DECEMBER 2023

DISCUSSION PAPER SERIES NO. 2023-31

Making Broadband Universal: A Review of Philippine Policies and Strategies

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Abstract

Accelerating digitalization is one of the cross-cutting strategies identified in the Philippine Development Plan 2023-2028. To ensure that the benefits of digitalization benefit everyone, widespread adoption of the internet is essential. This study provides an overview of the concepts and strategies that have been employed to increase broadband adoption. It then presents the state of broadband services in the Philippines and discusses the policies and strategies at the national and community level, including initiatives to provide relevant online services and content.

The government has in place a National Broadband Plan, a a coherent set of proposed policy, regulatory, and infrastructure interventions to ensure the delivery of universal, fast, reliable, affordable broadband internet services. While significant reforms have been introduced in recent years and additional measures are planned, the implementation of government programs has been less than satisfactory. There is a need to revisit the design of Free Wi-Fi for All to ensure that the country's flagship universal access program will fulfill its objectives, given the substantial public funding that is being allocated for internet services in public places. Moreover, with satellite technologies and service providers now available, connecting GIDAs to the internet is no longer insurmountable. To better understand the development of broadband in the Philippines, a broadband map should be developed. More comprehensive data will also help in uncovering digital connectivity disparities among specific sectors or groups and guiding the development of more targeted solutions.

Keywords: broadband, internet, universal access and service

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1. Introduction

1.1 Policy context and objectives

Universal access to information and communications technology (ICT), including the Internet, is one of the targets under Goal 9 of the Sustainable Development Goals. (SDGs) on Industry, Innovation, and Infrastructure. Last year, on World Telecommunication and Information Society Day, United Nations Secretary-General António Guterres asserted that "*Leaving no one behind means leaving no one offline* (UN 2022)*."*

A 2019 survey commissioned by the Department of Information and Communications Technology (DICT) revealed that only 17.7 percent of households in the Philippines have internet access at home (DICT 2019). The Philippines' internet access lags far behind both the global average (61.5%) and that of developing countries (52.6%) in 2019 (ITU 2021a). Stark regional disparities persist, with 33.2 percent of households in the National Capital Region having internet access compared to only 4.5 percent in the BARMM[1] (DICT 2019). The digital divide mirrors uneven development throughout the Philippines since household internet access is positively associated with regional economic output (GRDP per capita) and negatively correlates with poverty rates (Serafica and Oren 2022a).

The 2022 State of the Nation Address emphasized the importance of universal connectivity to ensure that digitalization benefits everyone. Accelerating digitalization is one of the cross-cutting strategies identified in the Philippine Development Plan 2023-2028. Specific chapters to enhance digital connectivity include Chapter 10 on "Promote Competition and Improve Regulatory Efficiency" in and through the internet and digital technologies and Chapter 12 on "Expand and Upgrade Infrastructure", which includes the modernization and expansion of digital infrastructure.

In line with the global and national policy priority of improving digital connectivity, the study will review government policies and programs related to broadband development and identify areas that could be improved. It builds on recently completed PIDS studies on ICT, specifically by Albert et al. (2021), which examined the state of ICT access, use and infrastructure in the country and Serafica and Oren (2022a, 2022b), which looked at the regulatory and competition issues. While this study focused on examining government programs that aim to bridge the digital divide through increasing universal broadband access, it did not address other ICT

* The first author is a senior research fellow, the second author is a research fellow, and the third author is a research specialist, all from the Philippine Institute for Development Studies (PIDS). The authors are grateful to Mr. Mike Kenneth Venus (Tech4ED-DTC Project Team - DICT), LTC Francel Margareth Padilla-Taborlupa (7th Signal Batallion Commander, Army Signal Regiment Philippine Army), Mr. Wilson L. Chua (BASS - Bandwidth and Signal Statistics) for sharing invaluable information and insights. The assistance of Ms. Junalyn Bayona, Ms. Lucita Melendez, Ms. Valerie L. Lim, and Mr. Jethro El L. Camara are likewise acknowledged.

[1] Bangsamoro Autonomous Region in Muslim Mindanao

issues, such as cybersecurity, data governance, consumer protection, and environmental impacts.

1.2 Overview of broadband services

What is broadband?

Broadband essentially refers to high-speed access to the Internet (DICT 2017). The policy-defined minimum speed varies across jurisdictions and changes over time. For instance, the US Federal Communications Commission (FCC) considers broadband to have a speed of 25Mbps downstream and 3 Mbps upstream (Fish 2020). A 2015 regulation of the National Telecommunications Commission (NTC) has defined entry-level broadband as an internet connection with at least 256 kbps speed. The transmission capacity defined by the International Telecommunication Union-Telecommunications Standardization Sector (ITU-T) is at least 1.5 or 2.0 Megabits per second (Mbps) (DICT 2017). As shown in Table 1 below, the required internet speed differs depending on the service or application.

Table 1. Upstream and Downstream Speeds Needed for Various Services and Applications

500 kbit/s to 1 Mbit/s	1 to 5 Mbit/s	5 to 10 Mbit/s	10 to 100 Mbit/s	100 Mbit/s to 1 Gbit/s	1 to 10 Gbit/s
• VoIP • SMS • Basic e-mail • Web browsing (simple sites) • Streaming music (caching) • Low-quality video (highly compressed)	• Web browsing (complex sites) • E-mail (larger attachments) • Remote surveillance • IPTV, SD (1–3 channels) • File sharing (small, medium) • Telecommuting (ordinary) • Digital broadcast video (1 channel) • Streaming music	• Telecommuting (converged services) • File sharing (large) • IPTV, SD (multiple channels) • Switched digital video • Video on demand, SD • Broadcast video, SD • Video streaming (2–3 channels) • Video downloading, HD • Low-definition telepresence • Gaming • Medical file sharing (basic) • Remote diagnosis (basic) • Remote education • Building control and management	•Telemedicine • Educational services • Broadcast video, SD and some HD • IPTV, HD • Gaming (complex) • Telecommuting (high-quality video) • High-quality telepresence • Surveillance, HD • Smart, intelligent building control	• Telemedicine, HD • Multiple educational services • Broadcast video, full HD • Full IPTV channel support • Video on demand, HD • Gaming (immersion) • Remote server services for telecommuting	• Research applications • Telepresence using uncompressed video streams, HD • Live event digital cinema streaming • Telemedicine remote control of scientific or medical instruments • Interactive remote visualization and virtual reality • Movement of terabyte data sets • Remote supercomputing

Note: kbit/s = kilobits per second; Mbit/s = megabits per second; Gbit/s = gigabits per second; VoIP = voice over Internet Protocol; SMS = short message service; IPTV = Internet Protocol television; SD = standard definition; HD = high definition.
Source: California Broadband Task Force 2008 as cited in Kelly and Rossotto (2012, p. 18)

The US FCC provided a broadband speed guide for households. Table 2 compares the minimum download speed (Mbps) required for light, moderate, and high household usage with one, two, three or four devices concurrently (e.g., laptop, tablet, or game console) to ensure satisfactory performance of each application.

Table 2. Household Broadband Guide

	Light Use (Basic functions: email, browsing, basic video, VoIP, Internet radio)	**Moderate Use** (Basic functions plus one high-demand application: streaming HD video, multiparty video conferencing, online gaming, telecommuting)	**High Use** (Basic functions plus more than one high-demand application running at the same time)
1 user on 1 device	Basic	Basic	Medium
2 users or devices at a time	Basic	Medium	Medium/Advanced
3 users or devices at a time	Medium	Medium	Advanced
4 users or devices at a time	Medium	Advanced	Advanced

Notes: Basic Service = 3 to 8 Mbps; Medium Service = 12 to 25 Mbps; Advanced Service = More than 25 Mbps. Mbps (Megabits per second) is the standard measure of broadband speed. It refers to the speed with which information packets are downloaded from, or uploaded to the internet.
Source: FCC (2022a)

Technologies and costs

Various technologies are used for digital connectivity, including fixed telecommunication networks and mobile networks, as well as cable television networks, fixed wireless networks, and various types of satellite networks. Mirandilla-Santos (2022) highlighted that understanding the digital supply chain is crucial for identifying challenges in the telecommunications sector. Among ISPs, major telco operators and small ISPs (including non-telco ISPs and cable broadband operators) have distinct supply chains[2]. Furthermore, the supply chain varies depending on the technology employed. Wireless ISPs or mobile network operators (MNOs) like Smart, Globe, and DITO, rely on towers, incorporating independent tower companies into their supply chain. Conversely, wired ISPs offering cable broadband utilize electric poles to mount cables or dig the ground for underground fiber optic installation. This understanding is useful in terms of reducing capital expenditure of ISPs.

