIDS DPS No. 2019-24. Philippine Institute for Development Studies. https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps1924.pdf

[172] DTI. Baseline Survey on Digitalization of MSME (September 2020). https://ecommerce.dti.gov.ph/madali/baseline_survey.html

[173] Desiderio, L. (2021, March 20). DTI: 70% of MSMEs yet to adopt e-commerce. *The Philippine Star*, https://www.philstar.com/business/2021/03/20/2085552/dti-70-msmes-yet-adopt-e-commerce

[174] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021.

[175] Google, Temasek, Bain and Company. (2021). e-Conomy SEA 2021.

- Moving forward, the Philippines can push for more initiatives to ride on the momentum started during the pandemic and support more SMEs to engage in e-commerce. The Philippine government can look at various strategies implemented by other countries for accelerating the adoption of e-commerce.

- In Singapore, for example, the government launched its "e-commerce booster package" to support its small and mid-sized businesses in their digital transformation. The package offers to cover 90% of the eligible cost of small businesses that will sign up for the program. Businesses will be assisted by the e-commerce platforms tapped by the government, namely, Lazada Singapore, Qoo10, Shopee, and Amazon, in selling their products online.[176]

- In Ireland, the government provides a grant to eligible businesses to start their own e-commerce platform. Meanwhile, Greece launched a digital solidarity platform where big tech firms can offer free training programs on online marketing and account management for small businesses.[177]

Banking and Finance

Financial inclusion—a state wherein there is effective access to a wide range of financial services for all, especially the vulnerable sectors[178]—is an important objective for the Philippines, where in 2019 only 29% of the 51.2 million adult Filipinos were banked.[179]

The Bangko Sentral ng Pilipinas[180] has made significant steps to achieve inclusive access to digital payments services. Pre-pandemic, there was already a steady increase in fintech development and adoption, with the BSP taking on a regulatory sandbox approach to support innovations in technological financial systems. The National Retail Payment System (NRPS) in 2015, under which two automated clearing houses, PESONet and InstaPay, were created, is positioned to be an innovation platform for fintech.[181] The advent of the Internet and extensive developments in technology opened up opportunities for the banking industry and fintech companies to adopt innovative ways to reach the unserved and underserved population.[182]

The potential for digital financial inclusion in the country is huge. As of January 2020, an estimated 63 million Filipinos were internet users, spending an average of 10 hours a day online. Mobile phone penetration is also high. BSP's 2019 Financial Inclusion Survey found that 52% of the adult

[176] Yu, E. (2020, April 2). "Singapore offers financial help for SMB retailers to go online," *ZDNet*, https://www.zdnet.com/article/singapore-offers-financial-help-for-smb-retailers-to-go-online/

[177] For more information on interventions of various governments in support of SMEs, visit https://som.yale.edu/blog/governments-encourage-smes-to-adopt-new-technology

[178] Definition of Financial Inclusion, BSP.https://www.bsp.gov.ph/SitePages/InclusiveFinance/InclusiveFinance.aspx

[179] Banked means owning a bank account. Based on BSP 2019 Financial Inclusion Survey. https://www.bsp.gov.ph/Inclusive%20Finance/Financial%20Inclusion%20Reports%20and%20Publications/2019/2019FISToplineReport.pdf.

[180] BSP. The BSP and Financial Inclusion. https://www.bsp.gov.ph/Pages/InclusiveFinance/BSPAndFinancialInclusion.aspx, accessed on October 22, 2021

[181] BSP. Speech of Governor Diokno for the eCompareMo.com Finovation Event on September 25, 2019 at the Peninsula, Makati. https://www.bsp.gov.ph/Pages/MediaAndResearch/Speeches/2019/September/678.aspx, accessed on October 23, 2021

[182] BSP. BSP Digital Payments Transformation Roadmap 2020-2023. https://www.bsp.gov.ph/Media_And_Research/Primers%20Faqs/Digital%20Payments%20Transformation%20Roadmap%20Report.pdf

population are using a smartphone. However, only 10% of adults use their mobile phone and internet for financial transactions and 71% of them do not have a transaction account.[183]

The BSP is confident that it will reach its goal of a cash-lite Philippines – increase digital payments to 50% and to encourage 70% of Filipinos to have their own bank accounts by 2023 under its Digital Payments Transformation Roadmap 2020-2023.[184] The year 2020 saw a 53% growth in active user for select mobile banking apps[185] while active e-money accounts increased by more than 200% from 41 million in 2019 to almost 140 million in 2020.[186] Given these developments, Bangko Sentral Governor Benjamin Diokno stated that the increase in fintech usage will likely remain post-pandemic. [187]

The availability and quality of Internet connection has implications on the national goal toward financial inclusion, particularly the use of key digital services like digital payments. Like stakeholders in other sectors, the BSP recognizes the **broader challenge on the state of broadband infrastructure** to support digital financial inclusion. Hence, the central bank supports policy reforms that "aim to address digital connectivity gaps." In particular, the BSP "sees strong potential in the use of satellite communications technology" in delivering internet connectivity.[188] The Financial Inclusion Steering Committee, of which BSP is a member, also endorsed the Open Access in Data Transmission bill.[189]

The challenge of lack of documentation for inclusive finance was recognized as another challenge, but is now addressed by the Philippine ID System (PhilSys). The BSP envisions a PhilSys-enabled Know-Your-Customer (KYC) to encourage more Filipinos to access digital financial services.[190] For instance, the co-location strategy of the Land Bank in the PhilSys registration sites resulted in more than five million Filipinos opening a bank account as of October 2021.[191]

In its survey, the *Bangko Sentral ng Pilipinas* (BSP) or Central Bank showed that an estimated 51.2 million Filipinos or 71% of the adult population do not use banks while 8.8 million have active e-money wallets. About 12% of mobile phone owners and 21% of adults with accounts use their phones to conduct financial activities despite the fact that mobile phones are used by the majority of individuals.[192]

Going cash-lite

[183] BSP Digital Payments Transformation Roadmap 2020-2023.
[184] BSP Digital Payments Transformation Roadmap 2020-2023.
[185] Google, et al. 2020
[186] BSP. Forging Pathways To A Cash-lite Society. Status of Digital Payments in the Philippines 2021 Edition. https://www.bsp.gov.ph/PaymentAndSettlement/BSP-Forging_pathways_to_a_cash-lite_society-Status_of_Digital_Payments_in_the_Philippines_(2021_edition).pdf
[187] Lucas, D. L. (2020, May 11). "BSP: E-payments surge during lockdown bodes well for shift to digital transactions," *The Philippine Star*, https://business.inquirer.net/296973/bsp-e-payments-surge-during-lockdown-bodes-well-for-shift-to-digital-transactions
[188] BSP Digital Payments Transformation Roadmap 2020-2023.
[189] BSP. Speech of Governor Benjamin Diokno at the Ulat ng BSP sa Bayan on February 19, 2021 at the Philippine International Convention Center, https://www.bsp.gov.ph/SitePages/MediaAndResearch/SpeechesDisp.aspx?ItemId=780
[190] BSP Digital Payments Transformation Roadmap 2020-2023.
[191] PhilSys Official Facebook Page. https://www.facebook.com/PSAPhilSysOfficial/photos/a.383166075829278/1077059266439952/
[192] BSP Digital Payments Transformation Roadmap 2020-2023.

The BSP's goal of going cash-lite will have implications for financial inclusion. Starting from a low baseline, the pandemic gave e-cash adoption the boost that it needed. Among 10 countries surveyed in the Asia-Pacific region by YouGov, the Philippines saw the highest increased in in e-cash adoption during this pandemic at 35%, with the regional average at 15%.[193] The challenge now is creating the right environment to continue the momentum.

The Philippines saw an increase in the volume of digital payments in 2020 reaching 20.1%, which achieved the BSP's goal of digitalizing 20% of the country's transaction in 2020. A large portion of the 4.5 billion monthly volumes of digital transactions came from payments made by individuals (78.1%), followed by business payments (21.2%) and government payments (0.7%).[194]

Table 12. Shift and share of digital payments BY VOLUME in 2020

Classified by the payer and overall All numbers are in millions					
		OVERALL	**P2X**	**B2X**	**G2X**
NON-DIGITAL		3,624	2,712	910	2
DIGITAL		910	828	52	30
Share of Digital Payments	**2020**	20.1%	23.4%	5.4%	93.2%
	2019	14%	15%	6%	80%

Table 13. Shift and share of digital payments BY VALUE in 2020

Classified by the payer and overall **All numbers are in USD millions**					
		OVERALL	**P2X**	**B2X**	**G2X**
NON-DIGITAL		90,199.3	19,548.7	69,099.0	1,551.6
DIGITAL		33,027.8	15,422.8	10,132.5	7,472.5
Share of Digital Payments	**2020**	26.8%	44.1%	12.8%	82.8%
	2019	24%	28%	17%	87%

Source: BSP, Status of Digital Payments in the Philippines 2021

The value of digital payments also increased in 2020 to 26.8% from 24% in 2019. Government payments remain the most cash-lite in both volumes (93.2%) and value (82.8%). Between 2019 and 2020, transfer volume of both PESONet and InstaPay increased from 46 million to 270 million (484.7%) and value increased from PHP1.517 trillion to PHP4.03 trillion (165.4%).[195]

The boom in digital payments is supported by the country's fintech ecosystem. There are 197 fintech companies in the Philippines with lending (24%), payments (21%), digital wallets (12%), and remittances (12%) as the four dominant markets.[196] In the first half of 2020, over 80% of the total announced invested capital in startups was in the fintech sector.[197] Just recently, Mynt (Globe Fintech Innovations, Inc.) which is a fintech startup backed by Globe Telecom, Ayala

[193] Manhit, V.A.C. (2021, October 19). "The rise of the Philippine cashless economy," *BusinessWorld*, https://www.bworldonline.com/the-rise-of-the-philippine-cashless-economy/
[194] BSP Status of Digital Payments in the Philippines 2021 Edition
[195] BSP Status of Digital Payments in the Philippines 2021 Edition
[196] Fintech News Philippines. (2020, September 4). Fintech Report Philippines 2020: Mapping out the Fintech Philippines Ecosystem. https://fintechnews.ph/41725/fintech/fintech-report-philippines-2020/
[197] Mirasol, P.B. (2020, December 9). "Philippine startup fundraising hits $184 million in first half of 2020," *BusinessWorld*, https://www.bworldonline.com/philippine-startup-fundraising-hits-184-million-in-first-half-of-2020/

Corporation and Ant Financial has reached unicorn status. [198] Mynt is now valued at over US$2 billion after it has successfully raised US$300 million in fresh funding from global investors led by Warburg Pincus and Insight Partners.[199] Mynt provides payments, remittance, loans, business solutions, and platforms services.[200] It is the company behind the mobile wallet Gcash. By the end of 2021, the company expects to have transacted PHP3 trillion (almost US$60 billion), more than tripling projected 2020 figures. The number of Gcash daily logins and active transactions peaked at 19 and 12 million, respectively.[201]

BSP digital financial inclusion initiatives

The BSP continues to implement policies and develop new payment streams to achieve financial inclusion:

- The National Retail Payment Systems (NRPS) has spurred the growth of e-commerce. InstaPay and PesoNet facilitate convenient and secure electronic fund transfers and payments.
- BSP supported electronic KYC and, at the height of the country's lockdown in April 2020, relaxed its KYC requirements for over-the-counter, electronic, and digital transactions.
- BSP has licensed six digital banks: Overseas Filipino Bank, a subsidiary of state-owned Land Bank of the Philippines; Tonik Digital Bank, Inc. (Philippines); UNObank; Aboitiz-led Union Digital Bank; GOtyme by the Gokongwei Group Singapore financial technology (fintech) firm Tyme; and Maya Bank, the fintech arm of Voyager Innovations, Inc.[202]
- BSP launched in October 2021 the Quick Response (QR) Ph P2M, which is an expansion of the QR Ph P2P launched earlier in 2019. The P2M aims to digitize even smaller businesses in the countryside such as *sari-sari* store owners and tricycle drivers.[203]
- BSP is set to launch an interoperable digital payments system in 2022 to harmonize the fragmented bills payment mechanism. Other developments in the pipeline are direct debit and request to pay facility.[204]

Banks and digital financial inclusion

Banks and financial institutions have demonstrated innovative ways to use digital technologies and encourage the participation of the unbanked in the rural areas.

The CARD MRI Banking Group, for example, introduced ATM withdrawals with the use of a smartphone. The Konek2CARD app minimizes banking transaction costs as withdrawals and deposits can be made through Konek2Card agents in the communities that are accredited by CARD MRI. Thus, CARD Bank clients in far-off areas need not go to a bank branch to conduct

[198] Bautista, R. N. (2021, November 2). "Ant-backed Mynt breaches $2b valuation post-$300m funding," *Tech In Asia*, https://www.techinasia.com/antbacked-mynt-breaches-2b-valuation-post300m-funding
[199] Bautista, R. N. (2021, November 2).
[200] Mynt Official Website. https://www.mynt.xyz/about-us/, accessed on November 8, 2021
[201] Bautista, R. N. (2021, November 2).
[202] Laforga, B.M. (2021, October 5). "BSP caps digital bank licenses at six," *BusinessWorld*, https://www.bworldonline.com/bsp-caps-digital-bank-licenses-at-six/
[203] BSP Status of Digital Payments in the Philippines 2021 Edition
[204] BSP Status of Digital Payments in the Philippines 2021 Edition

transactions. As of June 2021, there were already one million Konek2CARD registrants. CARD Bank aims to bring digital banking services to 3.5 million clients by June 2022.[205, 206]

RCBC and DTI launched the DiskarTech's NegosyanTech Program, which aims to digitalize community-based enterprises to benefit an estimated 1.3 million sari-sari stores and market vendors, and seven million informal and unregistered home-based microbusinesses. DiskarTech is the country's first and only *Taglish* local finance app. It reached one million download in just five weeks from its launch. Small businesses can gain additional income through its various features and a savings account interest rate of 3.25%.[207]

Government digital finance initiatives

The government can also lead the digitalization efforts in finance and partner with the private sector in order to create a robust digital payments ecosystem.

The EGov Pay is a web-based facility used for online payment of taxes, permits and other government fees. In the first five months of 2021, transactions rose by over 5,000% in volume and over 2,000% in value over the same period last year.[208] In July 2021, BSP Governor Diokno announced that there were already 387 government entities onboarded in the EGov Pay facility or 90 % of the government billers targeted for this year.

The Department of Transportation (DOTr) implemented cashless toll collection systems in major expressways in the National Capital Region (NCR) in late 2020.

The Department of Social Welfare and Development (DSWD) worked with the BSP to implement account-based contactless distribution of the 2nd tranche of the government's Social Amelioration Program. This has resulted to almost 10 million new transaction accounts.[209]

Several government agencies, such Bureau of Internal Revenue (BIR), Bureau of Customs (BoC), Social Security System (SSS) and Home Development Mutual Fund or Pag-IBIG (Pag-IBIG), receive payments and contributions using PayMaya Checkout, One by PayMaya, and PayMaya QR.[210]

PayMaya's Local Government Unit (LGU) Embracing and Accelerating Digitalization (LEAD) Program, which was started in July 2020, aims to assist local governments with cashless payments and digital disbursements.[211] LGUs, such as Makati City and Muntinlupa City, have partnered with mobile wallet Gcash to facilitate the distribution of the government's *ayuda* or financial assistance.[212] Other local governments, including Quezon City, Manila City, Taguig City,

[205] Mindanao Times. (2021, October 18). "App ramps up digital campaign," https://mindanaotimes.com.ph/2021/10/18/app-ramps-up-digital-campaign/
[206] CARD SME Bank. (n.d.). CARD SME Bank and its digital banking transformation. https://www.cardmri.com/cardsmebank/?p=1134, accessed on October 23, 2021
[207] DTI. (2020, August 4). DTI, RCBC onboard millions of micro-enterprises to digital. https://www.dti.gov.ph/archives/news-archives/micro-enterprises-to-digital/
[208] Chipongian, L.C. (2021, July 8). "Onboarding of EGov Pay 90% done – BSP," *Manila Bulletin*, https://mb.com.ph/2021/07/08/onboarding-of-egov-pay-90-done-bsp/
[209] BSP Status of Digital Payments in the Philippines 2021 Edition
[210] Back End News. (2021, July 10). PayMaya enables government agencies adopt digital payment technology. https://backendnews.net/paymaya-enables-government-agencies-adopt-digital-payment-technology/
[211] Back End News. (2021, July 10).
[212] BusinessWorld. (2021, August 10). "Makati and Muntinlupa LGUs partner with GCash to deliver digital 'ayuda'," *BusinessWorld*, https://www.bworldonline.com/makati-and-muntinlupa-lgus-partner-with-gcash-to-deliver-digital-ayuda/

Pasig City, Caloocan City, Mandaluyong City, Marikina City, Paranaque City, and Valenzuela City, use PayMaya's platform.

Financial inclusion international experience

Indonesia. Tech giants Sea Ltd and Gojek have both acquired local banks in Indonesia to tap into the more than 83 million Indonesians or about a third of the country's population that remain unbanked.[213] Indonesia is Southeast Asia's largest economy and is home to more than 300 fintech companies.[214] Gojek's GoPay and Grab's OVO, and DANA which is a part of Ant Financial, are the top e-wallet applications used. Both Grab and Gojek have become somewhat of a superapp with services including transportation, food delivery, groceries, financial services and more.[215]

Indonesia's fintech companies like PayFazz, Kudo, and Amartha have adopted a bank agent model to reach the unbanked in rural areas. Well-trained bank agents are promoting fintech products and teaching rural users on how to use these financial services. Integration of fintech solutions in e-commerce platforms has also increased financial inclusion in the rural areas. Because of these efforts, transaction account ownership of rural Indonesians increased from 16% in 2011 to 47% in 2017.[216]

Vietnam. Vietnam has also recently experienced a rise in digital payment adoption. Mainly because of the pandemic, online transactions increased by 66% in the first four months of 2021, compared to the same period last year. E-wallet adoption has also increased from 16% in 2017 to 56% in 2021.[217] This is significant, as almost 70% of the population are unbanked and 90% prefer to use cash on delivery (COD) for orders made online.[218]

Most recently, Vietnam's State bank launched mobile money service for pilot testing for two years. The government's telco and private telco MobiFone have signed up to pilot the mobile money service. Through this service, mobile phone credits can be used to pay small-value transactions.[219]

Kenya. In Kenya, a mobile money service called *M-Pesa* was introduced by the telecommunication company Safaricom in 2007. Kenya has a high mobile penetration rate but also a huge unbanked population, especially in rural areas. The *M-Pesa* service allows mobile users to do financial transactions through a network of agents. Customers need only to register for an *M-Pesa* account and transactions are confirmed via SMS. In 2016, 96% of Kenyan households had used the mobile money service. In 2017, 10 years after the service was first launched, *M-Pesa* was serving 30 million customers across 10 countries. A year later, there were

[213] Jiao, C., Sihombing, G. and F. Dahrul. (2021, January 28). "Banking on Indonesia's unbanked: Tech giants see big potential," *Aljazeera*, https://www.aljazeera.com/economy/2021/1/28/bb-banking-on-indonesias-unbanked-tech-giants-see-big-potential
[214] Medina, A.F. (2021, April 7). "Opportunities in Indonesia's Financial Technology Sector," *Asia Briefing*, https://www.aseanbriefing.com/news/opportunities-in-indonesias-financial-technology-sector/
[215] Medina, A.F. (2021, April 7).
[216] Mulia, K and AJ Cortese. (2020, August 6). "Serving the unbanked: Driving financial inclusion in Indonesia's rural areas (Part 2 of 2)," *KrASIA*, https://kr-asia.com/serving-the-unbanked-driving-financial-inclusion-in-indonesias-rural-areas-part-2-of-2
[217] Dharmaraj, S. (2021, October 13). "Vietnam to Pilot Mobile Money Services for Two Years," *OpenGov Asia*, https://opengovasia.com/vietnam-to-pilot-mobile-money-services-for-two-years/
[218] Das, K. (2017, July 12). "Vietnam's Payment Preferences: Four Trends to Watch," *Vietnam Briefing*, https://www.vietnam-briefing.com/news/vietnams-payment-preferences-4-trends-watch.html/
[219] Dharmaraj, S. (2021, October 13).

over 110,000 *M-Pesa* agents, which was 40 times the number of bank ATMs in Kenya at the time. A 2016 study concluded that *M-Pesa* has improved the lives of Kenya's citizen, lifting an estimated 194,000 households out of poverty.[220]

Education

The pandemic has forced schools to shut down and teachers and learners to shift to remote learning. Globally, 1.2 billion students in 186 countries were affected by school closures. This gave rise to e-learning platforms. A 2018 report by the International Telecommunications Union (ITU) showed that for middle-income countries like the Philippines, a 1% increase in fixed and mobile broadband penetration was associated with 0.06% and 0.08% increases in education's contribution to GDP per capita, respectively. This multiplier effect indicates that by investing in digital connection for students and the education system as a whole, the government can generate more economic value from its present education investment.[221]

In developing countries, like the Philippines, schools scrambled to adopt e-learning, which posed a challenge given the lack of digital infrastructure, devices, and training, among others.

The Philippine government, primarily through the Department of Education, has been supporting the use of technology for education, particularly in the form of providing digital hardware to schools. In 1996, the DepEd launched the DepEd Computerization Program. The DepEd Internet Connectivity Program (DICP), which began in 2009, a budget of PHP4,000 per month or PHP48,000 annually is allotted for the internet connectivity of each school.[222]

Over the years, other government agencies, LGUs, statae universities and colleges (SUCs), non-government organizations (NGOs), and the private sector have implemented various ICT for education initiatives such as the DTI's "Personal Computers for Public Schools" project, DOST's "Cloud top" Project, and FIT-ED's *Pilipinas* SchoolNet Project.[223]

For broadband connectivity, the government through the then ICT Office explored the use of TV white space (TVWS) or unused television bands. The TVWS pilot tests were conducted in Talibon, Bohol in 2014. The present TVWS technology can transmit data of up to 6 Mbps across a distance of up to 10 kilometers.[224] In 2017, the National Telecommunications Commission (NTC) issued a memorandum circular allowing the DICT the use of TVWS on VHF on a secondary basis, for the implementation of the government's Free Wi-Fi Project.[225] Relatedly, the DICT fast-tracked the roll out of the Free Wi-Fi Project aiming to establish 2,527 live sites in public schools and 1,804

[220] Piper, K. (2020, September 11). "What Kenya can teach its neighbors — and the US — about improving the lives of the "unbanked"," *Vox*, https://www.vox.com/future-perfect/21420357/kenya-mobile-banking-unbanked-cellphone-money
[221] Katz, R., & Callorda, F. (2018). *The economic contribution of broadband, digitization and ICT regulation*. International Telecommunications Union. https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/FINAL_1d_18-00513_Broadband-and-Digital-Transformation-E.pdf
[222] RTI International (2020). *EdTech Ecosystem Report: Philippines*. USAID. https://ierc-publicfiles.s3.amazonaws.com/public/resources/EdTech%20Ecosystem%20Full%20Report%20FINAL_1.pdf
[223] De Dios, B.V. (2016). *Building and sustaining national ICT/education agencies: Lessons from the Philippines*. World Bank Education, Technology & Innovation: SABER-ICT Technical Paper Series (#15). https://openknowledge.worldbank.org/bitstream/handle/10986/26262/113217-NWP-PUBLIC-ADD-SERIES-Agencies-Philippines-SABER-ICTno15.pdf?sequence=1&isAllowed=y
[224] DICT. (2014, February 24). TV White Space Deployment in PH the Largest in Asia. https://dict.gov.ph/tv-white-space-deployment-in-ph-the-largest-in-asia/
[225] NTC Memorandum Circular No. 02-04-17. https://ntc.gov.ph/wp-content/uploads/2017/MC/MC-02-04-2017.pdf

live sites SUCs and Technical Education and Skills Development Authority (TESDA) institutions.[226]

In April 2021, the DepEd and the DICT entered into an agreement for the establishment of the Public Education Network (PEN), a priority activity of the Digital Rise Program, DepEd's holistic framework in integrating ICT in the education sector.[227] PEN intends to improve digital connection in all public schools and DepEd offices around the country, allowing students to access DepEd TV, DepEd Commons, and other learning platforms more easily. In addition, PEN will link DepEd offices to governance platforms including the DepEd Enterprise Resource Planning System (DERPS), the Learner Information System (LIS), the DepEd Mobile App, and others.[228] The DICT and DepEd's partnership will establish a framework cooperation and collaboration between the two agencies, including advocacy for ICT service providers' presence in public school buildings, provision of online resources, materials, and systems for educational use, and coordination with the NTC, among other things. The DICT will also help increase DepEd's future satellite capacity for Last Mile Schools and provide data transport service via a fiber-optic network under the GovNet project and Microwave towers as part of its medium to long-term commitment.[229] Achieving the vision of the Digital Rise Program of having all schools, teachers and students digitally-enabled will cost an estimated PHP267 billion, which is 27 times higher than the 2021 budget for ICT in education (see Table 4).[230]

Challenges in education during the pandemic

With school closures due to the pandemic, learning has moved to the home and availability of internet and digital devices at home has become more important. The NICTHS survey 2019 show that only 24% of households own a computer, with only 17.7% having internet connection at home. The high cost of internet subscription, high cost of equipment, and the unavailability of internet in their area are top three reasons cited by households for not having internet connection at home.[231]

Younger members of the population (ages 5-17) not allowed to go out means public Wi-Fi spaces set up by the government were not useful to learners. Computer shops that were cited by 35.6% of household respondents in the NICTHS as one of the alternative ways to access to computer were also closed.[232]

In July 2020, the DepEd conducted a survey on the parents' preferred learning modality for their children before the start of classes. Almost half of parents surveyed preferred modular learning,

[226] Dharmaraj, S. (2020, June 18). "DICT fast-tracks free WiFi project in Philippine schools," *OpenGov Asia*, https://opengovasia.com/dict-fast-tracks-free-wifi-project-in-philippine-schools/
[227] Llego, M. A. (n.d). "DepEd Digital Learning Requirements for the COVID-19 Pandemic," *TeacherPH.com*, https://www.teacherph.com/deped-digital-learning-requirements-covid-19-pandemic/, accessed on October 26, 2021
[228] DepEd. (2021, April 19). DepEd, DICT team up to roll out Public Education Network. https://www.deped.gov.ph/2021/04/19/deped-dict-team-up-to-roll-out-public-education-network/
[229] DepEd. (2021, April 19).
[230] Llego, M. A. (n.d.).
[231] Albert, J.R. G., Quimba, F.M.A.,Tabuga, A.D., Mirandilla-Santos, M.G., Rosellon, M.A.D., Vizmanos, J.F.V.M, Cabaero C.C. and M.S. Muñoz. (2021). Expanded Data Analysis and Policy Research for National ICT Household Survey 2019. PIDS Discussion Paper Series No. 2021-20. https://serp-p.pids.gov.ph/publication_detail?id=7390
[232] Albert, J.R. et. Al. (2021).

and 20% preferred blended and online learning.[233] The preference for offline self-learning modules is understandable given the relatively low level of household internet access.

Table 14. Survey of parents' preferred learning modality

Learning modality	Number of respondents	share
modular	8. 8 million	46%
blended	3.9 million	20%
online	3.9 million	20%
educational TV	1.4 million	7%
radio	0.9 million	5%
other modalities	0.5 million	3%

Source: DepEd

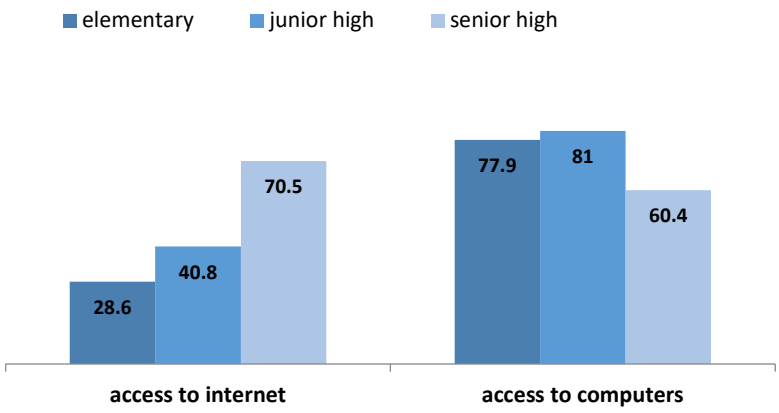
The sudden shift of learning from schools to the home has regrettably resulted in many Filipino students left behind. For school year 2020-2021, an estimated three million students did not enrol. The DepEd informed that many parents cited lack of access to technology for distance learning and inadequate education to guide their children's learning as the most common reasons.[234]

This lack of preparedness for digital transformation is more evident in poor households. By income class, 69% and 83% of poor and low-income families own a mobile phone while ownership of computer is much lower. Only 1% of poor families, 6% of low-income families, and 27% of lower-middle income families own a computer.[235]

The same can be said for schools in the country. In 2018, only 28.6% of elementary schools have access to internet for pedagogical purposes, 40.8% of junior high schools and 70.5% of senior high schools, while 77.9% of elementary schools, 81% of junior high schools and 60.4% of senior high schools have access to computers.[236]

Figure 16. Proportion of schools with access to internet and computers for pedagogical purposes

[233] DepEd Official Statement on LESF. July 29, 2020. https://www.deped.gov.ph/2020/07/30/official-statement-on-lesf/
[234] Mateo, J. (2020, October 4). "Classes set to resume with millions not enrolled," *The Philippine Star*, https://www.philstar.com/headlines/2020/10/04/2047050/classes-set-resume-millions-not-enrolled
[235] Abrigo,M.R.M., Uy, J., Haw, N.L., Ulep, V.G.T, and Kris Francisco-Abrigo. (April 2020). Projected Disease Transmission, Health System Requirements, and Macro-economic Impacts of the Coronavirus Disease 2019(COVID-19) in the Philippines. PIDS Discussion Paper Series No. 2020-15. Philippine Institute for Development Studies. https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps2015.pdf
[236] PSA. Sustainable Development Goals. OpenStat. Accessed on September 11, 2021 https://openstat.psa.gov.ph/PXWeb/pxweb/en/DB/DB__3I__G04/0133I3D04A1.px/table/tableViewLayout1/?rxid=790becbe-5e37-45ce-8d6e-ebf0d8b9cb24



Source: Philippine Statistics Authority OpenStat, Sustainable Development Goals

In a survey conducted by SWS on learning delivery modality in November 2020, a month after the school year started, it found that 80% of currently enrolled school-age household members use purely modular distance learning, 14% are in purely online distance learning (ODL), 1% in purely traditional face-to-face learning, 4% in blended mode, and 0.1% in television/radio based instructions.[237] Of the estimated 4.7 million households with members in online distance learning modality, 39 % have 'strong' internet connection, 29% have 'fair,' and 31% have 'weak' connections. 56% of ODL families use pre-paid, 41% use post-paid, and 5% rent their internet connection.[238] Also, 58% of enrolled students use devices for distance learning. Smart phone is the preferred learning device: 86% of students in rural areas while 74% of students in urban areas acquired a smartphone.[239]

Similarly, a Pulse Asia survey on remote learning experience of students and parents showed that issues related to internet connectivity and access to gadgets were among the most common educational problems encountered during the pandemic with 43% of the respondents saying intermittent Internet connection is usually their problem at home, 36% identified the lack of gadgets like cellphones, tablets or laptops, and 30% said they struggle with expensive Internet fees.[240]

Teachers are also bearing the brunt of distance learning as they had to spend their personal money to support their teaching needs.[241] According to a research released by the National Research Council of the Philippines, the primary obstacles faced by teachers in distant teaching and learning during the global health crisis in the country are internet access and internet

[237] Social Weather Stations. Fourth Quarter 2020 Social Weather Survey on Learning Delivery Modalities. (March 5, 2021). (Part 3). https://www.sws.org.ph/downloads/media_release/pr20210305%20-%20SWR%202020-IV%20Learning%20Delivery%20Modality_Part%203%20(media%20release).pdf
[238] Social Weather Stations. Fourth Quarter 2020 Social Weather Survey on Learning Delivery Modalities. (March 5, 2021). (Part 3).
[239] Social Weather Stations. Fourth Quarter 2020 Social Weather Survey on Learning Delivery Modalities. (March 1, 2021). (Part 2). https://www.sws.org.ph/downloads/media_release/pr20210301%20-%20SWR%202020-IV%20Learning%20Delivery%20Modality_Part%202%20(media%20release).pdf
[240] NewsByte.PH (April 26, 2021). "Survey shows distance learning woes hounding parents, learners," https://newsbytes.ph/2021/04/26/survey-shows-distance-learning-woes-hounding-parents-learners/
[241] Perez, A. (2021, August 17). "Internet access 'main challenge' for teachers in distance teaching in PH: study," *ABS-CBN News,* https://news.abs-cbn.com/spotlight/08/17/21/internet-access-main-challenge-for-ph-teachers-study

speed.[242] More than 90% of the teachers used modules in distant learning because of the problems with internet connectivity throughout the country.

DepEd Secretary Leonor Briones acknowledged that **stable and reliable internet connection is indeed a nationwide challenge**. She further explained that although DepEd would prefer shifting to technology for distant learning because it is least expensive than reproducing materials, however, internet connectivity is very limited.[243] This digital divide is revealed in the photos and videos of students and teachers' alike going viral on social media, as they either climb a tree, a hilltop or camp along the highway to get a reliable signal.

In response to the need to ensure connectivity for students and teachers in the midst of the global health crisis, a total of PHP7.65 billion for the education sector was included in the emergency law Bayanihan 2 or Bayanihan to Recover As One Act.

The Commission on Higher Education (CHED) was granted PHP3.3 billion under the Bayanihan 2 law for the Smart Campus Development projects of SUCs. The Smart Campus Development program includes provision of laptop computers for SUCs' faculty (PHP1.04 billion) and Smart Campus project proposals of SUCs (PHP1.96 billion).[244] Around 89 eligible SUCs were given a grant of not more than PHP25 million for their project proposals aimed at improving the implementation of flexible learning, such as internet access upgrade, campus area network, learning management system, learner information system, smart classrooms, student computer centers, or faculty multi-media centers.[245]

While DepEd's emergency appropriation of PHP4.35 billion are intended for provision of laptop computers for Teachers (2.4B), internet connectivity load (1.2B), DepEd TV and radio (300M), learning modules (150M) and basic education subsidies and allowances (300M).[246]

TESDA, on the other hand, was granted PHP1 billion to grant scholarships for the displaced workers and returning OFWs. Even with the pandemic, the upskilling and retooling of workers continued through the TESDA Online Program (TOP) which was established in 2012. The online platform had a total of 1.6 million registered from March 2020 to June 2021.[247]

Telecom companies PLDT/Smart and Globe provided free access to DepEd Commons and other web-based learning tools to support distant learning during the pandemic. Students and teachers can utilize DepEd Commons to access online study materials and Open Educational Resources (OER) even without data load.[248] The DepEd Learning Management System's zero-rating procedure is also nearing completion.[249]

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[242] Perez, A. (2021, August 17).
[243] Perez, A. (2021, August 17).
[244] CHED. (2021, July 14). CHED utilized 99% of its Bayanihan 2 funds by 30 June 2021. Press Release. https://ched.gov.ph/wp-content/uploads/CHED-utilized-99-of-its-Bayanihan-2-funds-by-30-June-2021.pdf
[245] CHED. (2021, July 14).
[246] DepEd. (2021, July 1). On Bayanihan 2 for Basic Education. Official Statement. https://www.deped.gov.ph/2021/07/04/on-bayanihan-2-for-basic-education/
[247] TESDA. (2021, July 19). Upskilling of workers to continue amid pandemic, TESDA assures. https://www.tesda.gov.ph/News/Details/20026
[248] Mocon-Ciriaco, C. (2020, October 8). "The impossible is possible: Covid shut down schools, but learning goes on," *Business Mirror*, https://businessmirror.com.ph/2020/10/08/the-impossible-is-possible-covid-shut-down-schools-but-learning-goes-on/
[249] Llego, M. A. (n.d.).