Different factors affect the cost of broadband deployed, especially for fixed networks. This include topography, population density, and the availability of existing communications infrastructure. Geographically isolated areas such as mountainous regions or islands or landlocked countries that are far from submarine cables face a considerable cost disadvantage (Marcus et al. 2021). The choice of technology also significantly affects the cost of broadband deployment. The 3G network is shown to be more costly than 4G since more sites are needed due to its lesser spectrum efficiency. LEO satellite network is another option, although it does not have sufficient capacity and coverage to affordably accommodate a large number of users. 4G networks can provide mobile broadband, while 5G non-standalone (NSA) offers enhanced

[2] See Serafica and Oren (2022b) for the discussion on the internet connectivity value chain

mobile broadband and can accommodate internet-of-things (massive machine-type communications). 5G standalone (SA) has added capacity to provide ultra-reliable and low-latency communications. Among all these, the least cost technology for developing countries are 4G and 5G NSA. Both can utilize wireless backhaul, which is more cost-efficient than fiber backhaul. Wireless backhaul is preferred for hard-to-reach areas. However, fiber optic has a lower long-term operational cost and is more appropriate for areas that need higher data demand. 5G NSA is a more efficient choice than 4G when more capacity is required (e.g., higher density of users in an area). However, when a country already made significant progress in deploying 4G networks (e.g., 80%-90% coverage), it is more cost-effective to complete 4G deployment (Oughton 2023).

The ITU's assessment in deploying ~10 Mbps broadband to 90 percent of the global population over ten years of age would require an investment of about USD428 billion for infrastructure cost. This estimate does not include ensuring broadband's quality of service. In contrast, the World Bank's assessment, which takes into account the quality of service, shows that private and public costs of universal broadband could reach about USD2 trillion to achieve at least ~10 Mbps universal broadband in low- and middle-income countries, an investment of greater than 0.67 percent of annual GDP over the next decade (Oughton et al. 2022).

The minimum cost of universal broadband for all developing countries over the next ten years ranged from USD0.62 trillion for 4G to USD1.1 trillion using 5G NSA (10-Year GDP shares of 0.21% and 0.35%, respectively), based on the minimum capacity requirements for urban (25 Mbps), suburban (10 Mbps), and rural (2 Mbps) users. In considering the 5G strategy, it is important to consider that not all users might be using 5G smartphones. Hence, they would not have access to the 5G network (Oughton et al. 2022). In terms of using a 5G network (NSA), 400 Mbps is twice the cost of a 25Mbps. However, the capacity of 400 Mbps is 16 times higher than 25Mbps. This suggests the growth of users' demand for capacity is an essential factor in choosing technology for the deployment of broadband services, other than the cost (Oughton 2023).

Alternative systems can address the digital divide by serving as a complement to commercial models in providing broadband access to local communities, particularly to unviable areas. Mesh networks, for instance, are the easiest and simplest networks. Some of these types of networks are in the form of wireless local area networks (LAN) that connect small geographical groups of users. It is resilient to natural disasters and provides anonymization and privacy to users. It can also be easily operated by communities lacking technical expertise by providing instructional manuals, such as what was done by LibreRouter (open hardware project). Satellite companies, such as Starlink, use spectrum technologies and partner with local companies. TV white spaces (TWS), an unlicensed spectrum, may also be used, particularly for rural connectivity and internet-of-things (IoT). Other technologies, such as microwave-based high-speed radio transmission, may also support local networks (Strover 2021).

1.3 Importance of broadband

Many studies have shown that broadband has a positive effect on the economy, though estimates of the magnitude vary. The impact of a 10% increase in broadband penetration on GDP growth, for example, can be anywhere from a low of 0.24 percent to a high of 1.50 percent (Kelly and Rossotto 2012). When properly harnessed, broadband can help spur innovation by individuals, firms, academic organizations, and the government. Together with the applications, content, services, and devices, broadband satisfies the criteria of a general purpose

technology (GPT), which are characterized by pervasiveness in the economy, technological dynamism, and the ability to create general productivity gains (Bresnahan and Trajtenberg 1995; Kelly and Rossotto 2012).

Broadband exhibits positive network externalities, both direct and indirect. Direct externalities arise from subscribership (a similar argument to telecommunications where the value increases with the size of the network or the number of people one is able to connect with). Indirect network externalities refer to the impact of broadband on the development of applications and content that rely on the speed of connectivity. More people would use broadband if it had more interesting or useful applications or content, but these will not be produced if the speed needed is not available (Atkinson 2007).

An ITU-commissioned study examined the economic impact of broadband in the Philippines during the period from 2000 to 2010. It found that fixed broadband had no significant effect on the economy, while mobile broadband contributed 0.32% annually to GDP (or 6.9% of GDP growth). Moreover, its contribution almost doubled from 2005 onwards. According to the authors, the result illustrates the importance of the network effects of Information and Communications Technology (ICT). During the period studied, the fixed broadband market had not yet covered 2% of the population and thus did not have a wider effect on the economy. Mobile broadband's contribution, however, was already notable during the same period, demonstrating that more access to networks increases its economic impact (Katz and Koutroumpis, 2012).

The increase in crises and catastrophic events in recent years demonstrates the growing need for internet connections. Broadband access enables economic resiliency during climate disasters or shelter-in-place orders (e.g., telehealth, distance learning, and work-from-home) and facilitates resource accessibility (e.g., access to online health care) (Dine 2023). The COVID-19 pandemic revealed the importance of access to broadband services when social distancing was mandated, in-person education became limited, medical facilities were over-burdened with patients, and remote work became a necessity for many companies and institutions (Fish 2020). As public and private services are increasingly delivered through digital means, the government's challenge is to ensure that every citizen can access broadband services to increase social welfare (Fish 2020; Glass and Tardiff 2021; Simatupang 2020).

Universal access (UA), Universal service (US), Universal access and service (UAS), and Communal and Institutional access

When the concept of universal first emerged a century ago, it referred to connection to the voice communication network (Fish 2020). The universal service goal in telecommunications is essentially a public policy that aims to provide telecommunications to the majority of the population and to make the necessary funding available, either directly or indirectly (Noam 1994). Over time, such policy has been applied to different types of ICTs.

A distinction is sometimes made between universal service (US) and universal access (UA). According to Blackman and Srivastiva (2011) the concepts of universal service (US) and universal access (UA) refer to two distinct levels of service provision. Universal access focuses on making services available at a publicly shared level, like providing public payphones or Internet telecenters for communities. Universal service, on the other hand, pertains to providing service to individuals or households, such as ensuring that each home has access to a telephone.

However, in many countries, these two concepts now overlap and coexist. This has led to the use of the term "universal access and service" (UAS) to encompass both aspects.

In the past, developing countries focused on universal access, but the growth of mobile communications has made it feasible for them to aim for universal service in urban areas while still working on universal access, especially for the Internet. Consequently, their policies now encompass both universal access and universal service. For ICTs, universal access (UA) and universal service (US) can largely be characterized by the availability, accessibility, and affordability of telephony and the internet. Table 3 shows the comparison of UA and US based on these three aspects (Blackman and Srivastava 2011, p.155-156):

- Availability: the service is available to inhabited parts of the country through public, community, shared, or personal devices;
- Accessibility: all citizens can use the service, regardless of location, gender, disabilities, and other personal characteristics; and
- Affordability: the service is affordable to all citizens.

Table 3. Characteristics of universal access and universal service

Aspect	Universal Access	Universal Service
Availability	Focused coverage	Blanket coverage
	Public access (e.g., at a payphone or telecenter)	Private service on demand
	Free emergency calls	Free emergency calls
Accessibility	Walking distance, convenient locations and hours	Simple and speedy subscription
	Inclusively designed premises (e.g., for wheelchair users); inclusively designed terminals or available assistance (e.g., for the blind or deaf)	Inclusively designed terminals and services (e.g., for blind or deaf people)
	Assistance from an attendant	Assistance through the terminal (e.g., by making calls or viewing help pages for the web)
	Adequate quality of service (e.g., having few failed call attempts)	Reasonable quality of service (e.g., having few dropped calls
Affordability	Options of cash and card payment	Cost of average monthly usage is a small percentage of monthly GNI per capita
	Options of cash and card payment	Options of cash, card and electronic payment
	Payment per use (e.g., for a single call or message or an hour of Internet access)	Flat rate, bundles of services or low monthly subscription fee

Source: Lifted in full from Blackman and Srivastava (2011, p. 156)

When individual and household-level of internet access is not yet feasible, some countries choose to focus on providing communal and institutional-level internet access, particularly to unserved and underserved areas. This includes public broadband access in schools, libraries, post offices, and government agencies and institutions (Kelly and Rossotto 2012).