Globe launched its *globeelibrary.ph* which contains more than 1000 free e-books and videos for the use of students and teachers.[250] TV, radio and cable operators were also tapped for the delivery of free TV and radio-based instructions as part of their public service obligation.[251]

Smart Communications introduced School-in-a-Bag for schools located in remote areas with no electricity and internet signal. The bag is a portable digital classroom aimed at providing connectivity and educational content for learners in the last mile schools.[252]

Similar to the Wi-Fi on Wheels initiative in rural California where school buses were fitted with solar-powered Wi-Fi routers and parked in underserved areas to provide internet access,[253] the City of Manila and Globe Telecom launched the KonekTayo School Bus Wi-Fi project. The school buses are deployed in underserved areas in Manila providing 12 hours Wi-Fi access from Monday to Sunday. Teachers and students can use the internet for free on the first hour and the internet service costs PHP15 a day.[254]

Government and broadband initiatives in other countries

During the height of the pandemic in 2020, Malaysia telco companies Maxis, Celcom, Digi, U Mobile and Unifi Mobile provided users with one (1) GB of data daily for online learning and productivity needs.[255]

In Saudi Arabia, users of the health app *Sehha*, e-learning platforms, and the *Tawakkalna* app[256] had their data charges waived. Saudi mobile service providers were temporarily granted to use an extra 40 MHz in the 700 MHz and 800 MHz bands in March 2020, a 50% increase in spectrum holdings, to help ensure that internet access and speed remains strong despite the surge in data use. [257]

In Korea, zero-rating policy for educational websites was also implemented by telecom companies KT, LG and SK. Students from low income families were lent digital devices and the government installed internet service in their homes with a monthly internet subsidy of US$17. The Ministry of Education added extra servers for the two major online learning platforms, the Korea Education and Research Information Service's (KERIS) e-Learning Site, and the Education Broadcasting System's (EBS) Online Class Platform to handle increase in demand. The two platforms can now handle 3 million students simultaneously.[258]

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[250] Mocon-Ciriaco, C. (2020, October 8).
[251] DepEd. (2020, July 2). DepEd secures NTC's support for TV, radio-based education, https://www.deped.gov.ph/2020/07/05/deped-secures-ntcs-support-for-tv-radio-based-education/
[252] Smart Communications. School-in-a-bag. https://smart.com.ph/About/learnsmart/programs-projects/school-in-a-bag
[253] Lee, N. T. (2020, March 17). What the coronavirus reveals about the digital divide between schools and communities. Brookings Institution. https://www.brookings.edu/blog/techtank/2020/03/17/what-the-coronavirus-reveals-about-the-digital-divide-between-schools-and-communities/
[254] Globe Telecom. (October 19, 2020). Globe Launches KonekTayo School Bus WiFi in Manila, https://www.globe.com.ph/about-us/newsroom/corporate/konek-tayo-school-bus-wifi.html
[255] Yeoh, A. (2020, July 1). "MCMC: Free daily 1GB Internet data for productivity and information now valid for 24 hours," *The Star*, https://www.thestar.com.my/tech/tech-news/2020/07/01/mcmc-free-daily-1gb-internet-data-for-productivity-and-information-now-valid-for-24-hours
[256] allowed users to apply for permits to move after curfew
[257] ITU News.(2020, July 24). How Saudi Arabia is deploying ICTs against COVID-19 – and beyond. https://www.itu.int/en/myitu/News/2020/07/24/18/49/Saudi-Arabia-deploying-ICTs-against-COVID-19
[258] Cho, J. and B. Riley. (2020, August 20). *Responding to COVID-19 in South Korea: Discovering Online Education as a Key for Future Education*. Inter-American Development Bank. https://blogs.iadb.org/educacion/en/covid19southkorea/

In the United States, Comcast has lifted data limitations, improved download speeds, granted temporary waivers on late penalties, and opened its Wi-Fi hotspots to non-Comcast subscribers. Other telecom companies also followed suit.[259]

While in Columbia, telecom operator Claro increased data and minutes for its postpaid and prepaid customers. Claro, for example, has raised the speed of its internet connection by 50% in order to make work and academic activities easier.[260] In Argentina, mobile phone companies Movistar, Claro, and Personal, will provide free access to educational platforms and virtual classrooms at more than 57 national universities.[261]

4. Digital infrastructure as a foundation of digital transformation

The Asian Development Bank's Asian Economic Integration Report 2021 described digital transformation as the foundation of a new wave of globalization across all countries, characterized by regional integration.[262] Benchmarking the state of ICT development between countries is, therefore, an important way to gauge the Philippines' readiness to participate in the global digital economy. Particularly in a post-COVID-19 world that relies on digitalization as a basis for "robust, resilient, and sustainable economic recovery," growth will be heavily influenced by a country's ability to engage in global ICT-enabled activities and processes.[263] Those who are unable to do so due to a lack of enabling ICT infrastructure risk getting left behind.

This section compares the Philippines' ICT development across several key areas, using publicly available information, including the findings of previously published reports. While not comprehensive, this section aims to paint the picture of where the country's digital infrastructure development stands in relation to its peers in the Asia-Pacific, and in particular the ASEAN region. It also aims to triangulate the key ICT issue areas that need the most attention based on how far behind the Philippines is vis-à-vis comparable countries.

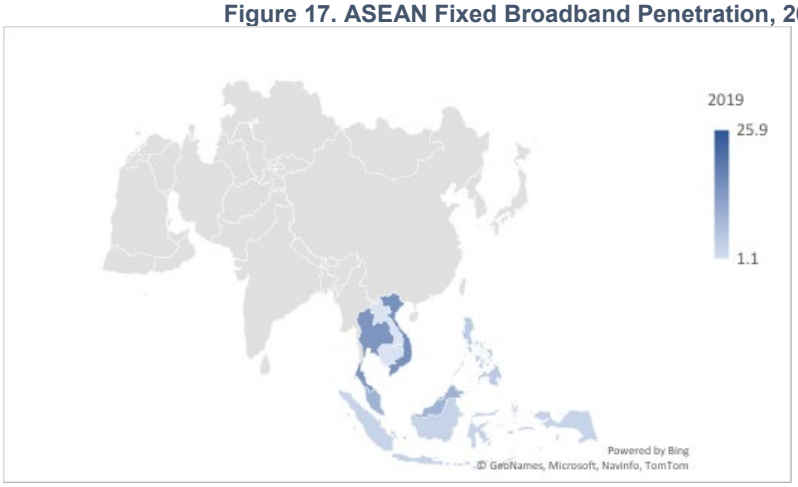
4.1 Fixed broadband networks

No collated data for wired Internet infrastructure coverage in the ASEAN region is available. However, a useful proxy for comparison is the proportion of the population with fixed broadband subscriptions. Although the number of people with wired Internet connections depends on more than just infrastructure availability, other intervening variables such as affordability are also linked to the relative development of ICT infrastructure.[264] Examining wired Internet penetration rate is therefore a useful way of gleaning insights into the state of wired Internet connectivity across countries.

[259] Lee, N. T. (2020, March 17).
[260] Saez, D. (2020, July 7). "Connectivity Challenges during Covid-19: Telecommunication Strategies," *The Dialogue,* https://www.thedialogue.org/blogs/2020/07/connectivity-challenges/
[261] Saez, D. (2020, July 7).
[262] ADB (2021).
[263] p. xvii, ADB (2021).
[264] See discussion in Section 1.

The following heat map shows fixed broadband density in the ASEAN region, based on the most recent year (2019) for which comparable data is available.[265]

Figure 17. ASEAN Fixed Broadband Penetration, 2019



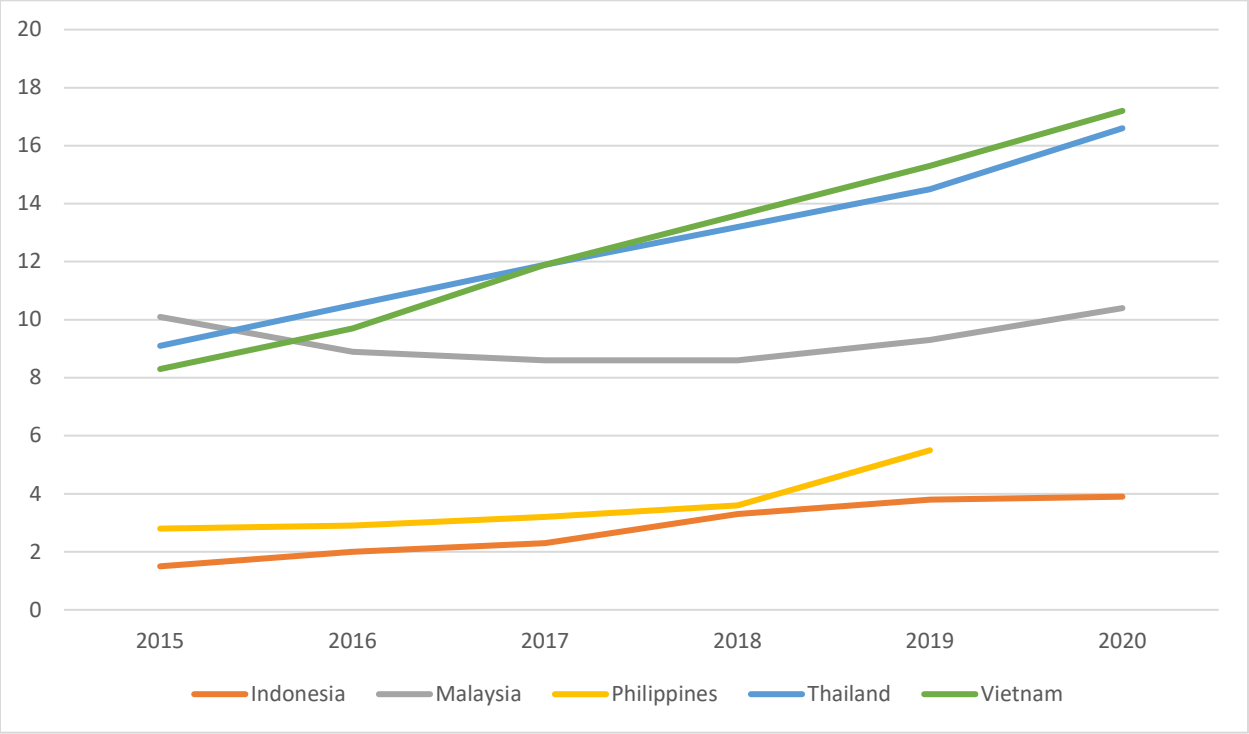
Source: Author's contribution, using data from ITU World Telecommunication/ICT Indicators Database.

Comparison reveals that fixed broadband penetration tends to be higher in continental Southeast Asia than in archipelagic countries. This is consistent with the expectation that wired infrastructure is easier to deploy in geographically contiguous terrain, as opposed to archipelagic countries. This alone, however. is not sufficient to explain the disparity in fixed broadband penetration between ASEAN countries.

Vietnam, for example, has a predominantly mountainous terrain, which presents similar geographic challenges to wired deployment as does archipelagos.[266] Both Vietnam and the Philippines also opened the telecoms sector to competition at around the same time, in 1995.[267] Despite these similarities, however, Vietnam's fixed broadband penetration rate stood at 15.3 percent as of 2019, compared to the Philippines' 3.6 percent.
The graph below shows the growth in fixed broadband penetration for select ASEAN middle-income countries for 2015-2020.[268]

[265] Data from ITU World Telecommunication/ICT Indicators Database, 2019. 2019 was chosen as it contained the most recent available data for the Philippines.
[266] About ¾ of all Vietnamese terrain is covered by mountains or highlands. See Socialist Republic of Vietnam (n.d.). Overview on Vietnam geography. *Socialist Republic of Vietnam Government Portal.* *http://chinhphu.vn/portal/page/portal/English/TheSocialistRepublicOfVietnam/AboutVietnam/AboutVietnamDetail?categoryId=10000103&articleId=10000505*
[267] Lee, R.C. (2011). Telecommunications in Viet Nam. In Findlay, C. (Ed.), *The Impacts and Benefits of Structural Reforms in the Transport, Energy and Telecommunications Sectors in APEC Economies* (pp. 415-432). APEC Policy Support Unit. https://www.apec.org/docs/default-source/publications/2011/1/the-impacts-and-benefits-of-structural-reforms-in-transport-energy-and-telecommunications-sectors/211_psu_structural-reform.pdf?sfvrsn=8e389685_1
[268] Most recent available data for the Philippines is from 2019.

Figure 18. Fixed Broadband Penetration Growth, Select Countries, 2015-2020



Source: Author's contribution, using data from ITU World Telecommunication/ICT Indicators Database.

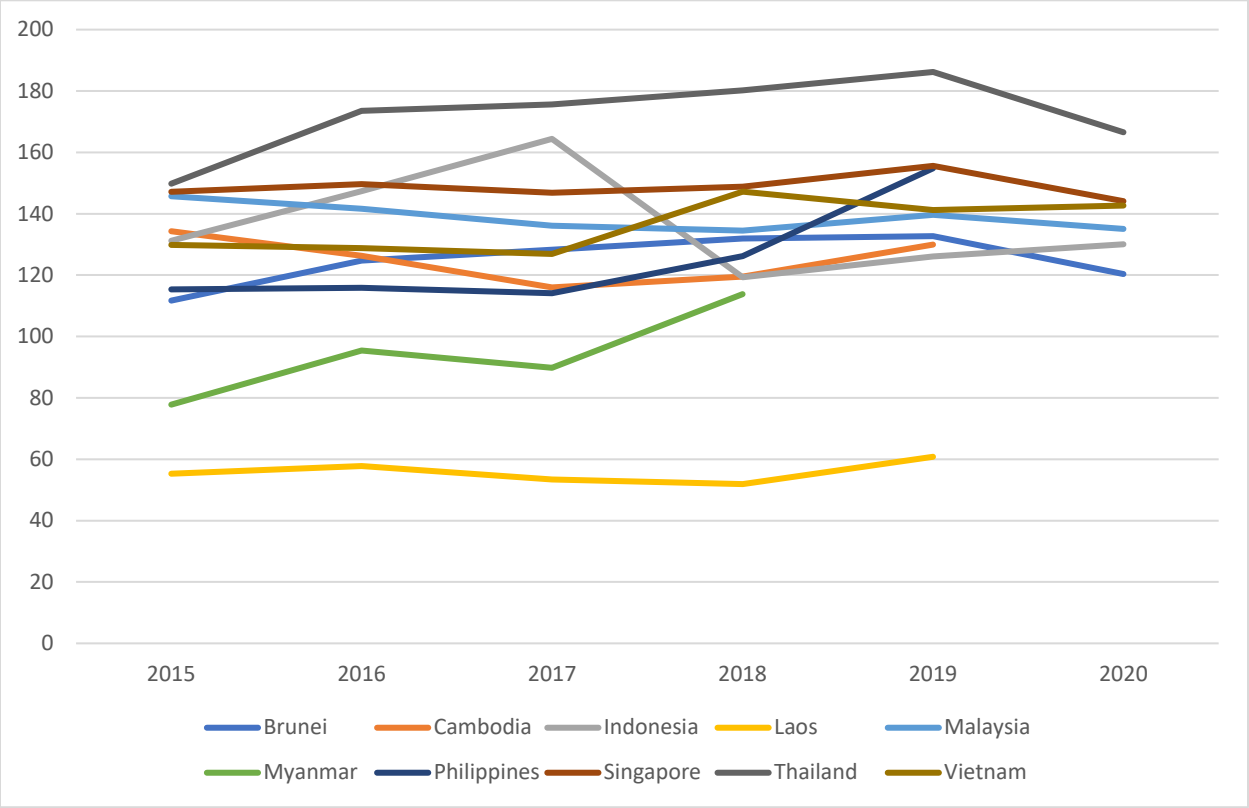
Comparing fixed broadband growth rates for comparable countries reveals that growth in wired Internet subscriptions in the Philippines has been very slow, particularly compared to Vietnam and Thailand. Indeed, between 2015 and 2018, the Philippines had the lowest positive growth rate in fixed broadband penetration among the countries examined (Malaysia experienced a negative growth rate during that period). Equally notable, however, is that between 2018 to 2019, fixed broadband subscriptions in the Philippines jumped 53 percent, from 3.6 to 5.5 subscriptions per 100 people.

This jump correlates to significant increases in capex spending from Globe and PLDT beginning in 2018, in response to the government's third telco selection process that culminated in the entry of Dito Telecommunity.[269] Similarly, fiber-only broadband provider Converge ICT significantly expanded its wired Internet network, deploying a 400 Gbps backbone network in 2019.[270] It is therefore reasonable to conclude that improvements in Philippine fixed broadband penetration were brought by increased market competition. Corollary to this, the slow deployment of wired Internet in the country may have been due to limited competition in the country prior to 2019.

4.2 Mobile broadband networks

[269] Venzon (2018).
[270] Converge (2019). Converge ICT rolls out 400Gbps backbone to deliver fastest internet speed in the Philippines. *Converge ICT Press Release.* https://www.convergeict.com/converge-ict-rolls-out-400gbps-backbone-to-deliver-fastest-internet-speed-in-the-philippines/

Figure 19. Mobile Subscribers per 100 People, ASEAN, 2015-2020



Source: Author's contribution, using data from ITU World Telecommunication/ICT Indicators Database.

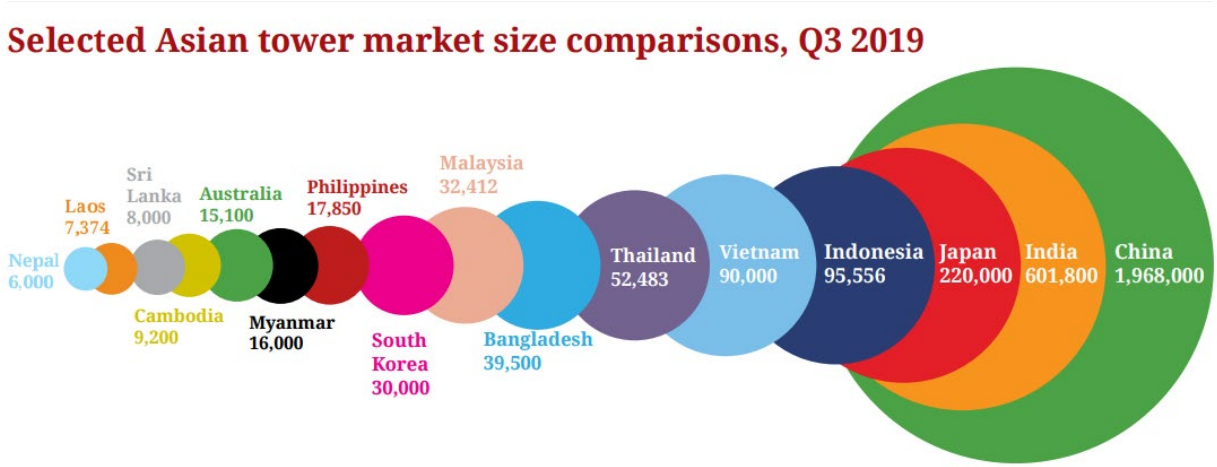
No comparative data for mobile broadband penetration in the ASEAN region is available. Instead this section looks at the growth of the mobile cellular sector in general, as measured by the number of mobile subscriptions in proportion to the population.

Like most Southeast Asian countries, the Philippines has more mobile subscriptions than people. Many users have multiple mobile devices, including tablets or computers, that may also be connected to a cellular network using a Subscriber Identity Module (SIM) card.[271] It should be noted that not all subscribers are mobile broadband users; a wide variety of factors, including device availability, cost, and network availability determine whether a mobile subscriber is willing or able to use mobile broadband. That said, it is still a useful measure for the general growth of the mobile cellular sector across countries.

A notable observation is that unlike most of the region's relatively stagnant growth in subscriber count, the Philippines experienced a surge in subscribers between 2018 and 2019 – from 126.2 to 154.8 subscriptions for every 100 people.[272] In fact this was the biggest increase in mobile subscribers among middle-income ASEAN nations for the period observed. As with the surge in fixed broadband, this may be attributed to increased competition in the space precipitated by Dito Telecommunity's entry, as incumbents Smart and Globe ramped up efforts to increase SIM sales. A limitation of this observation however is that no data exists to show whether these new

[271] Strictly speaking, mobile cellular refers to a communication protocol, and encompasses a range of 'smart' or connected devices, including phones, computers, and even smart appliances. For more discussion on cellular's use for the Internet of Things (IoT), refer to Section 2.
[272] 2019 data represents most recently available figure for the Philippines.

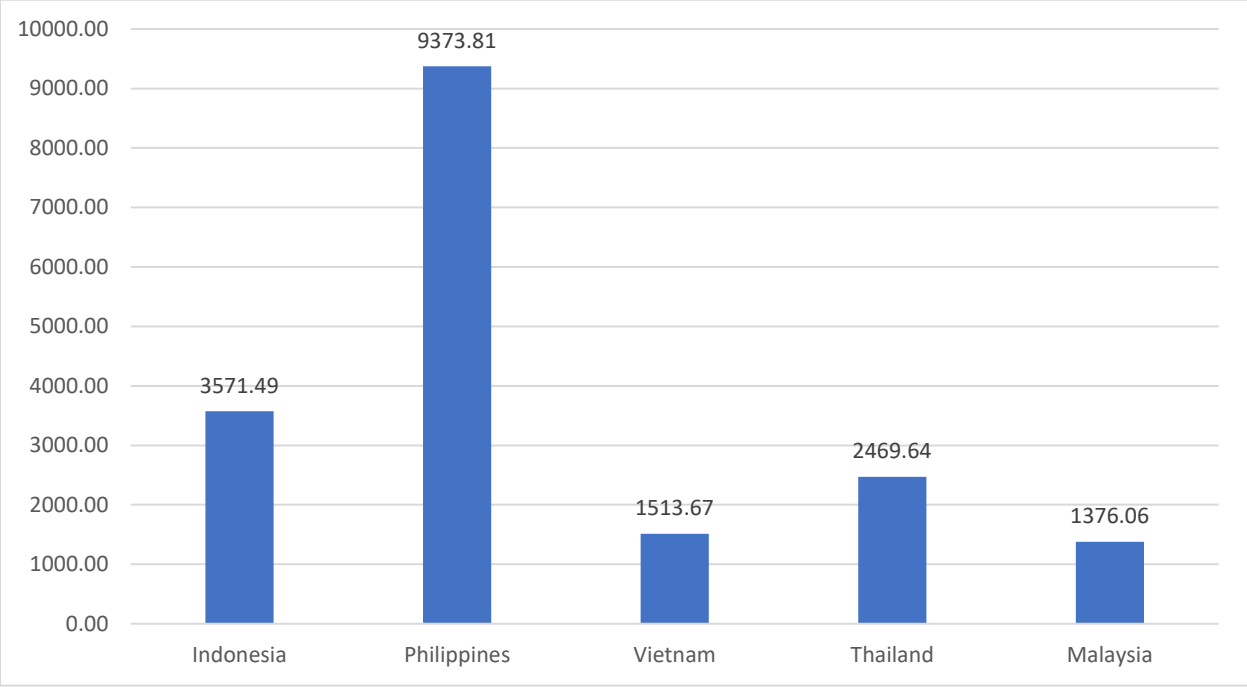
subscriptions went to previously unconnected Filipinos, or to users who already had previous subscriptions.



Source: TowerXChange (2019).

Based on available data, mobile cellular infrastructure development does not seem to have kept pace with subscriber growth. The Philippines still significantly lags behind its regional peers when it comes to the number of cellular towers compared to total population, an important measure of cellular network development.

Figure 20. Subscribers per Tower, 2019



Source: Author's contribution, using 2019 mobile cellular subscriptions data from ITU World Telecommunication/ICT Database, and TowerXChange (2019).

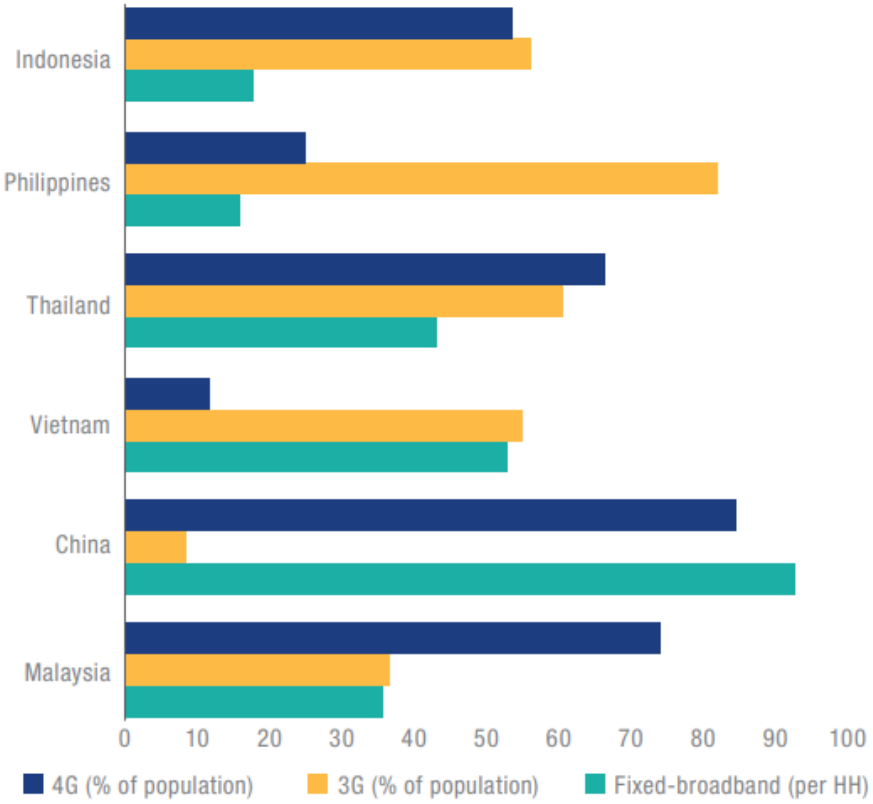
The Philippines has the highest contention ratio among the observed middle-income ASEAN countries.[273] At over 9,000 mobile users per tower, it is almost triple the same figure for Indonesia, the second country on the list. In 2020, Globe estimated that 4,000 households were sharing one cellular tower.[274] Particularly in the context of rapid subscriber growth in the Philippines, the country is clearly in dire need of infrastructure development in this sector. As discussed in Section 2, a low tower count relative to the number of users may lead to poor access and quality for users, particularly for mobile broadband.

As with fixed broadband pre-2019, the slow deployment of cellular towers may be attributed to the limited competition in the sector, among other factors. Most cellular towers in the Philippines are owned by incumbent operators, whereas in other countries, independent companies putting up towers and leasing space to network operators are much more common.

Recognizing this infrastructure gap and the need to infuse more competition in the mobile segment, the DICT initiated the formulation of a shared passive telecommunications tower policy in 2018.[275] Whether the common tower policy would result in greater mobile service coverage or the growth of an independent tower industry remains to be seen. This early, however, the DICT has attributed the increase in the country's mobile internet speed to the policy.[276] Majority of new towers being built as of 2021 still seem to be owned and operated by Smart-PLDT, Globe Telecom, or DITO Telecommunity.[277]

[273] Contention ratio is a technical term that refers to the number of users using the same network infrastructure – in this case, cellular towers. It can be considered a measure of congestion for scarce network resources. Visualization uses a *generalized* computation of contention ratio for purposes of comparison only, based on total number of mobile cellular subscriptions divided by the total number of towers. Actual contention ratios vary by operator. A mobile subscriber on one network will normally use only that network's towers/cell sites (with an exception for domestic roaming), so that each operator will have different contention ratios based on their specific mix of subscriber and tower counts.
[274] In a September 2020 Senate hearing, Globe Telecom revealed that 4,000 households are "forced to share" one cellular tower, compared to the ideal ratio of 100 to 200 households per tower. Philippine mobile network operators blame the long and cumbersome permitting process at the local government unit (LGU) level as the reason for the lack of cell sites. A month prior, the Department of Interior and Local Government had reported that "1,502 out of 1,930 pending applications for tower construction for the year 2020 in 55 provinces and 25 cities have already been approved by LGUs." reported that 1,502 out of 1,930 pending applications for tower construction for the year 2020 in 55 provinces and 25 cities have already been approved by LGUs. Galvez, D. (2020, September). One cell tower currently serves 4,000 households – telco official. *Inquirer.net*. https://technology.inquirer.net/104264/one-cell-tower-currently-serves-4000-households-telco-official; DICT. (2020, August). 1,500 permits for building towers approved, DICT expects faster roll-out of cell towers with LGUs' support. https://dict.gov.ph/1500-permits-for-building-towers-approved-dict-expects-faster-roll-out-of-cell-towers-with-lgus-support/.
[275] https://dict.gov.ph/wp-content/uploads/2020/06/Department_Circular_No_008_Policy_Guidelines_on_the_Co_Location.pdf.
[276] https://technology.inquirer.net/111484/dict-credits-impressive-growth-in-internet-speed-to-common-tower-policy.
[277] Abadilla, E.V. (2021, January 22). PH now has 23K cell sites, still behind in ASEAN. Manila Bulletin. https://mb.com.ph/2021/01/22/ph-now-has-23k-cell-sites-still-behind-in-asean/ In August 2021, Globe said that the cell sites that independent tower companies built for them was "not significant" yet. The MNO said "tower companies… need to set up their operations properly in the Philippines, and… to scale up." Fuentes, A. (2021, August 9). Globe says telco towers sale paused as tower builders yet to scale up. *ABS-CBN News.* https://news.abs-cbn.com/business/08/09/21/globe-says-telco-towers-sale-paused-as-tower-builders-yet-to-scale-up.

Figure 21. Broadband Penetration by Technology, December 2018



Source: Based on data from Telegeography and GSMA, as cited in p.1, World Bank (2020). *Philippines digital economy report 2020: A better normal under COVID-19: Digitalizing the Philippine economy now.* https://documents1.worldbank.org/curated/en/796871601650398190/pdf/Philippines-Digital-Economy-Report-2020-A-Better-Normal-Under-COVID-19-Digitalizing-the-Philippine-Economy-Now.pdf

Available data on the technology mix for selected countries as of end 2018 indicate that the Philippines is significantly behind regional peers for fixed broadband adoption. It is also behind middle-income peers Indonesia and Malaysia when it comes to 4G adoption. Corollary to this, the Philippines has the greatest proportion of the population still on the older 3G technology among countries observed. Overall, much work remains to be done for most ASEAN countries to connect users to high-speed 4G mobile broadband networks.

4.3 Radio Spectrum

Radio spectrum or *spectrum*, as an essential scarce resource, needs to be managed properly by the state in order to ensure efficient and equitable distribution to various users. Spectrum policy, the mechanism for assigning licensed radio frequencies to operators and governing the use of unlicensed ones, is an important window into the potential competitiveness of a country's ICT sector. Spectrum are used in all segments— international connectivity, backbone, middle mile, and last mile.[278]

There are several ways to authorize the use of spectrum: individual licensing (first-come, first-served basis); an administrative award; a competitive mechanism, such as an auction or beauty

[278] See discussion in Section 2.

contest; a class or blanket license that authorizes a large number of devices; or by identifying certain frequency bands as license-exempt or unlicensed.[279]

A nation's spectrum policies should reflect its vision and objectives for spectrum use (e.g., expand coverage, efficient allocation and use of spectrum, flexibility in meeting the needs of users). Policies that are excessively restrictive can have negative effects on the ability of operators to deploy wireless networks, or to begin operating at all, the entry of new players who can compete with the incumbent operators, the availability of networks, and the accommodation of new and emerging technologies. Hence, a light-touch approach that can encourage sectoral growth is generally preferred.[280]

Table 15. Spectrum License Validity of Select ASEAN Countries

Country	Longest License Validity[281]	Assignment Procedure
Singapore	15 years	Auction and Administrative Assignment
Malaysia	20 years[282]	Auction and Administrative Assignment
Indonesia	10 years	Auction
Thailand	15 years	Auction and Administrative Assignment
Vietnam	15 years	Auction
Philippines	Duration of Franchise (25 years)	Administrative Assignment

Typically, a spectrum license in select ASEAN countries is valid for several years or 10-15 years. The Philippines has the longest license durations for radio frequencies in ASEAN 6, at 25 years or for the duration of a telco's Congressional franchise. The country with the second longest license, Malaysia, limits assignments to 20 years at maximum, although in practice licenses tend to be 15 years or shorter.[283] Notably, the Philippines is also the only country not to adopt auctions for spectrum assignments, instead using administrative assignments exclusively. Together, these restrict the ability of new players to get access to licensed frequencies, particularly frequencies previously assigned to existing operators.

Some past regulatory decisions point to the propensity to keep spectrum in the hands of incumbent market players instead of using it to entice new investors. One example was when Smart and Globe were permitted to jointly acquire, at 50 percent each, San Miguel Corporation's (SMC) telecom assets, which included Vega Telecom that held frequencies in the 700 MHz and 2500 MHz bands (2540-2545 MHz, 2580-2595 MHz, 2535-2540 MHz, and 2565-2580 MHz). The purchase gave the incumbent MNOs effective control of the frequencies, which simply became the subject of a co-use agreement among Globe, Smart, and SMC instead of the state recalling

[279] World Bank & ITU. (2021). Digital Regulation Handbook. https://www.itu.int/en/ITU-D/Regulatory-Market/Pages/DigiReg20.aspx.
[280] World Bank & ITU. (2021).
[281] Based on data provided by regulators to the Asia Pacific Telecommunity, except where stated. See Asia Pacific Telecommunity Wireless Group (2021, April). APT report on information of mobile operators' frequencies, technologies and license durations in Asia Pacific countries. *No. APT/AWG/REP-15 (Rev.7)*. APT.
[282] Malaysian Communication and Multimedia Association (n.d.). *Spectrum assignment.* https://www.mcmc.gov.my/en/spectrum/assignment-of-spectrum/spectrum-assignment
[283] APT (2021).

the spectrum for possible re-assignment. Hence, the practice where acquiring a telco also includes co-use of its frequencies naturally gives entities with significant market power an advantage over other smaller players or potential new rivals. [284]

The capacity supply of a mobile network depends on the amount of spectrum that operators have access to – more spectrum enables greater throughput and higher data rates. In the Philippines, while the overall amount of IMT spectrum assigned is high in regional terms now, as enhanced broadband, IoT, data, analytics, and insight permeate every aspect of society, smartphones deliver connectivity into our work and play, and enterprises transition from manufacturing or commerce to also becoming industrial data platforms, mobile networks will require spectrum capacity plans that are integrated into a long term vision of each nation's industrial future. 6 GHz spectrum can play a central role in sustainable social and industrial development. The GSMA's study on the economic benefits of 5G demonstrates that, by 2030, 5G can be responsible for 0.68% of global GDP. 5G's benefits are precisely linked to its access to spectrum to provide sufficient affordability and throughput to ensure services are accessible. Without enough mid-band spectrum, the 2030 GDP impact will be reduced to 0.42% of global GDP. 6 GHz can prevent this economic loss. Timely availability of 6 GHz for mobile will drive cost-efficient network deployment, help lower the broadband usage gap and support digital inclusion.[285]The framework and criteria for how the regulator decides on license renewal is not clear. According to a GSMA report (2015), the best approach to license renewal will "depend on the licensing authority's policy objectives and the specific market circumstances." A strong case for the presumption of renewal, the report says, is "where spectrum is already likely to be in its best use, the market is effectively competitive, and non-renewal would carry risks to investment and service continuity. The GSMA also recommends that "the decision to renew the license should be made at least four to five years before the current license expires."[286]

There is no publicly available assessment by the National Telecommunications Commission about the optimal use of spectrum by their current holders. According to third party studies, the country's mobile segment market is highly concentrated, which rules out the reasoning that the market is competitive. Given that there are only two large mobile network operators serving a market of 155 million mobile subscribers,[287] removing the presumption of renewal of spectrum license does put a risk on service continuity. More effective competition, with mobile access spectrum distributed to more players could mitigate this risk. Decisions regarding spectrum licensing and renewal are also best made on a predictable, timely, and open manner.[288]

4.4 Overall Development of the ICT Sector

This sub-section compares the performance of selected ASEAN countries across time on established ICT indices and related reports. This approach has certain limitations: indices may change their methodology year-on-year, preventing direct comparison of scores. It is also not possible to directly compare scores across different reports or indices. Nonetheless, it provides a

[284] Rappler (2018, October 28). SC asked to stop Globe, Smart's use of 700 MHz frequency. *Rappler.com.* https://www.rappler.com/business/supreme-court-asked-stop-globe-smart-use-700-mhz

[285] GSMA (2022). 6 GHz in the 5G Era: Global Insights on 5925-7125 MHz. https://www.gsma.com/spectrum/wp-content/uploads/2022/07/6-GHz-in-the-5G-Era.pdf

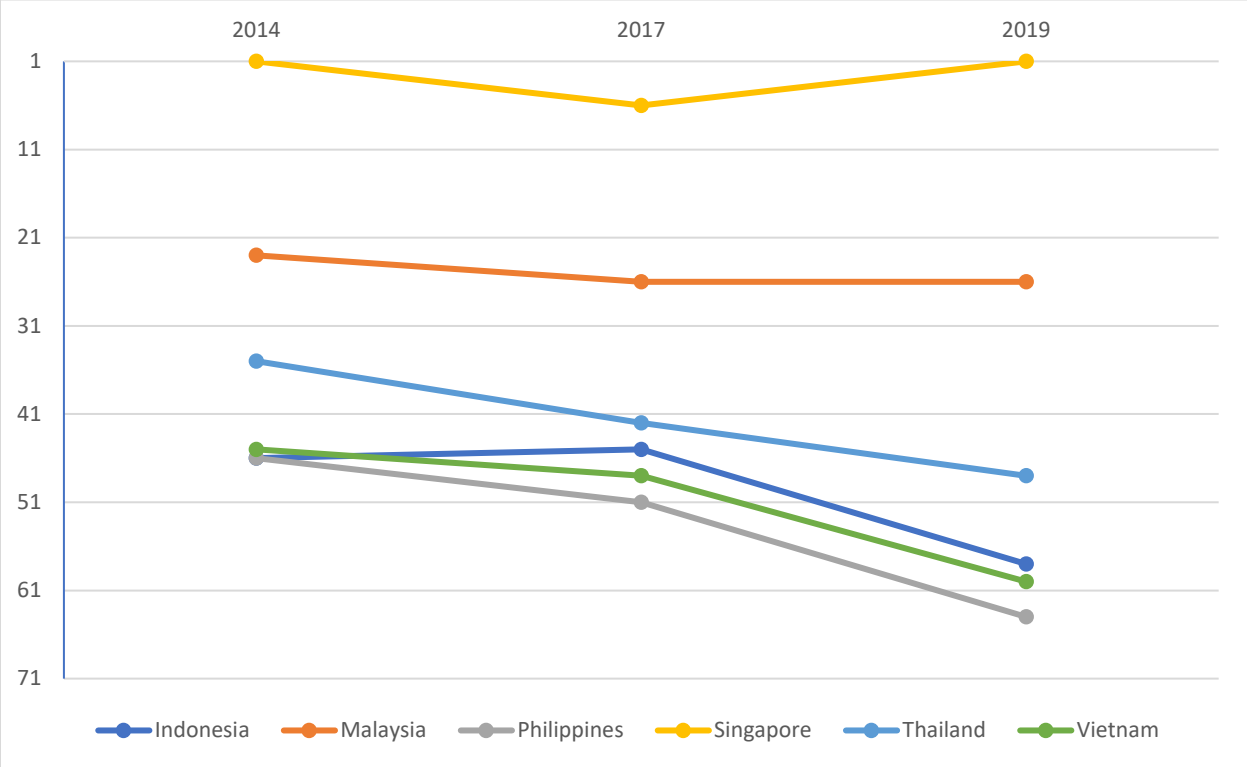
[286] GSMA (2014). *Best practice in spectrum license renewals: A toolkit for licensing authorities*. https://www.gsma.com/spectrum/wp-content/uploads/2015/01/Best-Practice-in-Spectrum-Licence-Renewals.-Jan2015.pdf

[287] Subscription is based on SIM card count. An individual may be subscribed to multiple SIM cards, which would explain why the number of subscription is higher than the total population of the Philippines, estimated at 110 million.

[288] GSMA (2015).

glimpse into the relative overall performance and growth of the Philippines vis-à-vis neighboring countries over time.