Access to the internet is now recognized as an essential tool for inclusive and sustainable development (UN 2022). Moreover, the adoption of broadband creates significant positive externalities, which justifies some form of government support. When positive externalities exist, market forces alone will tend to underproduce a good or a service than what is socially optimal. Thus, government intervention through a proactive national broadband strategy is needed to increase broadband adoption and maximize overall welfare (Atkinson 2007).

1.4 Approaches to achieving UAS

There is a difference between **deployment** which focuses on the coverage of broadband networks, **adoption** which looks at subscription rates to broadband services, and **usage.** Both broadband adoption and usage rely on deployment, which is considered the foundation (Marcus et al. 2023). As first-generation broadband services might be available to everyone, public policies would shift its focus to promoting higher-quality services. Technological advancements have introduced 4G and 5G networks, along with other communications technologies. The government initially focuses on supply-side promotion together with competition regulation. However, as the market for broadband expands, the subsequent phases of strategy will need to concentrate more on universalization, ensuring that broadband is widely used. The way the government manages, promotes, and universalizes broadband must adapt as the availability of a variety of applications and content increases. Broadband strategies should also change along with the changes in the quality of broadband services (Simatupang 2020).

Supply- and demand-side factors, as well as the interplay of these factors, are essential to attaining the greatest broadband adoption and penetration rates (Kelly and Rossotto 2012). The government can act as an **enabler** by lowering the barriers to entry or removing the restrictions to supply services and consume content. It can also act as a **facilitator** through measures that reduce the cost of network expansion including the regulatory burden or accelerate infrastructure build-out. It can also employ strategies to lower the total cost faced by consumers of broadband and other online services and content. Finally, the government can act as a **provider** to ensure that the services needed by the population are available particularly in areas or communities that are not economically viable. See Table 4 for some of the possible government interventions from both the supply- and demand-side to increase broadband adoption.

Table 4. Possible government interventions (non-exhaustive)

Role of the government	Supply Factors (Network infrastructure and Connectivity)	Demand Factors (Content, online services, and apps)
Enabler	Removing barriers to entry Preventing anti-competitive conduct of dominant ISPs or vertically integrated telecom companies Allow innovative ownership models Mandating open access to broadband supporting infrastructure (e.g., towers, points of interconnection, and international gateways)	Removing barriers to content creation Refrain from blocking access to content, including social networking sites, or restricting local content creation.

Facilitator	Fair and competitive spectrum sharing arrangements Infrastructure sharing Streamlining licensing requirements and procedures Funding broadband infrastructure or services (full or partial subsidy)	Loaning or subsidizing computer hardware purchase by individuals or businesses Subsidizing local content creation Subsidizing online services Funding start-ups Increasing trust in online transactions and improving cybersecurity
Provider	Government-owned and -operated ISPs	Government e-services

Source: Authors' compilation (Kelly and Rossotto 2012; Kelly et al. 2014; and Marcus et al. 2023)

Supply-side approaches

On the supply-side, the focus is on promoting the expansion of the network infrastructure over which applications and services can be delivered (Kelly and Rossotto 2012). In order to accelerate the deployment of broadband infrastructure and services, broadband providers must have access to the necessary resources and facilities. Moreover, the costs associated with network buildout must also be lowered. Ensuring access to bottleneck facilities, spectrum, and to land and rights of way are some examples. Sharing of infrastructure will also help reduce the cost of deployment (Marcus et al. 2023).

Many countries are examining ways to deploy broadband services that are in line with achieving SDGs. However, they are faced with issues that include financial viability of delivering universal broadband services (Oughton et al. 2022). In South Korea, providing universal service is challenged by high deployment costs in expanding broadband networks and end-user cost burden resulting in low broadband adoption. It could be addressed by widening rural areas under the jurisdiction of participating ISPs, decreasing the proportion of participating ISPs bearing the investment cost of deploying broadband, and improving the cost burden of the end-users of universal service in a few areas. PPP-based project with public sectors and ISPs is an effective measure to deploy rural broadband. Monitoring the potential of new access technologies to develop rural broadband more cost-effectively and solve terrain constraints is also helpful (Lee et al. 2023).

Infrastructure sharing

Much can be gained from cross-sector infrastructure sharing; the most prominent among the advantages is cost reduction. The high cost of setup for broadband networks serves as a major barrier to entry. A report shows that the sharing of passive[3] infrastructure can result in large cost savings as investment in the passive infrastructure layer constitutes 70-80 percent of total network costs, and it would take about 15 years for the company to recover this investment (Broadband Commission 2014). Incumbent network operators usually engage in infrastructure sharing to expand their coverage, adopt newer technology, and eventually improve the quality of their services (Papai et al. 2020). Smaller players, on the other hand, adopt infrastructure sharing to access the market more rapidly at a lesser cost. A recent study (Koutroumpis et al. 2023) also noted an improvement in market concentration (HHI-based), confirming the role of infrastructure sharing in inducing market competition. In terms of operator size, results show that improvements related to coverage, speed and data traffic are more intense for small market

[3] Physical infrastructure can be categorized into passive or active. Passive infrastructure includes the non-electronic facilities like towers, buildings, dark fiber, sites, etc., while active infrastructure are the essential parts of the system vital in the operation of the telecommunications company. This includes antennas, cables, radio access networks, backhaul, transmission systems, etc.

players. Moreover, Oughton et al. (2022) stated that supportive infrastructure sharing enhances commercial viability and reduces the need for public subsidy. It is predicted to reduce the cost of providing universal broadband services by 10 to 70 percent when either 4G or 5G NSA is used for broadband deployment.

While there appear to be several benefits derived from infrastructure sharing, there are also many issues and challenges attached to it. One major apprehension against infrastructure sharing is the potential weakening of infrastructure-based competition that could lead to lower service differentiation and decreased appetite for future investments. Usually, in the early stages of implementing broadband policies, the focus is on inducing service-based competition, which is usually done by compelling incumbent operators with significant market power to share their infrastructure at a regulated price. However, many studies found that this type of cost-based access regulation discourages investment in fixed network infrastructure (Cambini and Jiang 2009; Bouckaert et al. 2010; Briglauer et al. 2016). Another issue related to cross-sector infrastructure is the complexity of price regulation, given the number of sectors involved. As suggested in a World Bank document (2017, p.10), "*If price regulation is necessary, regulators should not establish prices which force a utility's core business customers to cross-subsidize telecommunications market customers*", as this creates market distortions and discourages infrastructure sharing. Further to this, Frischmann (2012) identifies three major challenges faced by regulators when dealing with shared infrastructure among different sectors: (a) price discrimination, (b) shared management and price regulation, and lastly, (c) infrastructure pricing.

Still, there remains a debate about whether to force incumbents to share their infrastructure with new entrants or let the market players decide on a mutual collaboration. A more recent trend is geared towards a more lightened and non-regulatory approach, wherein regulators will only intervene in cases where market competition is greatly compromised (World Economic Forum 2014). Another option is to utilize Shared Rural Network (SRN), wherein MNOs share active and passive components only in rural areas using Multi-Operator Radio Access Network (MORAN). SRN is more suitable since it preserves market dynamics in urban areas and promotes infrastructure sharing in commercially unviable[4] areas (Oughton et al. 2022). Communications Regulators' Association of Southern Africa and International Telecommunications Union (2016) also provided a set of principles to guide policymakers in fostering cross-sector infrastructure sharing based on international best practices. The following principles were most important:

- Inclusive regulatory framework –to attract cooperation and investments, as well as to avoid confusion for potential participants, regulations must be clear, transparent and should cover all aspects and sectors of the sharing arrangement.
- Non-selective infrastructure sharing –all types of sharing should be permitted as long as it does not go against competition regulations/policies.
- Right to request to share infrastructure based on government mandate –the government must identify the type of infrastructure allowed for sharing as well as the concerned operators. It should also develop a standard process (time-bound) that applies across different sectors.