Figure 22. Tufts Digital Evolution Global Ranks, 2014-2019



The Tufts University Digital Evolution Ranking examines countries based on ICT "Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change."[289] The indicators examined for the rankings, and which contribute to each country's total score include the following:

Table 16. Digital Evolution Ranking Indicators

Drivers of Digital Evolution	Measures	Indicators
Supply Conditions	Access Infrastructure	Communications sophistication and coverage; security
	Transaction Infrastructure	Access to financial institutions; electronic payment options
	Fulfillment Infrastructure	Quality of transportation infrastructure; logistics performance
Demand Conditions	State of the Human Condition	Consumer ability and willingness to spend; extent of digital skills

[289] p.6, Chakravorti, B., Chaturvedi, R.S., Filipovic, C., & Brewer, G. (2020 December). Digital in the time of COVID: Trust in the digital economy and its evolution across 90 economies as the planet paused for a pandemic. *The Digital Intelligence Index*. The Fletcher School: Tufts University. https://sites.tufts.edu/digitalplanet/files/2021/03/digital-intelligence-index.pdf

	Digital Payment Update	Degree of financial inclusion use of digital money; use of mobile digital money
	Device and Broadband Update	Device adoption and density; mobile and fixed connection uptake; digital consumption
	Digital Inclusion	Gender digital divide; class digital divide; rural digital divide
Institutional Environment	Institutions and the Business Environment	The legal environment; tax and regulatory policy; IP and investor protections; bureaucracy
	Institutions and the Digital Ecosystem	Government uptake and use of ICT and digital technology; telecom competition
	Institutional Effectiveness and Trust	Transparency; rule of law; regulatory quality
Innovation and Change	Inputs	Financing options and opportunity; start-up capacity; ability to attract and retain talent pool
	Processes	Sophistication of business practices; R&D
	Outputs	Value capture; value creation

Source: Chakravorti et. al (2020).

Taken together, these indicators paint a picture of a country's readiness to adopt digital technology across a variety of socio-economic areas. Instead of a definitive and comprehensive assessment of a country's performance on specific areas, the Ranking shows the relative overall performance of countries compared to peers in the region and around the world. This also acknowledges the fact that ICT ecosystem development is a multi-faceted task affected by many different factors, affected not only by supply and demand, but also by the context of local rules and regulations – the institutional environment.

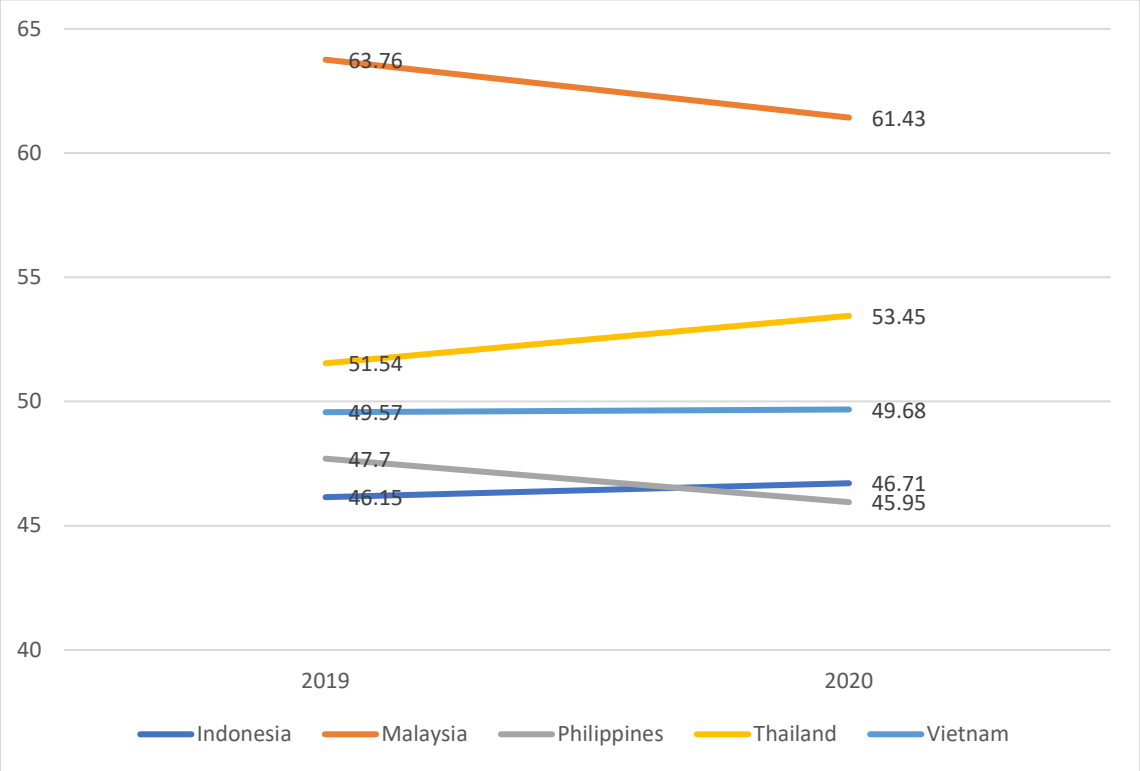
The scores for specific indicators are not provided in the report and specific areas of strength and weakness are not available. This limitation aside, the Digital Evolution rankings indicate that ASEAN countries (except for Singapore) are falling behind their global peers when it comes to ICT ecosystem development, of which ICT infrastructure is one part.

The Philippines has consistently ranked last among the ASEAN countries examined and had also fallen further behind Thailand and Vietnam, its closest ASEAN peers. Both Thailand and Vietnam have been classified as "Break Out Economies" in the latest edition of the report, indicating that they are rapidly adopting ICT despite current poor performance in the rankings. The Philippines,

on the other hand, has been categorized as a "Watch Out Economy," reserved for countries who are dealing not only with poor existing ICT development, but slow ICT sector growth as well.

The ranking of the Philippines continued to decline despite the country releasing a National Broadband Plan in 2017 and selecting a third major telecom player in 2018. It remains to be seen whether new policy issuances, especially in light of the pandemic, would make a dent in the next assessment.

Figure 23. Network Readiness Index



The World Economic Forum's Network Readiness Index, published by the Portulans Institute, examines ICT development through the lens of four pillars: Technology, People, Governance, and Impact.[290] In the two most recent editions of the ranking adopting a new methodology, the Philippines ranked in the bottom of ASEAN's middle-income countries. Furthermore, while most of these countries saw at least slight improvements in their scores from 2019 to 2020, the Philippines scored lower in 2020 than the previous year, putting it behind Indonesia, Thailand, Malaysia, and Vietnam.

While the Philippines was ranked 74th globally compared to Indonesia's 73rd, it performed significantly worse than the latter country in the Technology and Governance pillars. The Philippines ranked 80th in the world for the Technology pillar, while Indonesia ranked 72nd; and ranked 92nd for Governance, compared to Indonesia's 68.th

[290] World Economic Forum (2020). *Network Readiness Index.* Portulans Institute. https://networkreadinessindex.org/wp-content/uploads/2020/11/NRI-2020-V8_28-11-2020.pdf

For the *technology* pillar, the Philippines fell in rankings across multiple indicators under the Access sub-pillar, weighed down by high mobile tariffs, low 4G coverage, low number of households with Internet access, and low international Internet bandwidth. All these point to a lack of sufficient ICT infrastructure in the Philippines relative to other countries.

Table 17. Philippine Ranking in the Technology Sub-Pillars, NRI 2020

Sub-pillars	2019	2020
Access	**83**	**83**
Mobile tariffs	101	106
Handset prices	86	86
Households with internet access	84	86
4G mobile network coverage	79	80
Fixed-broadband subscriptions	n/a	n/a
International Internet bandwidth	96	101
Internet access in schools	n/a	n/a
Content	**74**	**88**
GitHub commits	n/a	86
Wikipedia edits	n/a	71
Internet domain registrations	n/a	n/a
Mobile apps development	98	101
Intellectual property receipts.	77	n/a
Future Technologies	**70**	**68**
Availability of latest technologies	71	n/a
Company investment in emerging technology	31	n/a
Government procurement of advanced technology products	78	n/a
Adoption of emerging technologies	n/a	52
Investment in emerging technology	n/a	31
ICT PCT patent applications	62	69
Computer software spending	30	54
Robot density	51	n/a

Source: From Congressional Planning and Budget Research Department (2020). The Philippines in the 2020 Network Readiness Index. https://cpbrd.congress.gov.ph/images/PDF%20Attachments/Facts%20in%20Figures/FF2021-06_2020_Readiness_Index.pdf

For the *governance* pillar, the Philippines scored the lowest in the *inclusion* sub-pillar, due to the growing socio-economic and urban-rural divide in use of digital payments. The country also performed poorly in the *regulation* sub-pillar, falling from 101st to 108th globally for the ICT regulatory environment indicator. Together, these point to a policy and regulatory gap, as well as a failure to address the digital divide. This divide was likely exacerbated by the pandemic, as it forced some businesses to conduct all their operations and transactions digitally. However, the pandemic has also served as a catalyst to accelerate digitalization.

Findings from the NRI suggest that the Philippines needs a responsive ICT policy and regulatory environment that enables infrastructure deployment in all areas of the country, leading to more accessible and affordable broadband. Without these structural changes, it is likely that the Philippines will continue to be a regional laggard in ICT.

Table 18. Philippine Ranking in the Governance Sub-Pillars, NRI 2020

Sub-pillars	2019	2020
Trust	**71**	**79**
Rule of Law	91	n/a
Software piracy rate	63	n/a
Secure Internet servers	98	98
Cybersecurity	60	60
Online access to financial account	n/a	97
Online trust and safety	26	71
Regulation	**78**	**79**
Regulatory quality	65	66
Ease of Doing Business	85	n/a
ICT regulatory environment	101	108
Legal framework's adaptability to emerging technologies	80	80
E-commerce legislation	1	1
Social safety net protection.	69	47
Inclusion	**100**	**109**
E-Participation	19	56
Socioeconomic gap in use of digital payments	116	126
Availability of local online content	73	49
Gender gap in internet use	n/a	n/a
Rural gap in use of digital payments	113	123

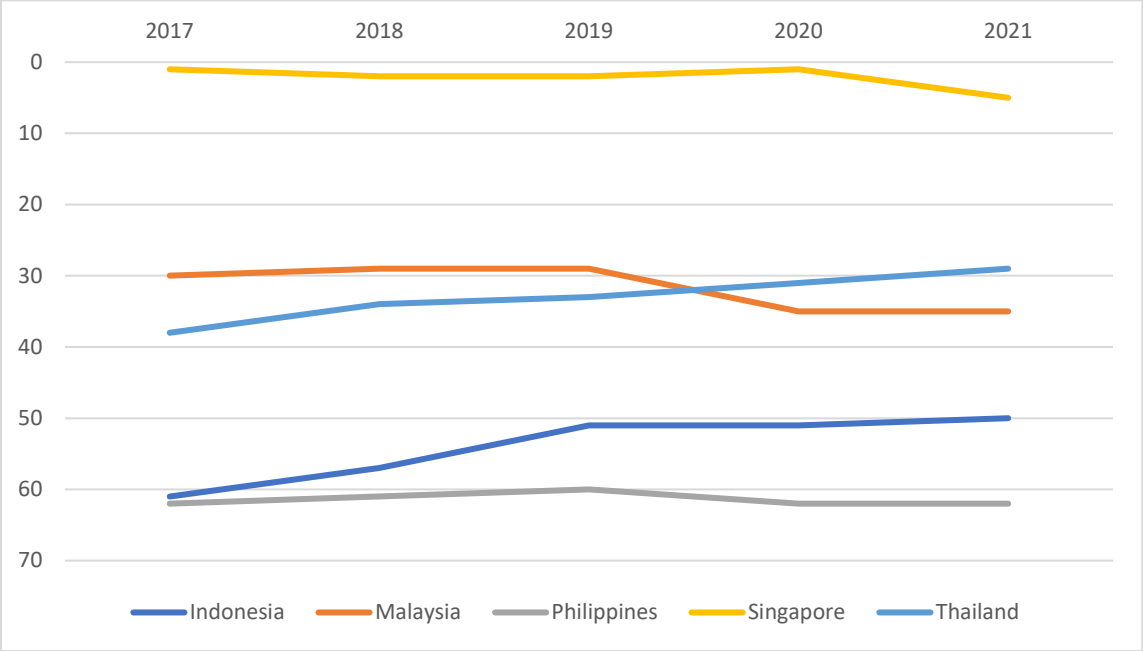
Source: Adopted from CPBRD (2020).

The IMD World Competitiveness Center's World Digital Competitiveness Ranking examines the state of ICT development in countries across four factors: knowledge, technology, and future readiness.[291] Among these, the *technology* factor relates the most to ICT infrastructure, particularly the *regulatory framework* and the *capital* subfactors.

The Regulatory Framework subfactor examines how conducive a country's policy and regulatory environment is to ICT businesses, relative to other countries. The rankings reveal that the Philippines has consistently fared poorly when it comes to regulation, both globally and in the region. Indeed, while Indonesia and the Philippines ranked close to each other for Regulatory Framework when the Rankings began in 2017, Indonesia has since improved significantly, whereas the Philippines' position has stagnated in the past five years.

[291] IMD World Competitiveness Center (2021). *World Digital Competitiveness Ranking 2021*.

Figure 24. World Digital Competitiveness - Regulatory Framework



Source: Adopted from data in IMD World Competitiveness Center (2021).

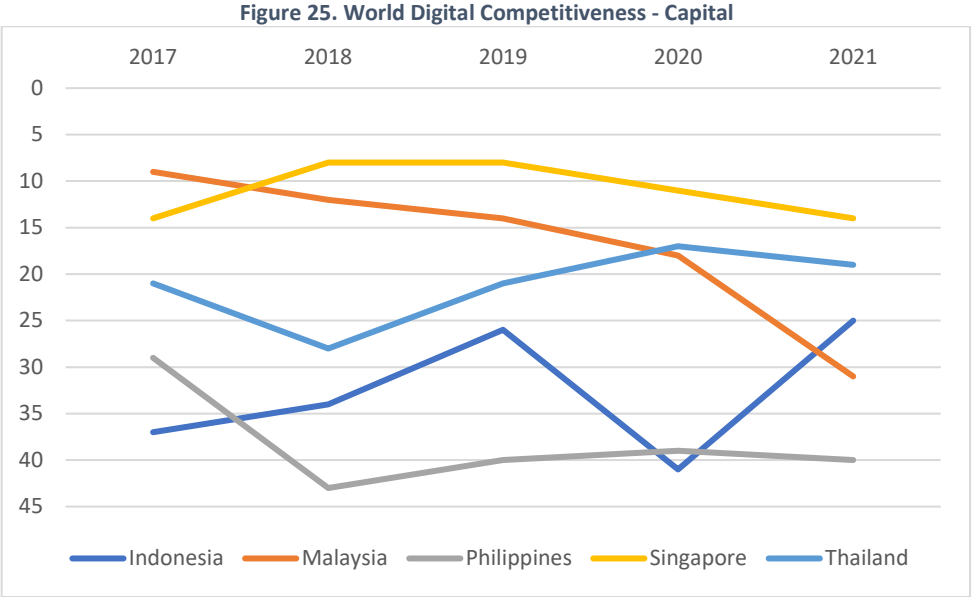
This is likely due to the lack of policy change that would change the digital infrastructure landscape in the Philippines in recent years. In the policy component of the National Broadband Plan, for example, only a handful of policy reform recommendations have been issued:

- DICT Department Circular No. 008 or Policy Guidelines on the Co-location and Sharing of Passive Telecommunications Tower Infrastructure (May 2020);
- Executive Order No. 127 or the National Policy for Expanding the Provision of Internet Services through Inclusive Access to Satellite Services (March 2021); and
- Joint Memorandum Circular on Streamlined Guidelines for the Issuance of Permits and Clearances for Poles, Underground Fiber Ducts, and Aerial and Underground Installation of Cables (October 2021).

None of the legislative priorities cited in the NBP has been approved by Congress.

A closer look at the 2021 Ranking's findings for the Philippines show that the country performed worst in the areas of *starting a business* and *enforcing contracts*. These indicators were marked two of the country's top overall weaknesses, along with the low number of Internet users and low Internet bandwidth speed. This continues to emphasize that an underdeveloped regulatory environment is highly correlated to poor ICT infrastructure development.

Figure 25. World Digital Competitiveness - Capital

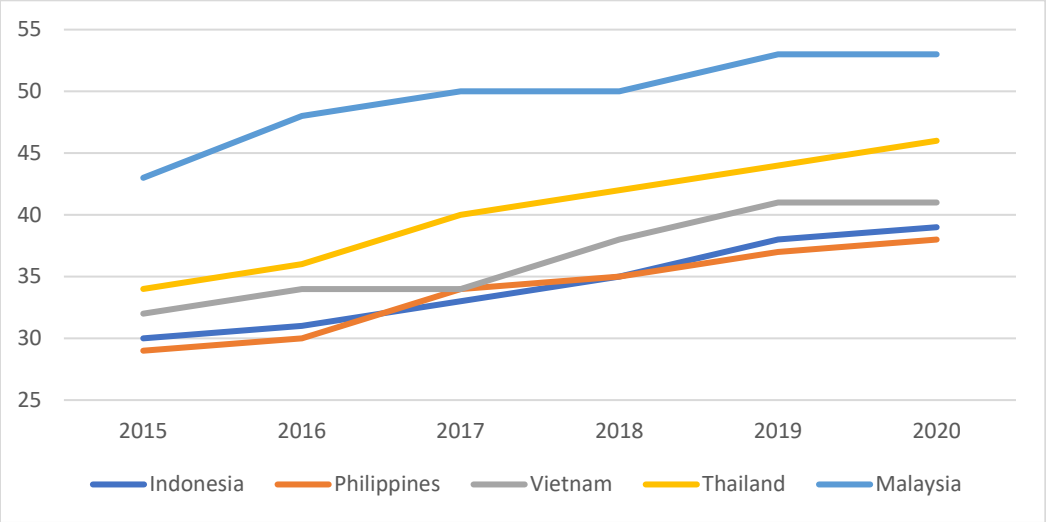


Source: Adopted from data in IMD World Competitiveness Center (2021).

This is further underscored by the Philippines' relatively good performance under the Capital subfactor. This subfactor examines the country's ICT investment activity, particularly for telecommunications. While the Philippines still scored the lowest for this subfactor among the selected ASEAN countries, it nonetheless placed 40th globally in 2021 – higher than its overall ranking of 58th, and with a much smaller gap to the ranks of its regional peers. Indeed, capital spending in the Philippines does not seem to be a significant issue; the country placed 14th highest globally for investment in telecommunications. This is likely driven by the surge in capital spending due to the entry of a third mobile network operator and emerging competition in the wired segment, as discussed in Section 2.

Taken as a whole, the result of the Technology factor of the World Digital Competitiveness Ranking for the Philippines paints the picture of a country that has high capital expenditures in telecommunications, but which has not yet translated into better digital infrastructure and services for the Filipino consumer. This may be due to the time-lag in investments and actual network improvements for end users. However, this may also indicate the outsize effect of a poor regulatory environment on ICT development: globally competitive capital spending by a limited number of players does not necessarily translate to improved connectivity.

Figure 26. GCI Scores, 2015-2020



Source; Author's contribution, from GCI Data.[292]

The Huawei Global Connectivity Index (GCI) examines country performance in 40 indicators that "track the impact of ICT on a nation's economy, digital competitiveness and future growth.[293]" These indicators are grouped into four main ICT pillars: supply, demand, experience, and potential. Performance across these pillars, in turn, correspond to levels of digital development in the areas of ICT fundamentals, broadband, cloud, Internet of Things, and artificial intelligence.

Scores are assigned to each indicator based on how close or how far a country is from reaching a realistic target for that indicator by the year 2025. For example, a country that has already reached its target number of fiber optic connections will receive a score of 10 for that indicator, while a country that is only 50 percent of the way to the targe receives a score of 5. With ten indicators per pillar, a country can have a maximum score of 100 per pillar. The country's final GCI score is then computed as an average of its scores across all four pillars.

The final score therefore can be reasonably interpreted as a quantitative measure of that country's progress towards its digital transformation target. Because the 2025 targets differ per country based on what the GCI considers 'realistic' for any given country, the GCI scores are not intended for use as a measurement of the absolute level of ICT development between countries. Rather, the scores are a measure of their individual progress towards their own country-specific targets.

As the preceding graph illustrates, all of the selected ASEAN countries have a way to go before reaching their targets. Based on their progress towards their targets over the last five years, none of the countries observed seem to be on pace to meet their targets by 2025. That said, it is clear that some countries are more slow-going than others: for almost the entire period of 2015 to 2020, the Philippines sits the farthest away from reaching its digital transformation goal.

With scores below 40, the Philippines and Indonesia fall under the GCI's *starters* country cluster. Starters are countries that are still "in the early stage of ICT infrastructure build-out. Their focus

[292] Historical scores can be found here: Huawei (2020a). *GCI 2020*. https://www.huawei.com/minisite/gci/en/country-rankings.html
[293] Huawei (n.d.). *GCI Methodology*. https://www.huawei.com/minisite/gci/en/methodology.html

is on expanding connectivity coverage to give more people access to the digital economy.[294]" In comparison, group leader Malaysia falls under the ***adopter*** cluster, along with other countries who already have sufficient ICT infrastructure, and for whom the largest gains towards digital transformation will be achieved by "increasing demand for high-speed connectivity.[295]"

Table 19. Scores for GCI Pillars, Select Countries, 2020

	Supply	Demand	Experience	Potential
Malaysia	43	56	54	48
Thailand	41	48	55	41
Vietnam	36	40	52	38
Indonesia	35	39	45	38
Philippines	30	41	44	38

Source: Huawei (2020a).

A closer look at the breakdown of scores per ICT pillar for the 2020 edition of the GCI reveals that the Philippines fared worst in the Supply pillar, both compared to its progress in other pillars, and to other countries' progress in the same pillar. In fact, the Philippines' Supply score was the lowest for all pillars and all countries included in the above observation.

Table 20. Indicator Scores for Supply Pillar, Select Countries, 2020

	4G & 5G Connections	Fiber Optic	International Internet Bandwidth
Malaysia	7	4	3
Thailand	7	4	4
Vietnam	3	8	4
Indonesia	6	3	3
Philippines	4	3	1

Source: Huawei (2020a).

A look at the Supply pillar scores reveals that the Philippines is not even halfway towards its 2025 targets for number of 4G and 5G connections, and number of fiber optic connections. Of note is that the Philippines obtained the lowest possible score of 1 for international internet bandwidth, an indicator that measures the total amount of international bandwidth used by the country relative to the total capacity of all international internet links to that country. This implies that the Philippines is still far from utilizing all of the international capacity coming to the country.

Table 21. Indicator Scores for Demand Pillar, Select Countries, 2020

	Mobile Broadband Subscriptions	Smartphone Penetration	Computer Households	E-Commerce Transactions	Fixed Broadband Subscriptions	Secured Internet Servers

[294] p.10, Huawei (2020b). *Shaping the new normal with intelligent connectivity: Mapping your transformation into a digital economy with GCI 2020.* https://www.huawei.com/minisite/gci/assets/files/gci_2020_whitepaper_en.pdf?v=20201217v2

[295] p.10, Huawei (2020b).

Malaysia	10	10	8	3	2	2
Thailand	10	10	2	2	3	1
Vietnam	9	5	3	1	4	1
Indonesia	10	10	2	1	1	1
Philippines	10	9	3	1	1	1

Source: Huawei (2020a).

Looking at the indicator scores under the Demand pillar, it is interesting to note that the Philippines has already achieved its 2025 GCI target for total number of mobile broadband subscriptions, as well as smartphone penetration. When put into context alongside the Philippines' low 4G and 5G penetration rate, these scores imply that the country has already reached the maximum number of mobile broadband users that can be supported by its current ICT infrastructure. In other words, the Philippine targets for these indicators are relatively low because the country is bottlenecked by poor infrastructure availability.

On the flip side, the scores for e-commerce transactions, fixed broadband subscriptions, and secured Internet servers are all very low. These scores suggest that there is still much room for demand growth in these areas, relative to the capacity of Philippine ICT infrastructure. For fixed broadband in particular, evidence seems to support this claim: the number of homes passed by wired network operators far exceeds the number of currently connected households.[296]

5. Legal and regulatory challenges pertaining to the development of Philippines digital infrastructure

The Philippines' digital infrastructure has not developed at a pace and scale that is necessary to meet the demand of the country's growing population and bandwidth requirements. While investment mainly comes from the private sector, existing laws limit building and operating broadband infrastructure to duly enfranchised telcos only. Existing laws favor entities that meet licensing requirements, such as a Congressional franchise, that have less to do with technical qualifications and more to do with complying with an analog-era way of doing things. The key barrier to expanding and upgrading the country's digital infrastructure is the archaic laws that were designed for analog communication (fixed telephone lines) and services (radio broadcast and voice services) that are being applied to digital connectivity.[297]

The telephone-based policy and regulatory environment does not enable Internet technologies and Internet service providers (ISPs) to grow, does not accommodate emerging technologies, and is slow to adapt to new business models. Due to outdated laws, wired Internet technology, like fiber optic cable, is regulated together with copper-wire telephone lines and telegraph. Wireless technology, like 5G, is lumped together with radio broadcast.

[296] Refer to discussion in Section 2.
[297] Albert et al. (2021). Expanded Dat Analysis and Policy Research for National ICT Household Survey 2019. PIDS. https://dict.gov.ph/ictstatistics/wp-content/uploads/2021/08/NICTHS-EDAPR.pdf.

An ISP, who does not intend to offer a telecommunications service—identified by existing laws as local exchange (fixed telephone), cellular mobile telephone system (CMTS), inter-exchange (national long distance), and international carrier (international voice call), is required to secure a telco franchise from Congress if it wishes to own, build, and operate a network to offer Internet service.

The huge disconnect between policy and regulation and the technology and business models used for connectivity is preventing the growth of the broadband sector.

This section will discuss the legal and regulatory frameworks that govern the provision of broadband infrastructure and services, as well as the gaps and issues that have been cited as possibly hampering the growth of Internet service providers in the country. This will include a brief analysis of legislation, executive policies, as well as regulatory issuances that are affecting the development of digital infrastructure.

1.1. Legal framework

1. Radio Control Act of 1931 (Act 3846)

The Radio Control Act of 1931 is the policy and regulatory framework for the management of radio spectrum. It provides the mandate to the government (then Secretary of Commerce and Communication, whose functions have been delegated to the NTC today) "to regulate the establishment, use, and operation of all radio stations and all forms of radio communications and transmissions" within the country.

The law provides the following powers and functions of the regulator on radio spectrum matters, including: classifying radio stations and prescribe the nature of service; assigning frequencies; making rules and regulations to prevent and eliminate interference; approving or disapproving application for the construction and operation of a radio station, and for the renewal of a station license; and revoking the station or operator license of a violator of the law or regulations, among others.

The Act 3846 requires **a legislative franchise** for entities to "construct, install, establish, operate a radio station." The law, however, provides that no franchise shall be necessary for certain radio stations "in a place without any means of communication (see Section 1)." The Radio Control Law has undergone the following a number of amendments:

Commonwealth Act No. 365[298] *(approved 1938)* and *Commonwealth Act No. 571* (approved in 1940) provide that "station" or "radio station" refers "to a radio transmitting station and its receiving equipment, a radio receiving station used for commercial purposes, or a radio broadcasting station."

Republic Act No. 584[299] (approved in 1950) requires the possession or ownership of transmitters and transceivers (combination transmitter-receiver) to secure a *registration* with the government

[298] https://mirror.officialgazette.gov.ph/1938/08/23/commonwealth-act-no-365/
[299] https://www.chanrobles.com/republicacts/republicactno584.html

and that the construction, manufacture or purchase of radio transmitters or transceivers requires a *permit* from the government. The 1950 amendment also granted authority from the then "Secretary of Commerce and Industry" to what was known then as the "Secretary of Public Works and Communication."[300]

As a law crafted in the 1930s and amended in the 1950s, the law's provisions are focused on analog radio communications and transmissions. It does not provide any guiding framework relevant to spectrum for digital use. This law is so outdated that its latest amendment still mentions the authority of the president of the United States of America over radio stations in the country.

The NTC is mandated to implement Act 3846 by virtue of the regulatory power granted to the Secretary of Public Works and Communication, which was eventually transferred to the NTC through Executive Order 546 s. 1979. However, as spectrum is critical to ICT development, spectrum management policy should be considered part of the mandate of the Department of Information and Communications Technology (DICT), an agency created in 2016 as the primarily policy and planning entity of the executive branch that will develop and promote the national ICT development agenda. The NTC is an attached agency of the DICT for policy and program coordination.

2. Public Service Act of 1936 (Commonwealth Act 146)

The Public Service Act (PSA) provides the legal framework for what was then known as the Public Service Commission (PSC), which supervises and controls all public services in the country. The powers and functions of the PSC have since been devolved to various regulatory agencies. The law enumerates a list of public services for which foreign ownership of equity in an entity offering these services is capped at 40 percent.

The PSA or any other existing law **does not offer a clear legal definition for public** utilities. According to CA 146, a public service includes "any common carrier... wire or wireless communications system, wire or wireless broadcasting stations and other similar public services."[301]

CA 146 requires entities offering a public service, such as telecommunications, to secure a certificate of public convenience (CPC) or certificate of public convenience and necessity (CPCN) to be issued by the Public Service Commission, which "shall have jurisdiction, supervision, and control over all public services and their franchises, equipment, and other properties"—a function now designated to the sector regulators. [302]

A distinction of what does and does not count as a public utility can determine whether a public service should be subject to the more restrictive provisions of the PSA, such as the limits on foreign ownership. The differentiation between "public utilities" and "public services" is necessary because technologies and modes of economy evolve with the times. In the past, a service like ice-refrigeration plants was critical to the survival of the public. This obviously is no longer true

[300] http://www.ntc7.net.ph/images/LawsRulesAndRegulations/MC/ROC/DO_11.pdf
[301] Section 13 (b) of CA 146.
[302] Section 13 (a) of CA 146.

today. Hence, it makes no sense to treat ice plants with the same regard as water and electricity (both public utilities) in the age of the household refrigerator.

Telecommunications networks today are still classified as a public utility under "wired or wireless communication systems." However, telecommunications no longer possess the characteristics of a public utility, such as that a public utility can serve the public more effectively and efficiently as a *natural monopoly*. The mere fact that PLDT and Globe are very profitable while offering similar services, operating similar networks, and thriving side by side in the same market is proof that telecoms is not a natural monopoly. There is also third major telecoms player, DITO Telecommunity, offering the same mobile services as the two incumbents. DITO reached 4 million subscribers just eight months after its commercial launch in March 2021.[303]

There are proposed amendments to the PSA contained in bills filed in Congress that aim to update the law to better reflect modern-day Philippines and introduce competition in key sectors, which serve as bottlenecks for development efforts. The bills propose to define the concept of a public utility," leaving electric distribution and transmission, and water and sewage systems as the only industries classified as public utilities. The proposed legislation classifies sectors, like telecommunications and transportation, as a "public service." If the bill is passed, the foreign ownership restrictions will apply to public utilities only. As a result, the telecommunications sector could be opened to foreign-owned companies.

The lifting of foreign ownership restrictions will infuse more competition into key markets like telecommunications, which provides a large segment of the country's digital infrastructure. It is also envisioned to provide Filipinos access to fresh new capital, innovative technologies, and improved services in certain sectors.

3. Public Telecommunications Policy Act (RA 7925)

The Public Telecommunications Policy Act [304] institutionalized the deregulation of the telecommunications sector in the Philippines, which began with executive orders under the administration of President Fidel Ramos (1992-1998). It was a pioneer law that liberalized a sector previously monopolized by PLDT. RA 7925 established the national policy to ensure the growth and development of telecommunications services based on fundamental objectives "to develop and maintain viable, efficient, reliable and universal telecommunication infrastructure using the best available and affordable technologies"[305] and "to prioritize improving and extending basic services" to unserved areas.[306]

The law has key provisions that affect the development of digital infrastructure in the country.

Telecommunications entities. Sections 7-13 enumerate the categories that a public telecommunications entity (PTE) can operate in that require a franchise: local exchange carrier (primarily voice service), inter-exchange carrier (national long-distance service), international

[303] https://mb.com.ph/2021/11/09/dito-hits-4m-subscribers/
[304] https://ntc.gov.ph/wp-content/uploads/2015/10/LawsRulesRegulations/RAs_PDs_EOs/RA_7925.pdf
[305] Section 4(a) of Republic Act 7925
[306] Section 4(b) of RA 7925

carrier (transmission and switching of any telecoms service between the Philippines and any point in the world), mobile radio service (wide area mobile radio telephone), and radio paging service (voice or data messages).

Section 16 provides that no person or entity shall commence or conduct the business of a PTE without first obtaining a franchise from Congress as the first authorization to engage in a certain type of telecoms service. As a second step, the NTC will grant a CPCN based on the telecom franchise.

By requiring a franchise for the construction of telecommunications networks, RA 7925 also limits the participation of foreign investment in the sector.

Value-added service. Section 11 defines a "value-added services (VAS) provider" as an entity that need not secure a franchise from Congress provided that it does not put up its own network. A PTE may provide a VAS as long as it registers with the NTC. The law also provides that a VAS provider shall be allowed to competitively offer its services and/or expertise, and lease or rent telecommunications equipment and facilities necessary to provide such specialized services, in the domestic and/or international market in accordance with network compatibility."

In 2000, "Internet Protocol" services were classified by the NTC as VAS.[307] According to NTC Memorandum Circular 02-05-2008, VAS are services that are "not strictly public service offerings in the same way that voice-to-voice lines are but is merely supplementary to the basic service."[308] The "basic service" is defined by NTC as "Services Ordinarily Provided for by Local Exchange and Inter-Exchange Operators and Overseas Carriers" and these refer to "voice services offered through circuit switched networks."[309] While the NTC clarified the difference between VAS and basic services, it nonetheless interpreted Section 11 as prohibiting ISPs from owning and operating not just telecommunications networks for voice services offered through circuit switched networks but *all forms of network*, including networks necessary to render internet services themselves.[310]

Spectrum management. Section 15 provides that the allocation and assignment of radio spectrum, shall be subject to period review, and that its use shall be subject to reasonable user fees. It also provides that demand must exceed supply as a precondition to holding open tenders for spectrum licensing. The law also provides the mandate of spectrum management to the NTC (Commission).

While the law clearly pertains to basic telecommunications services (i.e., primarily voice service), Internet service is lumped together with telecommunications service in the absence of any other law on digital connectivity. As a result, an ISP is not allowed to build or own a network, even if it is for Internet and not any of the PTE categories defined by RA 7925 and regardless of the technology used. An ISP can only offer Internet service where the telcos are present, hence

[307] See NTC MC 14-07-2000 http://ntc.gov.ph/wp-content/uploads/2015/10/LawsRulesRegulations/MemoCirculars/MC2000/MC-14-07-2000.pdf

[308] NTC Memorandum Circular 05-08-2005

[309] Section 2(d) NTC MC 05-08-2005.

[310] The DICT discusses at length the difference between an Internet connection, which it classifies as an information service, and a telecommunications service in the implementing rules and regulations of Executive Order No. 127.

preventing the growth of an independent ISP industry. In short, the digital infrastructure is limited to where duly enfranchised telcos choose to build their networks, which is often in the urban areas.

However, a recent policy issued by the DICT offers a more liberal and updated view of Internet connection and how various types of network, including telecom networks, can be used to offer Internet as an "information service."

4. Department of Information and Communications Technology Act (RA 10844)

The law created the DICT[311] as "the primary policy, planning, coordinating, implementing and administrative entity of the executive branch of the Government that will plan, develop, and promote the national ICT development agenda" (Section 5). The department's powers and functions (Section 6, I-IV) include policy and planning, improving public ICT access, resource-sharing and capacity-building, and consumer protection and industry development.

The law **abolished certain agencies** and transferred their personnel to the DICT, which include the ICT Office (ICTO); National Computer Center (NCC); National Computer Institute (NCI); Telecommunications Office (TelOf); National Telecommunications Training Institute (NTTI); and all operating units of the former Department of Transportation and Communications (DOTC) with functions and responsibilities dealing with communications (Sec. 16 [a]). It also provides for the **attachment of certain agencies** for policy and program coordination, which include: the National Telecommunications Commission (NTC); the National Privacy Commission (NPC);[312] and the Cybercrime Investigation and Coordination Center (CICC) (Sec. 16 [b]).[313]

The DICT is mandated to draft plans, policy, and standards that will serve as the framework for all policy and regulation related to ICT development. It is also tasked with prescribing rules and regulations for the establishment, operation, and maintenance of ICT infrastructure in unserved and underserved areas, as well as providing free Internet service to the public.

In 2017, the DICT issued the country's first National Broadband Plan (NBP), which included an information infrastructure component and a policy component. Based on the NBP, the DICT has partnered with the state firm Bases Conversions and Development Authority (BCDA) to build the country's first publicly funded cable landing stations (CLS) on the east and west coasts of Luzon island (San Fernando, La Union and Baler, Aurora). The two CLS are connected by a 240-km underground corridor with repeater stations at 50-km interval, which all form part of the Luzon Bypass Infrastructure (LBI) project.[314]

The LBI project was originally intended to serve as a bypass route for the Pacific Light Cable Network (PLCN) submarine cable system[315] to avoid the earthquake-prone Luzon Strait. Partly

[311] https://www.officialgazette.gov.ph/2016/05/23/republic-act-no-10844/
[312] The NPC has yet to be created by the President, as of September 30, 2015.
[313] The CICC was created under RA 10175 or the Cybercrime Prevention Act of 2012. S.B. 2686 proposes that all powers and functions of the CICC related to cybersecurity, such as the formulation of the national cybersecurity plan, establishment of the national computer emergency response team, and facilitation of international cooperation on intelligence regarding cybersecurity, be transferred to the proposed Department from the CICC, which shall be chaired by the DICT Secretary. On September 17, 2015, Pres. Benigno Aquino III signed Executive Order No. 189 creating the National Cybersecurity Inter-Agency Committee with the aim of addressing the country's vulnerabilities of government and commercial information systems to cyber threats. http://www.gov.ph/2015/09/17/executive-order-no-189-s-2015/.
[314] https://dict.gov.ph/wp-content/uploads/2020/05/SIGNED-EOI-call-APRICOT-Project-initialled.pdf.
[315] https://www.submarinenetworks.com/en/systems/trans-pacific/plcn.

owned by Facebook, Google, and PLDC, the PLCN cable was designed to connect Hong Kong, Taiwan, the Philippines and the US.