[4] geographically isolated and rural areas

- Obliging sector participants to negotiate sharing their infrastructure within reasonable timeframes –the government should come up with guidelines related to a standard process about accepting/rejecting sharing requests. This can help reduce disputes.
- Define guidelines on how pricing should be set –this is relevant especially for operators with significant market power; should be obliged to publish a reference offer.
- Develop an efficient process to encourage infrastructure sharing –approval should be timely and effective; there should be a maximum time limit for every step of the process. Involve stakeholders in designing the process.
- Dispute resolution –should be documented, timely, and should apply cross-sectoral; important to involve stakeholders in designing and reviewing the process.
- Consistency with the national broadband plan and future technologies –the regulatory framework for infrastructure sharing should complement the national broadband plan and should be technology-neutral to account for future developments in technology.

Ownership models

Other than major telecommunication providers, other types of ISPs can help bridge the digital divide. Local ISPs can also be incentivized to improve rural connectivity. Municipally-owned broadband network that provide connection for security, education, and health services can be extended to give internet access to residents at a lower cost, similar to Massachusetts' Mass Broadband 123 program. Co-ownership arrangements or public-private partnerships, which involve local or national-level government entities and private institutions utilizing both local public and private capital, can also be considered. Cooperatives may also manage their own networks with the government's approval and provide broadband access to small towns in a region, such as cooperatives in Northern Sweden. Some are later sold or turned over to managers (Strover 2021).

Spectrum pricing and sharing

Charging spectrum fees is designed to award spectrum to those who will use it most efficiently to benefit society. It also provide state revenues, which may lead the government to artificially inflate spectrum prices such as setting excessive annual spectrum fees or restricting supply of mobile spectrum. Imposing high spectrum prices has been shown to significantly lead to lower quality mobile broadband speed, limited network coverage, and slower network rollout. These consequences negatively affect consumers, contradicting the intended purpose of spectrum fees. For instance, mobile operators providing 4G network in countries with the highest spectrum prices could have covered 7.5 percent more population had they acquired a median priced spectrum (GSMA 2021a). Across countries, spectrum pricing weighs 2 to 33 percent of the total cost for broadband infrastructure. Reducing spectrum pricing can further reduce the cost of delivering universal broadband service (Oughton et al. 2022).

As data traffic increases and new technologies emerge, efficient use of limited spectrum resources becomes crucial. Aside from clearing new frequency bands, spectrum sharing emerges as a complementary approach, particularly useful for in-demand areas or under-used spectrum (GSMA 2021b). Efficiency gains from spectrum sharing include coordinating interference, enabling carrier aggregation, lowering the number of sites needed, exploiting spectrum more effectively, and enhancing economic viability. This strategy can assist in lowering costs for customers and increasing adoption (Oughton 2023). However, spectrum sharing needs a careful planning, including simple, clear, and predicatble sharing conditions

and setting protection rules for the diffferent classes of users, as well as providing mechanisms when these rules are violated. It should also not hinder the long-term evolution of spectrum, such as when repurposing spectrum with fragmented bands (e.g., repurposing a portion of broadcast spectrum to provide mobile services without disrupting portion shared for TVWS services) (GSMA 2021b).

Demand-side approaches

Broadband service is consumed depending on its necessity to an individual or group which can be influenced by social and cultural factors and how society values available applications and services. This implies that the government must not only focus on increasing the supply of broadband infrastructure but also increasing the demand for broadband services. In addition, the cost of broadband services is not the only demand factor. For critical services, such as education, health care, employment, government services, food security, and emergency communications, broadband services must be uniform in quality and equally accessible to everyone (Fish 2020; Humphreys 2019).

On the demand side, the goal should be to increase broadband adoption and usage by making internet connection available and ensuring that access is inexpensive and usable. Effective instruments include subsidies, demand aggregation, education and training, and enhancing privacy and security to strengthen public confidence in broadband (Marcus et al. 2023).

It is important to provide relevant content and increase the awareness and adoption of broadband services to encourage more people to take advantage of them. New services and applications in education, public health, media and entertainment, and government services would act as motivations. The government should also enhance digital literacy and provide digital government services. For rural areas, tailored applications that are relevant to consumers, including freely accessible agricultural market information, as well as farm management and agricultural techniques, employment opportunities, and other relevant digital applications and content (Dine 2023; Phan 2023).

Subsidies

Another strategy may include subsidization. When market failure cannot be addressed by cost-reducing policies (e.g., infrastructure sharing and choice of technology), the government may utilize public subsidies. However, the effectiveness of broadband subsidies is still ongoing. Some research show its effectiveness in closing the digital divide, higher levels of broadband coverage, and indirect positive effect on GDP, which compensates funding expenses. However, broadband subsidies do not necessarily increase job creation, enhance broadband adoption, or improve educational outcomes (Oughton et al. 2022). Trial and error experimentations can be done to check the efficacy of regulatory cross-subsidization, direct government grants, and ancillary revenues from over-the-top service providers and advertisers, among other strategies (Fish 2020).

The US has a subsidy program named “Affordable Connectivity Program”, which aims to address the digital divide by providing consumers with free or low-cost broadband plans, increasing the internet adoption rate among the offline population. The main reasons for internet non-adoption are lack of interest or the high cost of internet subscriptions, more than the unavailability of networks. Considerable efforts were implemented on the supply side. Hence, there are more opportunities to increase the demand-side to connect more people to the

internet. Singapore has a similar program wherein eligible consumers may be provided with a subsidy to afford a computer and/or internet subscription.

The most effective subsidies are flexible and applicable to the needs of consumers by providing them with computer access, lower cost of broadband subscription, or digital skills training. Its application process should also be streamlined. Consumers must also be aware if these programs would be made available. They should also be provided with adequate knowledge of the application process and eligibility requirements. The quality of services must still be ensured, even though internet service would be subsidized or provided for free (Dine 2023).

Funding universal access and service

When the cost of building and operating universal broadband services for less developed countries is higher than the revenue generated from the consumers, other funding strategies should be available to compensate the cost.

There are countries that have established a universal service fund. According to GSMA (2016), the goal of a universal service fund is to increase the coverage and access of telecommunications services in underserved and unserved areas by using, for example, a portion of telecommunications operators' gross revenues. USF should have an independent structure, measurable objectives, and transparent management. If principles are not effectively applied, USF can be counterproductive. Failure maybe due to poorly developed USF levies and legal frameworks, political interference, poor management, unsuccessful deployment, and a lack of transparency.

A review of the various types of universal access and service funds (UASFs) in the Asia Pacific by UN ESCAP (2017) found that the effectiveness of such funds seems to have been limited, possibly due to a host of factors such as inadequate design, weak structure, and poor implementation. The challenges encountered include low disbursement rates, delays in implementation, misalignment between objectives and implementation, the absence of monitoring tools and mechanisms, and non-compliance of operators with their obligations. Results were often not reported, and it was unclear whether UASFs have significant impacts on the groups that are supposed to benefit, for example, women, people with disabilities, and the rural population. Legal disputes were also encountered due to the lack of clarity in the management and operations of UASFs. Moreover, the effectiveness of the UASFs were hampered by the lack of capacity to implement the projects. The report strongly recommends more transparency to ensure accountability, strengthen the commitment of stakeholders and guide decision-makers. The collection of more and better data, disaggregated at the household-level, is also recommended to determine if the target groups are benefitting.

Design considerations and the importance of monitoring and evaluation

There is no single solution or UASF model that would be suitable for everyone, as each country faces its own set of challenges in terms of governance, rule of law, leadership, geography, market development, and others (UN ESCAP 2017). The investment requirement also varies. Country-level modeling and comparative analytics on multi-technology strategic options would provide more understanding of the country's investment needs. However, the lack of data hinders in effective management of public investment projects and the development of rural broadband initiatives (Oughton 2023; Hambly and Rajabiun 2021).

Comprehensive programs at the national level need oversight to ensure that recipients effectively benefit from the program. Implementing comprehensive programs with local communities and organizations can also be effective since local government and community organizations have more knowledge on the barriers consumers face in their local area and could ensure that programs are properly disseminated and utilized by intended users. However, the disadvantage includes the limited capabilities in collecting data, evaluating and analyzing local programs, and measuring outcomes. National and provincial level funding and partnership with independent policy research institutions and universities may address this issue (Hauge and Prieger 2009).

Regular surveys measuring internet use could help in the design of programs. Particularly for the nonadopters of the internet, a clearer understanding of the reasons for non-adoption should be captured. Respondents being "not interested" may have other reasons that might be identified and addressed by a policy perspective, particularly in terms of particular needs and backgrounds of respondents. Information on the socio-demographic profile of individuals and households may be linked to the adoption and non-adoption of the internet. Hence, these are vital information that should also be included in surveys (Dine 2023).

In implementing ICT projects, it is essential to be aware that ICT procurements are vulnerable to corruption, fraud (e.g., failure to deliver or install products or features included in the contract; submitting false, inflated, or duplicate invoices), bid rigging (e.g., Writing contract specifications in favor of a competitor in exchange for corrupt payment), and collusion (e.g., ICT vendors unlawfully cooperated which one will bid and win specific projects). To improve the transparency and accountability of ICT projects, the government may use ICT systems such as the Integrated Financial Management System. However, these systems may also be prone to systemic corruption, especially those that are large-scale and complex, which make it challenging to detect abuses; expensive and with large profit margins which may provide opportunities for bribing government officials; and low to no risk of detecting corrupt vendors and officials (LaCascia and Kramer 2021).

2. The current state of broadband access in the Philippines

2.1 UN Broadband Commission's seven advocacy targets

The Broadband Commission's seven advocacy targets serve as a guide for countries in promoting policies and programs for broadband development. The seven (7) targets are enumerated in table 5 (ITU and UNESCO 2023). In the context of the Philippines' progress towards achieving the advocacy targets, the National Broadband Program (NBP), which started in 2017, is continuously being implemented (see chapter 3). As the Philippines recovers from the effects of the COVID-19 pandemic, ICT services are becoming more affordable, particularly from 2021 to 2022, as shown in Figure 1. The data-only mobile broadband basket is within the target of less than 2 percent share of the country's GNI per capita (1.98%), while the Mobile-cellular low-usage basket, Mobile data and voice low-consumption basket, and Mobile data and voice high-consumption basket were 2.32 percent share of monthly GNI per capita. The fixed broadband basket is at 11.26 percent (ITU 2023a). The ITU estimates the Philippines to have about 52.7 percent internet users in 2021, compared to a 65 percent target in 2025 (ITU 2023b). See also Figure 2.

According to the ITU's data on ICT skills, using the latest year available in 2018-2020, six percent of individuals in the Philippines have basic skills[5], 2 percent have standard skills[6], and 1 percent have advanced skills[7]. To avoid bias in self-reporting, ICT skills are measured by an individual's engagement in activities that demand varying levels of ICT skills in the previous three months (ITU 2021b). Account ownership increased to 56 percent in 2021 from 29 percent in 2019. The purpose of the account is majority for payment (78%) rather than savings (56%). Among the total volume of payments, 42.1 percent were digital payments in 2022 (Masangkay 2023). Based on DAI's survey[8] of 1000 MSMEs across the Philippines in 2021, 59 percent are using digital tools in their businesses, and 35 percent use digital payment tools (DAI and Ipsos 2022).

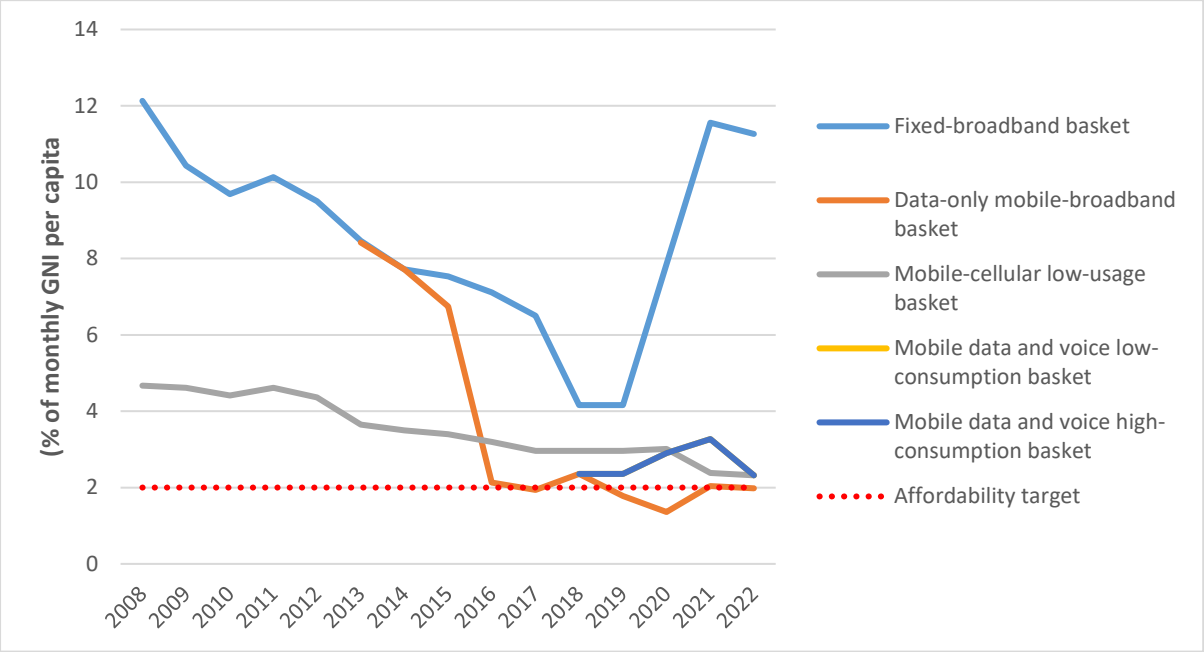
Table 5. Broadband Commission for Sustainable Development: 2025 advocacy targets

Advocacy	Target
#1 Make broadband policy universal	By 2025, all countries should have a funded National Broadband Plan (NBP) or strategy in place or include broadband in their Universal Access and Service (UAS) Definition.
#2 Make broadband affordable	By 2025, entry-level broadband services should be made affordable in low- and middle-income countries (LMICs) at less than 2 percent of monthly Gross National Income (GNI) per capita.
#3 Get everyone online	By 2025, broadband-Internet user penetration should reach i) 75 percent worldwide, ii) 65 percent in low- and middle-income countries, and iii) 35 percent in least-developed countries.
#4 Promote digital skills development	By 2025, 60 percent of youth and adults should have achieved at least a minimum level of proficiency in sustainable digital skills.
#5 Increase the use of digital financial services	By 2025, 40% of the world's population should be using digital financial services.
#6 Get MSMEs online	This target aims to improve the connectivity of micro-, small- and medium-sized enterprises (MSMEs) by 50 percent by sector by 2025.
#7 Bridge the gender digital divide	By 2025, gender equality should be achieved across all global advocacy targets.

Source: ITU and UNESCO (2023)

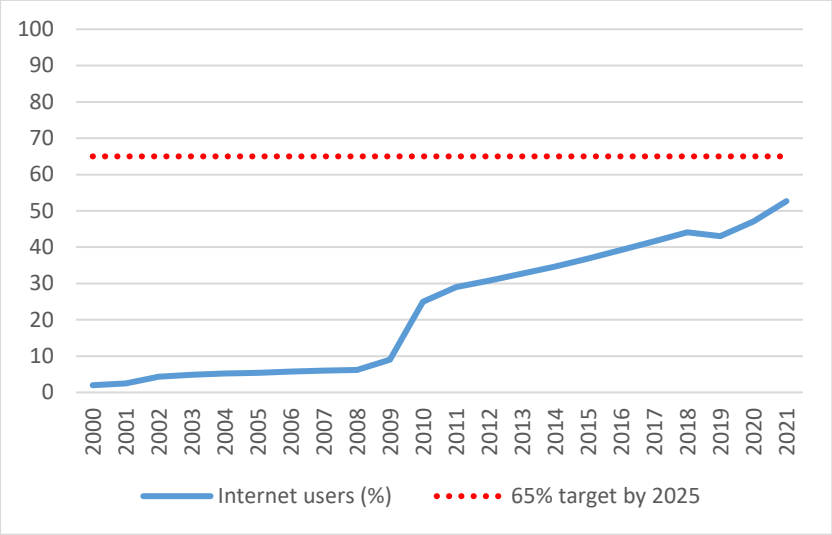
[5] "The value for basic skills is the average value of the available recent data for following four computer-based activities: copying or moving a file or folder, using copy and paste tools to duplicate or move information within a document, sending e-mails with attached files, and transferring files between a computer and other devices" (ITU 2021b).
[6] "The value for standard skills is the average value of the available recent data for the following four computer-based activities: using basic arithmetic formula in a spreadsheet; connecting and installing new devices; creating electronic presentations with presentation software; and finding, downloading, installing, and configuring software" (ITU 2021b).
[7] "The value for advanced skills is the value for writing a computer program using a specialized programming language" (ITU 2021b).
[8] not nationally representative

Figure 1. ICT price basket (% of monthly GNI per capita)