In November 2017, the DICT and BCDA signed a landing party agreement with Facebook so that PLCN can use the LBI. In exchange, Facebook will provide the Philippine government with cable capacity equivalent to 2 terabits per second (Tbps).[316]
To distribute the bandwidth from PLCN, the DICT in June 2018 signed an agreement with the National Grid Corporation of the Philippines (NGCP), the national transmission grid's operator, and the National Transmission Commission (TransCo), the power grid's owner, for the free use of the transmission grid's spare fiber optic cables to connect government offices to the NBP infrastructure.

However, the operation of the PLCN cable was delayed due to national security concerns by the US government because of the route that connects to Hong Kong, a special administrative region of the People's Republic of China. In February 2020, Facebook and Google requested permission from the US Federal Communications Commission (FCC) to activate the PLCN segment between the US and the Philippines and Taiwan, leaving behind the Hong Kong segment.[317] In April 2020, the FCC granted Google's request for Special Temporary Authority (STA) to commercially operate the segment of PLCN connecting the US and Taiwan for six months.[318] Two months later, the Committee for the Assessment of Foreign Participation in the United States Telecommunications Services Sector ("Team Telecom") recommended that the FCC grant the portions of PLCN's application seeking to connect the US, Taiwan, and the Philippines only.[319] The PLCN has yet to announce the start of commercial operation.

In September 2021, the DICT built an NBP Resiliency Route, a supplemental infrastructure that will serve as a redundancy and protection loop to international gateway access via Singapore, in case of service disruption of submarine cables connected to the US, such as the PLCN.[320] The resiliency route was designed to support the metropolitan centers in the country.

The NBP's infrastructure component has undergone several design changes since 2017. In its latest presentation, the DICT detailed the NBP's implementation in four components:

- **Component 1** consists of the national fiber backbone that traverses the three major islands of Luzon, Visayas, and Mindanao.
- **Component 2** is the set of CLS in La Union and Baler connected to the Luzon Bypass Infrastructure, which will serve as the NBP's gateway to international connectivity and to land more capacity into the network.
- **Component 3** will focus on tower build where installation of fiber optic cable may be challenging or time intensive. This will cover the middle mile and last mile segments of the network.
- **Component 4** will focus on fiber build to pick up capacities from Points of Presence and distribute bandwidth to national governance agencies, local government units, state universities and colleges, public schools, rural health units, and public hospitals.

[316] https://technology.inquirer.net/69252/dict-bcda-high-speed-internet-luzon-bypass-infrastructure.
[317] https://techcrunch.com/2020/02/06/google-and-facebook-turn-their-backs-on-undersea-cable-to-china/.
[318] https://www.rappler.com/technology/google-plcn-subsea-cable-fcc-approval.
[319] https://www.justice.gov/opa/pr/team-telecom-recommends-fcc-deny-pacific-light-cable-network-system-s-hong-kong-undersea.
[320] https://www.philstar.com/business/2021/09/28/2130104/dict-launches-national-broadband-program-resiliency-route.

In order to maximize implementation, the NBP's implementation will be divided into three phases:

- **Phase 1** will activate the backbone segments in Northern and Central parts of Luzon. Broadband access capacity will be distributed to NCR, La Union, Pangasinan, Benguet, Nueva Ecija, Ilocos Sur, Tarlac, Pampanga, Bulacan, Bataan, and Zambales. Around these nodes, so-called "Regional Rings" will be laid down in succeeding projects to create the "Provincial Broadband." The DICT estimates that the government will be able to use Phase 1 and have access to at least 100 Gbps of Internet connectivity by 2022.

- **Phase 2** will extend the network to connect more parts of Luzon, distributing access points in Cagayan, Isabela, Nueva Vizcaya, Benguet, Rizal, Cavite, Laguna, Quezon, and Batangas.

- **Phase 3** will provide connectivity to majority of the Bicol Region, while succeeding phases will extend the backbone across Visayas and Mindanao.

In 2021, the NBP was allocated a budget of PHP 1.9 billion from the general appropriations fund.

5. Free Internet Access in Public Places Act (RA 10929)

The Free Internet Access in Public Places Act, also known as the Free Wi-Fi Law, mandates the DICT to implement a free internet access program for public places, such as transport terminals, municipal halls, plazas and parks, state universities and colleges. It institutionalizes the free Wi-Fi program of the government and designated the spectrum user fee (SUF) collected from wireless operators as its main source of funding.

RA 10929 allows both telcos and ISPs to build and operate broadband networks as long as they are enrolled in the free internet access program of the DICT. This policy also promotes the use of satellites and emerging technologies in order to connect unserved and underserved areas. In 2021, the free Wi-Fi connectivity in public places and free Wi-Fi connectivity for SUCs programs were each allocated PHP 250 million from the general appropriations fund.

1.2 Regulatory framework

Wired networks

a. NTC MC 02-05-2008 on Value-Added Services

MC 02-05-2008 enumerates the services to be treated as value-added services, which include services offered over the Internet,[321] such as audio and video conferencing, electronic mail service, electronic gaming services except gambling, application service, virtual Private Network service, and hosting service.

This MC reiterates that VAS providers do not require a franchise or CPCN, and are not to operate their own networks, while at the same time requiring PTEs to provide leased line services to VAS providers at the same quality and a price not higher than offered by the PTE

[321] Services in bold are those that mainly or exclusively use Internet connectivity today. From *NTC MC 02-05-2008*. Value-Added Services. https://ntc5.ntc.gov.ph/wp-content/uploads/2017/05/MC-02-05-2008.pdf

to the public. As with MC 14-07-2000, MC 02-05-2008 requires PTEs to provide VAS providers with connection wherever technically feasible.

b. Joint Memorandum Circular No. 1, series of 2021 on Streamlined Guidelines for the Issuance of Permits and Clearances for the Erection of Poles, Construction of Underground Fiber Ducts, and Installation of Aerial and Underground Cables and Facilities to Accelerate the Roll Out of Telecommunications and Internet Infrastructure

Following the pattern set by Anti-Red Tape Authority (ARTA) JMC No.1 s.2020 (as amended by ARTA Revised JMC No.1 s. 2021), which provided a streamlined permitting process for the deployment of cellular towers for wireless connectivity, JMC No.1 s. 2021 streamlined the permits and clearances necessary for the deployment of wired infrastructure. Specifically, the JMC streamlines the "processes and requirements for permits and clearances for the installation of poles, the laying of underground fiber ducts, and deployment of cables and facilities along national, local, and subdivision roads, including pavements and sidewalks for Internet connection projects."[322]

Under the JMC, a single excavation clearance is necessary for the construction of poles (used for aerial fiber deployments) or underground fiber ducts.[323] LGUs are not allowed to ask for requirements beyond an Affidavit of Undertaking for the deployment of wired infrastructure, and a copy of the authority from the infrastructure owner undertaking any liabilities that may arise from the cable laying works.

The JMC was signed by the ARTA, DICT, NTC, Department of the Interior and Local Government (DILG), Department of Public Works and Highways (DPWH), Civil Aviation Authority of the Philippines (CAAP), Energy Regulatory Commission (ERC), National Electrification Administration (NEA), and the Philippine Competition Commission (PCC).

Wireless networks

c. NTC Memorandum Circular No. 10-10-97 on Spectrum User Fees

Act 3846 or the Radio Control Law limits the use of licensed radio frequencies to holders of a Congressional franchise.[324] Section 15 of RA 7925, in turn, provides the use of spectrum is subject to "reasonable spectrum user fees (SUF)." The overarching principle guiding the collection of SUF is laid out in NTC MC No. 10-10-97, which states that:

[322] Better Internet PH (2021, November 4). *JMC on streamlining permit and clearance approvals will help accelerate rollout of wired broadband connection.* https://medium.com/@betterinternetph/jmc-on-streamlining-permit-and-clearance-approvals-will-help-accelerate-rollout-of-wired-broadband-d6307a016869

[323] Ochave, R.M.D. (2021, October 26). ARTA simplifies permit process for laying cable, wiring poles for internet. *Business World.* https://www.bworldonline.com/arta-simplifies-permit-process-for-laying-cable-wiring-poles-for-internet/

[324] See Section 1. *Republic Act No. 3846.* An Act Providing For The Regulation of Radio Stations and Radio Communications in the Philippines and Other Purposes. https://ntc.gov.ph/wp-content/uploads/2015/10/LawsRulesRegulations/RAs_PDs_EOs/RA_3846.pdf

> "The SUF shall be based on the amount of spectrum used, **the type of service being offered,** and the economic classification of the areas covered by the radio stations.[325]"

The MC makes it clear that SUF is computed based on the *service* for which particular radio frequency bands are used. MC 10-10-97 goes on to provide a schedule of rates for each particular service, including cellular mobile telephone service (CMTS), private mobile radio service, point to multipoint radio stations, and broadband services, among others.

Succeeding memorandum circulars issued by the NTC pertains to SUF computation of specific services, such as 3G technology (MC No. 07-08-2005) and Broadband Wireless Access (BWA) (MC 06-08-2005).[326]

d. NTC Memorandum Circular No. 09-09-2003 on Wireless Data Networks and Devices

MC 09-09-2003 designated the 2400 MHz to 2483 MHz, 5150 to 5350 MHz, and 5470 to 5850 MHz bands as open and unprotected Wi-Fi networks that can be freely used on a non-interference basis.[327] However, these frequencies overlap with those subsequently allocated by MC 06-08-2005 for Broadband Wireless Access (and therefore designated as licensed frequencies). While the 2.4 GHz and 5.8 GHz bands continue to be unlicensed in the Philippines, it needs to be clarified how the two regulations are harmonized.

The MC defines an *indoor* Wi-Fi equipment as those not exceeding 250mW effective radiated power (ERP) and not having an external antenna. This distinction is important, as the MC imposes a spectrum user fee on any entity (whether a person, private entity, or PTE) operating *outdoor* equipment. While the ERP distinction is clear, the MC does not define 'external antenna,' nor describe what it encompasses. The examples of indoor equipment it provides – "WLAN cards or other similar cards directly sold to the end users, WLAN enabled portable computers, Bluetooth enabled mobile phones, Bluetooth enabled portable computers and personal digital assistants" – imply by omission that an external antenna is any appendage that protrudes from the body of a device. If so, plenty of consumer devices with external antennas, from personal computer motherboards to home Wi-Fi access points, are potentially subject to SUF.

On the other hand, if this is not the case, then non-PTEs (including individuals and other entities, such as VAS providers) should not be subject to SUF for deploying Wi-Fi networks. Discussion raised during deliberations on House Bill 9851 or the "Zero Spectrum User Fee for Telcos Using Wi-fi Act," indicated that the NTC charges SUF from non-PTEs operating Wi-

[325] Emphasis added. *NTC MC No. 10-10-97,* Spectrum User Fees. https://region7.ntc.gov.ph/images/LawsRulesAndRegulations/MC/GeneralFiles/MC_10-10-97.pdf

[326] *NTC MC No. 06-08-2005*, Frequency Band Allocations for Broadband Wireless Access. https://ntc.gov.ph/wp-content/uploads/2015/10/LawsRulesRegulations/MemoCirculars/MC2005/MC-06-08-2005.pdf

[327] See Section 3, *NTC MC No. 09-09-2003,* Wireless Data Networks and Devices. https://ncr.ntc.gov.ph/wp-content/uploads/2017/Memorandum_Circulars/MC-09-09-2003.pdf This is consistent with the treatment of the 2400-2500 MHz and 5725-5875 as among the industrial, scientific, and medical (ISM) bands, which "must accept harmful interference" from other devices using the same frequencies. These bands are therefore colloquially known as *unlicensed* or *unregulated frequencies*. See Sec. 5.150, NTC (2019). *National Radio Frequency Allocation Table*. https://ntc.gov.ph/wp-content/uploads/2019/08/NRFAT-Rev-2019.pdf

Fi networks.[328] Whether this was made on the grounds of the indoor-outdoor equipment distinction, or some other basis, is unclear. Section 6 of HB 9851, which passed Third Reading in the House on September 22, 2021, provides that "the State through the DICT and the NTC shall not impose a levy, charge, or collect fees from PTEs *and other users*" of Wi-Fi frequencies, thus exempting both PTEs, and VAS providers and other users. Further clarity is also needed on why the NTC charges SUF for the use of open and unlicensed frequencies by any user, on any grounds.

e. DICT Department Circular No. 008 on Policy Guidelines on the Co-Location and Sharing of Passive Telecommunications Tower Infrastructure for Macro Cell Sites

As part of a push to accelerate mobile broadband infrastructure deployment in the country, the DICT issued a common tower policy in May 2020. The policy provides a framework for passive telecommunications tower infrastructure (PTTI) companies or entities that construct towers, masts, ducts, and other infrastructure on or through which active network equipment is installed for the delivery of wireless network services. The policy mandates market-based access rates to shared passive infrastructure, subject to monitoring and regulatory action by the DICT alone or together with the NTC, as appropriate.[329] Section 11 (d) of the policy mandates that:

> "All installations made after the effectivity of this Circular, of private sector antennas, transmitters, receivers, radio frequency modules, radio-communication systems, and other active ICT equipment, units, and implements of macro cell sites, as week as improvements, renovations, upgrades or updates thereof, **shall be co-located in Shared PTTIs, except as may be allowed by the DICT upon a clear showing of meritorious grounds**, which are not contrary to departmental policies.[330]"

The policy aims to eliminate redundant passive network infrastructure and make it more efficient to deploy towers in unserved and underserved areas. This is meant to complement an earlier DICT issuance, the *Rules on The Accelerated Roll-Out of Common Towers in the Philippines,*[331] which provides independent tower companies a priority list of 2,500 sites for the construction of shared towers.[332] This issuance also prohibits the construction of new towers within 150 meters for urban and within 1,000 meters for rural areas of existing or planned towers, subject to exceptions which include existing infrastructure being unable to accommodate more capacity or more modern technologies.[333]

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[328] House of Representatives Bill 9851, 18th Congress. An Act Establishing A Zero Spectrum User Fee Policy For Philippine Telecommunications Entities Using Wi-Fi Frequency Bands or Spectrum. https://www.congress.gov.ph/legisdocs/third_18/HBT09851.pdf

[329] See Section 11 (b) and (c), *DICT Department Circular No. 008*, Policy Guidelines on the Co-Location and Sharing of Passive Telecommunications Tower Infrastructure for Macro Cell Sites. https://dict.gov.ph/wp-content/uploads/2020/06/Department_Circular_No_008_Policy_Guidelines_on_the_Co_Location.pdf

[330] Emphasis added.

[331] A copy of the issuance can be found at https://dict.gov.ph/wp-content/uploads/2019/05/Final-Version-Rules-on-the-Accelerated-Roll-Out-of-Common-Towers-in-the-Philippines.pdf

[332] For a list of the sites, see Annex B – Hard to Acquire (HA) sites (as per GLOBE and SMART), and Annex C – GovNet Sites, https://dict.gov.ph/rules-on-the-accelerated-roll-out-of-common-towers-in-the-philippines/

[333] See Section 6, *Rules on The Accelerated Roll-Out of Common Towers in the Philippines.*

The common tower policy also puts in place a registration mechanism for independent tower companies who would like to operate in the Philippines. As of September 2020, the DICT has accredited 23 independent tower companies.[334]

These issuances however only cover the construction of new towers and other passive infrastructure. Legacy PTTIs, or those existing towers directly or indirectly owned by the incumbent wireless operators, are merely encouraged to share space on a voluntary basis.

f. Anti-Red Tape Authority (ARTA) Revised Joint Memorandum Circular No. 1, series of 2021, Revising and Expanding Joint Memorandum Circular No.1, S. 2020 Or The "Streamlined Guidelines for the Issuance of Permits, Licenses, and Certificates for The Construction of Shared Passive Telecommunications Tower Infrastructure."

Under ARTA Revised JMC No. 1, s. 2021, the construction of any telecommunications tower, whether shared or private, shall be subject to a uniform set of requirements enumerated in the JMC.[335] The Revised JMC and its streamlined requirements remain in force for the duration of the emergency pandemic response bill Republic Act No. 11494, otherwise known as the "Bayanihan to Recover As One Act.[336]" This operationalizes Section 4 (ii) of RA 11494, which calls for the accelerated deployment of ICT infrastructure in the country.

The incumbent wireless operators Globe Telecom and PLDT-Smart have long attributed delays in their network rollouts to slow and non-uniform permitting frameworks.[337] As RA 11494 has a sunset provision of three years from its signing in September 2020, it is possible that permitting guidelines will revert to the per-LGU system in force before the COVID-19 pandemic. Both Globe and PLDT have expressed their desire to see the streamlined permitting process set by Revised JMC No.1 s.2021 made permanent.[338]

The revised JMC was signed by the DICT, NTC, DILG, DPWH, CAAP, Department of Health (DOH), Department of Human Settlements and Urban Development (DHSUD), Food and Drug Administration (FDA), and the Bureau of Fire Protection (BFP).

g. Republic Act No. 10929, otherwise known as the Free Internet Access in Public Places Act of 2017, and its IRRs

RA 10929 provides a specific exception allowing non-PTEs to own and operate their own broadband networks and to use whatever Internet technologies are available even without a CPCN, when said network's primary purpose is to support the government's Free Internet Access

[334] https://business.inquirer.net/307576/23-firms-accredited-for-common-tower-program
[335] *ARTA Revised JMC No. 1, s. 2021.* https://arta.gov.ph/wp-content/uploads/2021/07/Revised-Telco-JMC-.pdf
[336] *RA No. 11494.* An Act Providing For COVID-19 Response And Recovery Interventions And Providing Mechanisms To Accelerate The Recovery And Bolster The Resiliency Of The Philippine Economy, Providing Funds Therefor, And For Other Purposes. https://lawphil.net/statutes/repacts/ra2020/ra_11494_2020.html
[337] Prior to the JMC, LGUs at the municipal and barangay level were free to require their own set of documentary requirements and regulatory fees to entities looking to deploy towers in their jurisdiction. See Mercurio, R. (2021, March 15). Telcos continue to face challenges with permits. *The Philippine Star.* https://www.philstar.com/business/2021/03/15/2084278/telcos-continue-face-challenges-permits
[338] Balinbin, A.L. (2021, July 26). Telcos: Keep easier permit process for towers. *Business World.* https://www.bworldonline.com/telcos-keep-easier-permit-process-for-towers/

Service.[339] Network operators under the program are allowed to sell excess bandwidth[340] to the general public, provided that they first register with the NTC as a VAS provider, and only for so long that the operator continues to operate the public Internet access site.[341] Unlike regular VAS providers, however, whose rates are deregulated in accordance to NTC MC 02-05-2008, paid access rates of free public Internet network operators are regulated by the DICT, the implementing agency of RA 10929.[342]

It should be noted that the terms of reference for a free public Internet access site only covers the last mile segment. The TOR does not cover the middle mile, and so the ISPs enrolled in the free Wi-Fi program must still connect to a PTE's middle mile PoP. These ISPs are not allowed to construct their own middle mile segment without a Congressional franchise and CPCN/PA, with the exception of using satellite and other emerging technologies to connect directly to a backbone facility.[343]

Satellite Broadband

h. Executive Order No. 127, s. 2021 on Expanding the Provision of Internet Services Through Inclusive Access to Satellite Services, Amending Executive Order No. 467 (S. 1998) For The Purpose

A special regulatory case exists for the use of satellite broadband with the passage of EO 127 s. 2021.[344] Prior to this executive order, EO 467 s. 1998 restricted access to international fixed satellite systems (of which broadband satellites are a subset) to enfranchised telecommunications entities, or PTEs.[345] With the passage of EO 127 s. 2021, PTEs, value-added service (VAS) providers, and Internet service providers (ISPs) registered with the NTC are allowed direct access to all satellite systems, whether fixed or mobile, international or domestic, and to build and operate broadband facilities to offer internet services.[346]"

EO 127 s. 2021 allows VAS providers and ISPs to build last mile networks for distributing bandwidth obtained directly from a national backbone (in the case of a domestic teleport) or even from overseas (with international teleports). Under the new policy, an ISP connecting to satellite broadband does not require access to a PTE's middle mile PoP or any PTE involvement, if it deems it unnecessary.