Source: ITU (2023a)

Figure 2. Internet users, 2000 - 2021



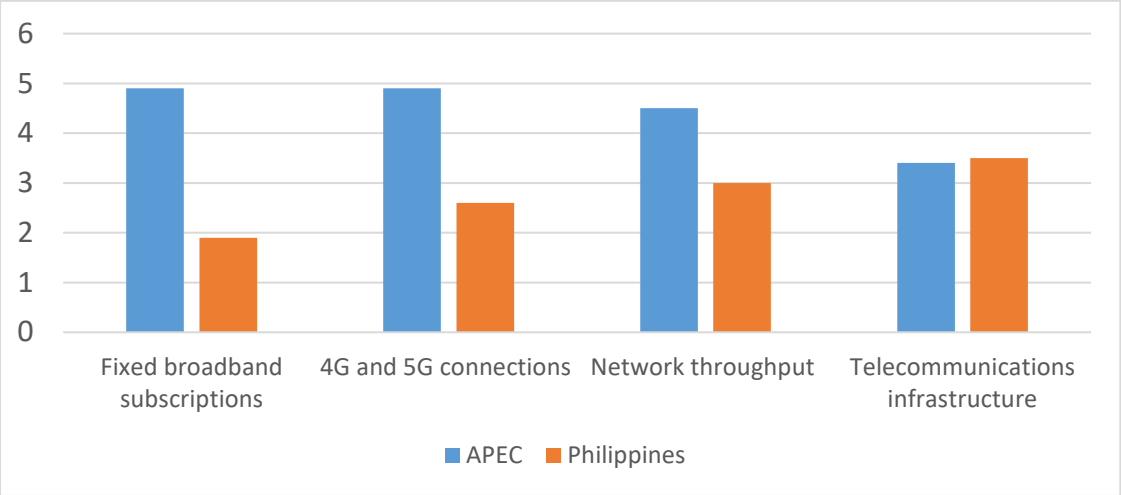
Source: ITU (2023b)

2.2 Digital First Economy (DFE) Index: Digital connectivity dimension

The Digital First Economy (DFE) index is developed to assist APEC economies in tracking the growth towards attaining a "digital first" economy, a next wave of digital economy heavily reliant on data, artificial intelligence, and green technology. The Philippines is still in the first stage, categorized as an "Adopter". Based on the DFE index, in terms of the "Digital connectivity" dimension, "Adopter" countries like the Philippines have already developed digital policies for developing the digital economy, mainly focusing on expanding the national digital infrastructure. However, the development is more concentrated in the key city centers. The growth of its digital economy is mainly attributed to e-commerce and IT services.

The Philippines performs slightly above the APEC average in terms of telecommunication companies' investments in building and maintaining network infrastructures[9] (PH = 3.5 vs. APEC = 3.4). However, it performs below average in terms of Fixed broadband subscriptions (PH = 1.9 vs. APEC = 4.9), 4G and 5G connections (PH = 2.6 vs. APEC = 4.9), and network throughput (PH = 3 vs. APEC = 4.5) (ABAC 2022). See Figure 3. Adopters must focus on developing more comprehensive digital masterplans and policies, including increasing connectivity in homes and businesses, expanding the coverage of 4G and fixed broadband, increasing bandwidth to 100 Mbps, and providing initiatives and incentives for businesses to transform from computerization to digitalization (ABAC 2022).

Figure 3. DFE digital connectivity indicators: APEC and Philippines, 2022



Source: ABAC (2022)

2.3 Philippines and other countries

Comparing ASEAN countries in terms of broadband coverage and performance, Singapore has the highest fixed broadband speed, while Brunei Darussalam has the highest mobile broadband speed. The Philippines has an average fixed broadband speed. However, it performs poorly in mobile broadband speed, with an average of 6.21 upload and 25.47 download speed. These are based on August 2023 data from Ookla (2023a). The Philippines has 99 percent 4G population coverage, while it has 70 percent 5G population coverage (GSMA 2023). Table 6 shows the key characteristics of ASEAN countries.

Table 6. ASEAN countries' key characteristics, 2022*

Country	Income group	Urban population	4G coverage	5G coverage	Mobile download*	Fixed download*
Singapore	H	100	100	76.56	81.41	254.65
Brunei Darussalam	H	78.854	85	0	100.63	49.52
Malaysia	UM	78.214	96.35	20.67	62.92	98.48
Thailand	UM	52.889	98	86.14	40.06	212.68
Indonesia	UM	57.934	99	70	24.22	28.28

[9] Telco Capex Spending Expenditures

Vietnam	LM	38.766	98	0	47.08	93.11
Philippines	LM	47.977	99	70	25.47	88.81
Lao PDR	LM	37.592	98	11.79	27.44	31.83
Cambodia	LM	25.114	98	0	24.1	23.81
Myanmar	LM	31.771	94	0	22.68	19.56

Note: Per column, Red to Green filled cells represent low to high values; Urban population = % of total population; Note: H = High income; UM = Upper-middle income; LM = Lower-middle income; *Mobile and fixed broadband download speeds as of August 2023
Sources: GSMA (2023); Ookla (2023a); World Bank (n.d.; 2022)

Regarding mobile connectivity, the 2022 GSMA Mobile Connectivity Index shows that compared to other ASEAN economies, the Philippines ranks third to the lowest in terms of the key enabler "Affordability" (score: 47.01 out of 100), while it showed an average performance across all other key enablers. The country scored 73.25 on infrastructure, which measures the available mobile network coverage, amount of spectrum assigned to mobile operators, and mobile network performance, while it scored 76.77 on consumer readiness, which includes factors needed to use the internet, particularly mobile ownership, basic skills, and gender gap in the use of mobile phone and internet. It recorded 59.41 on content and services measuring local relevance and internet security. See Table 7.

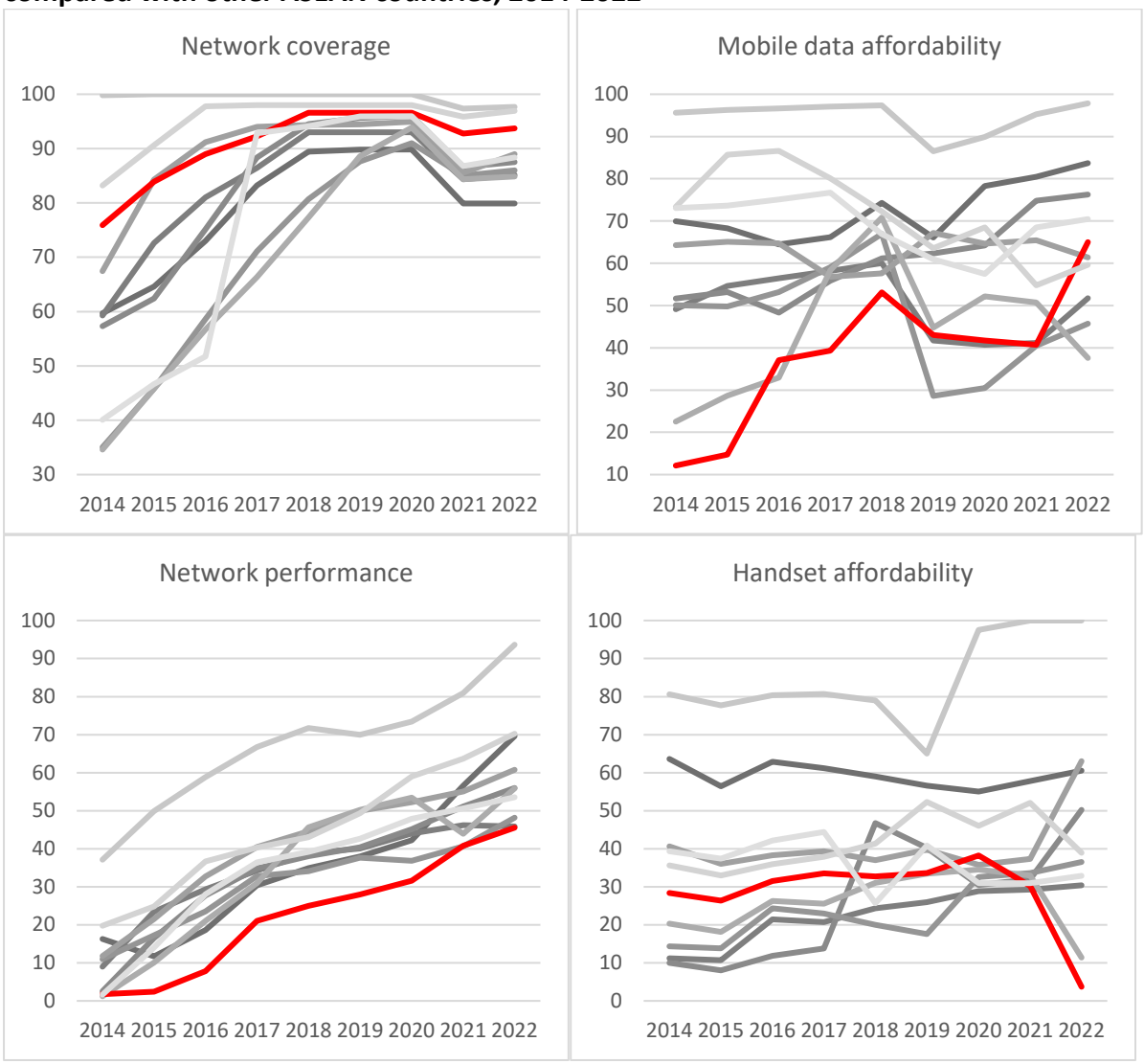
Table 7. GSMA Mobile Connectivity Index: Key enablers, 2022

Country	Index Score	Infrastructure	Affordability	Consumer Readiness	Content and Services
Philippines	62.95	73.25	47.01	76.77	59.41
Singapore	93.09	90.91	99.14	93.58	89.02
Thailand	73.77	82.05	59.43	86	70.62
Indonesia	67.87	64.19	70.59	66.71	70.19
Brunei Darussalam	71.24	64.34	77.69	82.17	62.71
Cambodia	54.63	58.27	50.57	61.96	48.78
Laos	52.52	59.97	42.67	71.78	41.43
Myanmar	47.51	62.73	39.6	56.66	36.19
Vietnam	68.46	62.78	61.33	74.3	76.8
Malaysia	73.92	73.93	64.83	81.53	76.41

Note: Per column, Red to Green filled cells represent low to high values
Source: GSMA (2023)

In terms of dimension scores (components of key enablers), as shown in Figure 4, the country scored high in network coverage, particularly 4G population coverage. Mobile data affordability scored poorly since 2014 but noticeably improved from 2021 to 2022, while mobile network performance under Infrastructure has been consistently low since 2014. Handset affordability under Affordability was at an average level from 2014 to 2020. However, it has drastically declined since 2020, gaining the lowest score among all ASEAN countries in 2022.

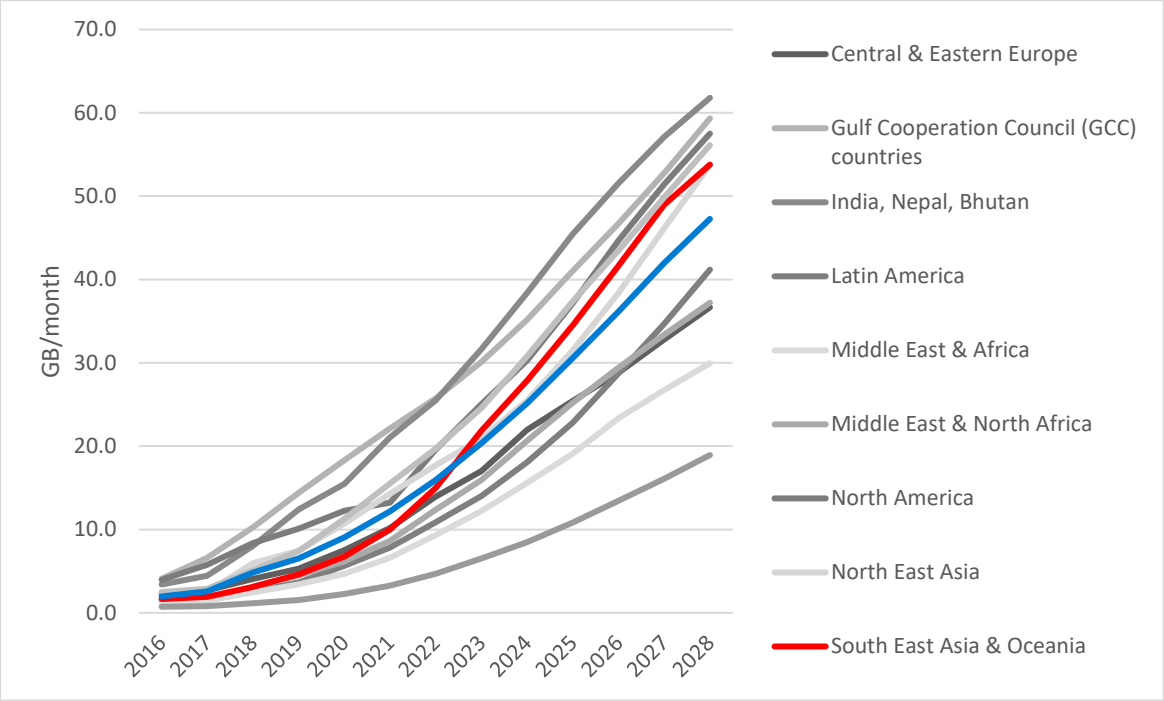
Figure 4. GSMA Mobile Connectivity Index selected dimension scores: Philippines compared with other ASEAN countries, 2014-2022



Source: GSMA (2023)

In addition, monthly mobile data traffic for smartphones in Southeast Asia and Oceania, which includes the Philippines, is constantly increasing, with 15 GB per month in 2022, and is expected to increase to 53.8 GB per month in 2028, as shown in Figure 5 (Ericsson 2023).

Figure 5. Mobile data traffic per smartphone per month (GB/month)



Source: Ericsson (2023)

2.4 Philippine Development Plan (PDP) 2023-2028 targets: Expand and upgrade digital infrastructure

The Philippine Development Plan (PDP) 2023-2028, particularly under the "Expand and upgrade infrastructure" chapter, aims to improve accessibility, affordability, and quality of internet services (Table 8). As of 2019, only 17.7 percent of households and 46.88 percent of individuals have internet access. The affordability target for mobile broadband was achieved in 2022 with 1.98 percent share of the country's monthly GNI per capita in 2022, while fixed broadband slightly decreased from 11.56 percent in 2021 to 11.26 percent in 2022, still way behind the target of 2 percent share of the country's monthly GNI per capita in 2028 (ITU 2023a).

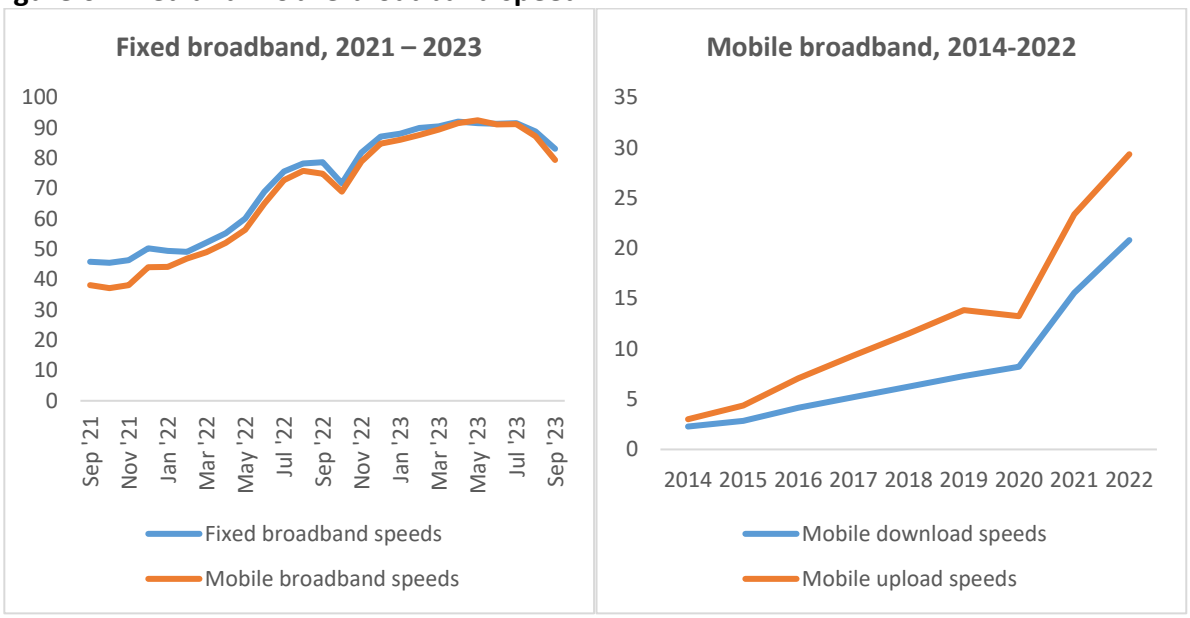
Both fixed and mobile broadband speed generally shows an increasing trend. Mobile download speed increased from 8.23 Mbps in 2020 to 20.83 Mbps in 2022 to 26.36 Mbps in September 2023 (GSMA 2023; Ookla 2023a), while fixed download speed increased from 45.85 Mbps to 83.09 Mbps from September 2021 to September 2023. (GSMA 2023; Ookla 2023b; Ookla 2023c). See Figure 6 on the historical data for mobile and fixed broadband speed.