The Implementing Rules and Regulations of EO 127 s. 2021 contain more specific guidelines that could potentially affect regulation of the broadband sector.[347] By defining the concepts of 'Broadband' and 'Internet Service Provider' separately from PTEs and their services (Section 2 of

[339] See Section 6, *Republic Act No. 10929.* An Act Establishing the Free Internet Access Program in Public Places in the Country and Appropriating Funds Therefor. https://www.lawphil.net/statutes/repacts/ra2017/ra_10929_2017.html
[340] Excess bandwidth here refers to bandwidth beyond that stipulated in an operator's terms of reference with the government for the operation of a free public Internet access site.
[341] See Section 13, *Rules and Regulations Implementing Republic Act (R.A.) No. 10929 Known As The Free Internet Access In Public Places Act.* https://www.dict.gov.ph/wp-content/uploads/2017/12/IRR-RA-10929-Version-8.pdf
[342] See Section 13 (b) and (c), RA 10929 IRRs.
[343] See Section 6, *RA 10929*; and Section 14, *RA 10929 IRRs*.
[344] Ex*ecutive Order No. 127, series of 2021.* https://www.officialgazette.gov.ph/downloads/2021/03mar/20210310-EO-127-RRD.pdf
[345] See Section 1 (a), *Executive Order No. 467, series of 1998,* Providing For A National Policy On The Operation And Use Of International Satellite Communications In The Country. https://region7.ntc.gov.ph/images/LawsRulesAndRegulations/EO/EO_467.pdf
[346] See Section 1, EO 127 s.2021.
[347] A copy of the IRRs can be accessed here: https://dict.gov.ph/wp-content/uploads/2021/09/DC_UP-ONAR.pdf

the IRRs), and distinguishing the Internet as an information service separate from switched/telecommunications services (Section 12), the IRRs clarifies the separation of broadband from telecoms. This represents a paradigm shift from the 'VAS to telecommunications' perspective adopted by the NTC based on RA 7925, and further reinforced in issuances such as NTC MC No. 07-08-2015, which states that only PTEs "may provide networks for broadband/Internet services.[348]"

EO 127 and its IRRs contain provisions promoting the uptake of and investment in satellite broadband technology, including owning and operating a Philippine satellite. It also requires all satellite broadband providers to register as a Satellite Systems Provider or Operator (SSPO) before it can do business with Authorized entities (PTE, ISP, VAS provider, broadcast company.

6. Policy recommendations for the development of Philippines ICT infrastructure

This section will tackle policy recommendations that promise to address the gaps and issues identified in the discussions in the previous sections, with a particular focus on policy and regulation that aim to develop and expand the country's digital infrastructure and improve access to Internet and digital services for more segments of the population.

1. Realizing the full benefits of the National Broadband Plan and Free Public Wi-Fi program

The NBP is a prerequisite to improving Internet connectivity in any country. More than just a broadband rollout plan, the NBP looks at the digital ecosystem and the different aspects and requirements of connectivity.

The plan consists of two major components—infrastructure and policy. Throughout the years, the DICT has been working on getting the various segments of the information infrastructure in place, beginning with the partnership with Facebook for access to the PLCN submarine cable, the two cable landing stations and LBI connecting them, and the agreement with the NGCP.

The key issue, however, has always been the distribution of the bandwidth down to the end users. This is a major challenge for several reasons:

- Existing laws, as well as the regulations that interpret their implementation, require a Congressional franchise and a CPCN as a PTE or telco before entities can put up *any type of network*. This has prevented non-telcos from participating in building the country's digital infrastructure, even at the local segments of the network. ISPs, such as cable broadband operators and wireless community ISPs, are not allowed to own and operate the middle mile infrastructure that is necessary to connect to a domestic backbone facility to pick up and bring bandwidth to the end users at the last mile.

[348] Section E (2), *NTC MC No. 07-08-2015,* Rules on the Measurement of Fixed Broadband/Internet Access Service. https://ncr.ntc.gov.ph/wp-content/uploads/2019/Memorandum_Circulars/2015/MC-07-08-2015.pdf

- The definition of a "network" is based on the broad definition provided in RA 7925 and its IRR. Taking the definition as is, "network" can mean something as simple as connecting one building to the one beside it. In practical terms, laying a fiber optic cable across two municipalities is already considered an activity reserved for a telco. As a result, small players are left with the following scenarios:
    - Look for a telco that can bring the bandwidth to their community
    - secure a Congressional franchise as a telco
    - in the case of cable TV operators, secure a Provisional Authority from the NTC to operate for each of the municipality where the cable is passing through. However, a PA means the operator has to actually provide service in that particular municipality even though it just intends to pass through

- The middle mile is a major bottleneck for connecting many parts of the country. This segment connects the last mile to the nearest backbone facility, that is usually located in the city center or *población*.[349] In many provinces and municipalities in the country, there are many small ISPs that can bring Internet service to the communities. However, their ability to do so depends on whether a telco sells capacity and is willing to bring the capacity to where they operate.

  The current network design and rollout strategy of the NBP, which will connect and establish Provincial Broadband networks, is promising. However, there has to be a recognition of the constraints of bridging the backbone and the last mile.

Given the higher cost of rolling out in lower income, less populated areas, incentives for operators who are connecting the underserved and unserved areas should also be considered. Incentives can be in the form of a subsidy for the network deployment, tax incentive or tax deduction for equipment purchase, or regulation that will make it less costly and less cumbersome to put up the necessary infrastructure (i.e., streamlining pole attachment, mandating the use of shared towers, putting up a common fiber optic cable corridor). The DICT- and ARTA-led guidelines for the use of shared passive telecom towers and the streamlining approval and permits for pole erection, laying of underground cable, and coordinated digging are a good start.

The Free Wi-Fi program allows non-telcos to participate in providing Wi-Fi connection in public places using satellite and emerging technologies, without the need for a Congressional franchise. This exception provided by RA 10929 gives an opportunity to explore the most feasible and cost-effective technology to provide Internet access, which should be applied to a broader context through legislation, such as the proposed Open Access in Data Transmission Act.

2. Open Access in Data Transmission Act

The proposed Open Access in Data Transmission Act is a curative legislation designed to **address the legal obstacles** brought about by outdated policy and, as a result, **bridge the broadband infrastructure gap**.

[349] Poblacion is the most populous part of a town where, usually, the local government office and plaza are located. In some contexts, however, población is where the church and houses are located.

The Philippines has been using outdated policy that is heavily distorted in favor of the PTEs to govern Internet or data transmission. In the 1990s, Internet service was dial-up connection using telephone lines. Hence, back then, it was logical to apply RA 7925 to Internet service. However, that is no longer the case for quite some years now, as other technologies have emerged that can carry Internet service.

RA 7925 was clearly designed to govern PTEs that operate telecom networks. Using this law for data transmission when Internet is no longer dependent on just telco facilities unfairly handicaps ISPs. ISPs cannot compete fairly because they are made to rely on telcos for access to infrastructure, pricing, and quality of service. Meanwhile the telcos are allowed to operate in the same retail market as the ISPs. More importantly, this means that ISPs can only operate in areas where the telcos are present. This has huge implications on the country's digital infrastructure, especially in the countryside.

Open Access will provide the **appropriate legal and regulatory framework** for internet provisioning. The bill aims to expand broadband infrastructure by:

- Introducing a simple and expeditious registration and qualification process for data transmission service providers, without the need for a Congressional franchise and a CPCN;
- Encouraging infrastructure sharing and co-location;
- Ensuring efficient and transparent management of radio frequency spectrum;
- Protecting the Internet as an open platform enabling consumer choice;

The bill recognizes and promotes the use of different technologies, platforms, and business models. This empowers small, local players to compete, innovate, and connect their communities. If passed, the Open Access Law will make it easier and less costly for ISPs to enter the market, put up a network, and offer internet service.

In August 2021, the Open Access bill was approved on third reading by the House of Representatives. It is awaiting a hearing at the Senate.

3. Amendments to Public Service Act

The intent of these amendments is to introduce competition in order to make the provision of public services and utilities more efficient.

The proposed amendment (1) clarifies the definition of public utilities, to help differentiate it against public services and (2) makes the 60% capital-stock-ownership-by-Filipinos requirement applicable only to public utilities. This aims to inject foreign capital into making public services (which includes telecommunications) more efficient.

With the possibility of full foreign ownership, the Philippines could potentially become a much more attractive investment opportunity for telcos from overseas. Easing restrictions on foreign investments is expected to attract more foreign investors.[350] Should the franchise requirement for

[350] Vera, B. (12 July 2017). Duterte gov't eyes up to 70% foreign ownership of telcos – NEDA chief. *Inquirer.net.* Accessed from: https://business.inquirer.net/232963/duterte-govt-eyes-70-foreign-ownership-telcos-neda-chief

telecoms also be removed, there will be lower barriers to entry for potential new players and less red tape before commencing operations.

The biggest argument against the removal of the foreign ownership cap is the possibility of compromising national security once foreign companies are allowed to operate infrastructure, like telecommunications networks. The current version of the PSA amendments in the Senate bill addresses this by placing certain restrictions on foreign state-owned companies from operating critical infrastructure and ensuring that cybersecurity mechanisms are in place to check against possible vulnerabilities that might be exploited by malicious actors.

The PSA amendment bill was approved on third reading at the House of Representatives. The Senate version was certified as urgent by the Office of the President and was still under consideration as of November 15, 2021.

4. Spectrum Management Policy Act

Given the importance of wireless technology in expanding and operating digital infrastructure, spectrum management policy law is a critical reform. The Radio Control Law provides the legal framework for spectrum management in the country, together with the Public Telecommunications Policy Act, which has some provisions on spectrum for telecommunications use.

There are bills pending in Congress that aim to amend or repeal the Radio Control Law.

Senate Bill (SB) No. 793, filed in July 2019: (i) mandates the DICT and NTC to create an annual spectrum management plan and (ii) mandates that all allocations of the radio frequency spectrum be in accordance with the ITU International Table of Radio Frequency Allocations, "insofar as consistent with national priorities and demand for radio frequency spectrum."[351]

SBN 793 also prescribes a mechanism for **dividing each spectrum band into blocks** in order to ensure competition, and also for a "sufficient number" of blocks be reserved for non-commercial government and public use. It also mandates the DICT and the NTC **to establish a competitive bidding methodology** for the allocation of all available blocks, with **accompanying performance requirements**, with a spectrum license valid for a maximum of **five (5) years.**

The bill further **bars the merger or acquisition** of any licensed entity with or by any other entity without prior approval by the NTC and the Philippine Competition Commission (PCC). It also bars any entity or group of entities with a "material interest" in each other **from holding more than 25%** of the licensed spectrum in any given band. The House version of the Open Access in Data Transmission bill proposes a threshold of 15% of all assignable spectrum in a band that would require a review by, and a no-objection notice from the PCC.
The House of Representatives' proposed amendments to RA 7925 include a provision that mandates the DICT, in consultation with the NTC and the Philippine Competition Commission, to issue the **guiding principles and policy direction for spectrum use** (House Bill No. 062).[352]

[351] SBN 1742. http://senate.gov.ph/lisdata/2755723808!.pdf
[352] https://www.congress.gov.ph/legisdocs/basic_18/HB00062.pdf

In pursuing the spectrum management policy reform, the following should be taken into consideration:

- **Objectives for spectrum management.** The government must have a list of objectives and targets that it intends to meet in terms of spectrum management. These objectives and targets may evolve and change periodically, depending on the government's priorities. They may include:
    - Ensure the highest value spectrum use for the most number of users
    - Promote competition by distributing spectrum equitably among a diverse set of broadband service providers
    - Promote the use of new and emerging Internet technologies for the digital era

- **Geographical spectrum assignment.** The NTC must review **authorized use versus actual use** of spectrum of all existing rights-holders. In **geographical areas** where the spectrum is not used despite a provisional authority or other permit authorizing use in the area, the spectrum assigned to an entity for that area may be considered as eligible for recall, subject to notice and hearing, and reassigned to new players that may use them in the areas where the current rights-holder failed to rollout the necessary network.

  Provincial-level spectrum assignment may be considered instead of nationwide spectrum assignment. If a telco does not have a tower in a certain location, the telco must not be given spectrum-use privileges in that location; the telco must build towers first before being assigned spectrum in a location. This is current practice for broadcast entities, so there is no reason why this practice cannot be applied to telecommunications entities.

- **Dynamic spectrum access**. In response to Resolution ITU-R 58-1, the NTC should consider and report out, within six (6) months, its proposal and timetable for the adoption of dynamic spectrum access,[353] as recommended by the ITU.

  The DICT may also consider issuing policy guidelines on dynamic or open and shared spectrum for purposes of the government's free Internet program. This is enshrined in paragraph 3, Section 8 of the "Free Internet Access in Public Places Act," which states:

  > "Within one (1) year from the effectivity of this Act, the DICT, in consultation with the NTC and PCC, shall issue the guiding principles and policy direction for the open and shared use of spectrum, especially for the implementation of the program."

- **Open tenders.** Clarify and define what "open tenders" means and how this will be carried out to assign spectrum to new players. The existing rules[354] simply state that the NTC shall *hold open tenders* "where demand for specific frequencies exceed availability," recognizing that the government needs to ensure a wider access to this scarce, "limited resource." The rules also provide that "open tenders shall follow the standard government bidding process."

[353] "Dynamic spectrum access" refers to the use of a portion of spectrum which is not being used at a given time and within a given geographic area, and may be available for use by a radiocommunication application, operating in accordance with the Radio Regulations. See https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-SM.2405-2017-PDF-E.pdf

[354] Rule 604 of NTC MC 03-03-96, a circular in addendum to Rule 600 of NTC MC 08-09-95, the IRR of RA 7925. https://ntc.gov.ph/wp-content/uploads/2015/10/LawsRulesRegulations/MemoCirculars/MC1996/MC-03-03-96.pdf

An "Open Tender" is different from a beauty contest where spectrum is awarded to the entity who has the most need for it. However, standard bidding procedure requires terms of reference (TOR) to be issued and reviewed by the bids and awards committee (BAC) of a government office. Spectrum assignment is not determined through a TOR and not awarded by a BAC. In other countries, the government carries out spectrum auctions, as they are considered "the simplest and most transparent method of allocating [spectrum] resources where there is competing demand." There are different types of auctions,[355] but the common goal is to award the spectrum to the highest bidder, based on the assumption that "the willingness to pay for the spectrum is a measure of the value of the service for which the spectrum will be used if acquired (opportunity cost)."[356] As seen in the third telco selection process, financial and technical capability can be combined as a requirement for the awarding of a license. A similar approach in awarding future spectrum may be considered.

5. Unleashing the potential of unlicensed spectrum

While the ITU recommends radio spectrum standards, it is the discretion of each country on how it will ultimately manage spectrum. Given the archipelagic nature of the Philippines, wireless may be the most efficient and affordable network to deploy. Hence, spectrum use policy is very crucial, especially for communities that are beyond the commercial reach of wired technologies.

Other countries follow the ITU recommendation on unlicensed spectrum, such as ISM bands, that are not assigned to particular holders but rather are left to any person or entity to use. While interference is the biggest issue in using unlicensed spectrum, access to these bands can help many rural communities enjoy some form of access or more affordable Internet service.

There are opportunities for small providers to help proliferate Internet services in communities using unlicensed frequencies. This is akin to the Public Wi-Fi network concept in other countries, such as in Europe and other Southeast Asian countries, adopt a decentralized approach where shops, restaurants, cafes, and public transport facilities are allowed to rollout wireless internet connection.[357]

According to Eliseo Rio, Jr., a former government official who is now part of a consortium of ISPs, a major constraint for public Wi-Fi in the Philippines is the ambiguity of rules when it comes to the use of unlicensed spectrum. Unlicensed Wi-Fi frequencies, such as 2.4Ghz, 5Ghz and 60GHz, are levied SUF by the government when used outdoors. According to Rio, the SUF for outdoor Wi-Fi is prohibitive and not fit for small players. Given responsive regulation, Rio says wireless ISPs can help connect communities via Wi-Fi if allowed to use equipment with limited power output of 5-10 watts of effective radiated power (ERP) and imposed lower, if not zero, SUF.[358]

[355] See, for example, the Australian Communications and Media Authority's auction methods https://www.acma.gov.au/theACMA/types-of-auctions
[356] See https://www.acma.gov.au/Industry/Spectrum/Radiocomms-licensing/Spectrum-licences/spectrum_20#17.
[357] https://indianexpress.com/article/explained/india-public-wifi-project-explained-7113250/
[358] Personal (online) communication with Gen. Eliseo Rio, Jr. 5 November 2021.

Conclusion

The pandemic has pushed the acceleration of digitalization in the Philippines. The public health crisis has provided the momentum for the adoption of digital solutions and platforms; this opportunity must not be wasted.

Discussions in the previous sections offer the following key mesages:

- The new normal is digital. While there are marked improvements in the quality of Internet service for communities that are already online, access to the digital infrastructure is still a challenge for many areas outside of the National Capital Region and Luzon.

- Public and private investment in the digital infrastructure is substantive but, at this stage, is still targeted more at improving Internet performance in connected communities rather than expanding coverage to the underserved and unserved areas.

- The Philippines has great potential in terms of accelerating digitalization. Uptake of digital tools for e-commerce, digital banking, online learning, and remote work has been tremendous, albeit forced by the pandemic; Filipinos are, after all, quick to adapt to technology and survive a crisis.

- Despite achieving some progress, the Philippines still lags behind in terms of Internet access, quality, and affordability compared to other ASEAN nations. In most global and regional ICT indices, the lack of digital infrastructure and a restrictive regulatory environment are identified as constraints to digitalization.

- Outdated policy and restrictive regulations remain as significant barriers to the development of the Philippines' digital infrastructure.

There are exciting new technologies, business models, as well as changing mindsets and behavior by Filipinos—all important ingredients that can propel the Philippines to embrace a digital new normal. However, online everything requires a reliable and robust digital infrastructure.

The government must continue the policy reforms for digital connectivity that were started by the current administration. While there is progress in executive policy issuances, there is barely any movement in the legislative space. If reforms in ICT infrastructure were to be sustained, Congress needs to update the analog-era legal frameworks that will push regulation to adapt to a digital world.

Unless policy reforms and program implementation are geared toward expanding and extending infrastructure to the rural areas, the digital divide (gaps in access and affordability) threatens to exclude millions of Filipinos from participating meaningfully in the digital economy and enjoying the benefits of digitalization.

Hence, the government must prioritize policy that will allow a diverse set of network operators and service providers, democratize access to digital technologies, and unleash the potential of small players who are willing and able to connect and enable digital services in the rural communities.