Table 8. Philippine Development Plan 2023-2028: Expand and upgrade digital infrastructure targets

Indicator		Baseline value (Year)	End of plan target	Means of verification	Responsible agency
Households with internet access (% of total HH)*		17.7 (2019)	60	NICTHS	DICT
Individuals using the internet (%)*		46.88 (2019)	70	NICTHS	DICT
Affordability (% of GNI per capita)	Mobile broadband	2.04 (2021)	< 2.00	ITU	DICT
	Fixed broadband	11.56 (2021)	2.00	ITU	DICT
Download speed (median, in Mbps)*	Mobile broadband	36.76 (2022 Dec)	125.00	Ookla Speedtest Global Index	DICT/NTC
	Fixed broadband	75.18 (2022 Dec)	300.00	Ookla Speedtest Global Index	DICT/NTC

Note: * - with national and regional targets
Source: (NEDA 2023a, p. 76-79)

Figure 6. Fixed and mobile broadband speed



Source: GSMA (2023); Ookla (2023b; 2023c)

2.5 Regional socio-economic characteristics and ICT indicators

At the regional level, NCR (National Capital Region) has the highest GRDP and is the most urbanized region. As of August 2023, it has the highest fixed and mobile broadband download speeds (93.75 Mbps and 36.58 Mbps, respectively). CAR places 2nd in fixed broadband download speed (92.46 Mbps), while Region VII is 2nd to the highest mobile broadband speed (24 Mbps).

In contrast, Region VIII has the lowest fixed broadband download speed (41.23 Mbps), followed by Region II with 56.7 Mbps. Both regions are the least urbanized, with only 14.6 percent urbanization for the former and 19.5 percent for the latter region. BARMM has the lowest mobile download speed (10.86 Mbps), followed by Region XIII with 15.7 Mbps. It also has the least GRDP per capita. Region XIII is 2nd to the lowest mobile download speed. See Table 9.

Table 9. GRDP per capita, urbanization, and fixed and mobile download speeds by region based on the latest data available, 2020-2023

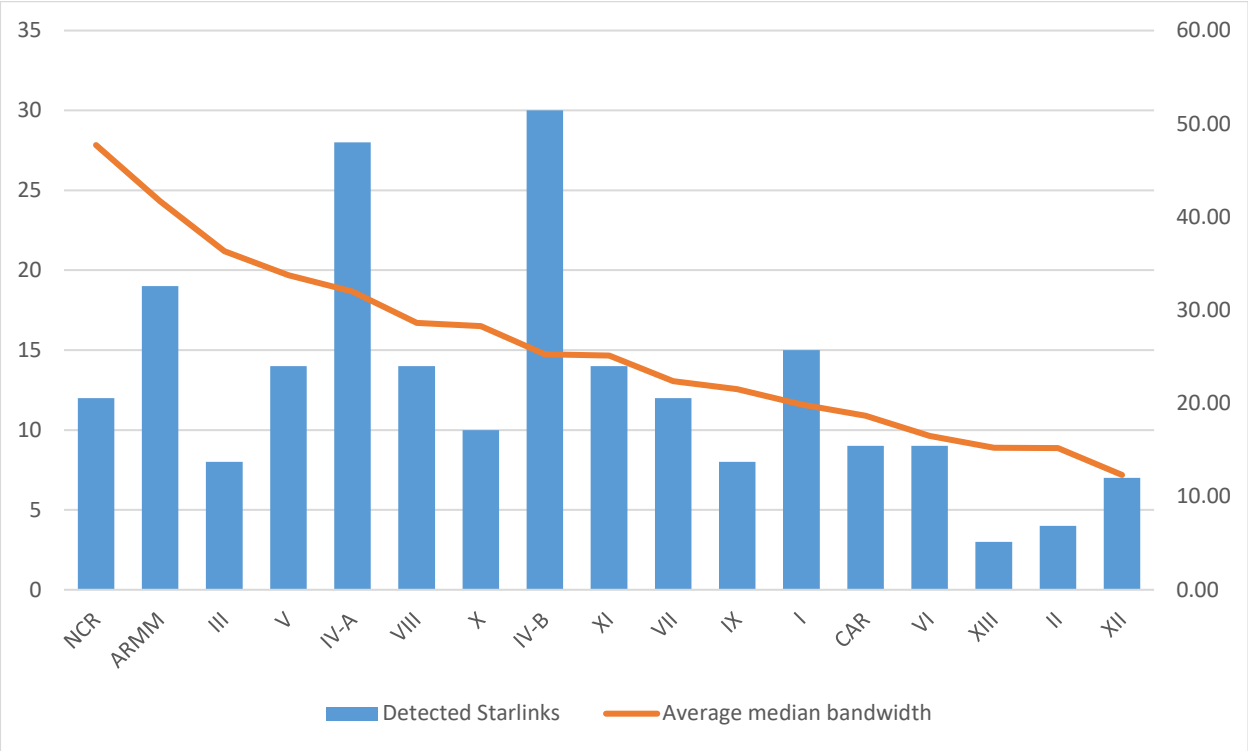
Region	GRDP per capita	Urbanization	Fixed download	Mobile download
NCR	420207	100	93.75	36.58
CAR	163465	33.30373931	92.46	18.53
I	113439	25.48895624	76.36	22.93
II	100426	19.47471121	56.66	21.7
III	151385	66.25454872	89.74	22.72
IV-A	159748	70.48911636	80.38	22.51
IV-B	107924	35.24858466	62.47	21.12
V	84262	23.79695388	76.53	20.13
VI	107629	42.15363627	87.7	20.91
VII	147054	51.92582568	82	24.07
VIII	87355	14.65693896	41.23	19.75
IX	104374	38.43152605	91.08	18.2
X	171498	50.33557194	90.2	20.08
XI	168329	66.83529969	87.91	20.64
XII	106725	55.46565974	91.38	18.81
XIII	106271	36.62390883	78.06	15.72
BARMM	55107	27.5562409	74.87	10.86

Note: Per column, Red to Green filled cells represents low to high values; GRDP per capita and urbanization are based on 2020 data, while Fixed and mobile download are based on October 2023 data
Source: PSA (2022; 2023); Ookla (2023d)

Other than telcos and ISPs providing mobile and fixed broadband, satellite internet services, particularly Starlink, have recently been commercially available in the Philippines. Based on crowdsourced data gathered via the Bass [10] android app, there were 238 detected number of Starlink in the Philippines as of July 2023. The average median bandwidth of detected Starlink is higher (27.55 Mbps) compared to the average median bandwidth of other detected cell sites at 17.22 Mbps. Figure 7 shows the number of detected Starlink in the Philippines by region, wherein Region NCR has the highest median bandwidth (47.71 Mbps), followed by BARMM (41.67 Mbps). According to Ookla (2023e), however, while Starlink outperformed major telcos in median download speed (110.78 Mbps vs. 89.57 Mbps) for the first quarter of 2023, it still lagged in upload speed (13.69 Mbps vs. 88.14 Mbps) and latency (162 ms vs. 22 ms).

[10] Mr. Wilson Chua (Founder, Bass – Bandwidth and Signal Statistics) in response to Author's data request on July 19, 2023.

Figure 7. Bass – Bandwidth and Signal Statistics: Number of detected Starlink and Median Bandwidth (Kbps) in the Philippines by region, July 2023[11]



Note: Crowdsourced data

3. Universal access and service policies and strategies in the Philippines

3.1 Brief overview of past, present, and planned policies and strategies

The Philippines has experimented with different approaches to universal access in telecommunications. Previous efforts by the government to attain universal access in telecommunications involved a mix of public investment and the imposition of service obligations on telcos.

Past initiatives

Public investment in telecommunications infrastructure[12]

During the 1980s, the Philippines implemented various telecommunications initiatives outlined in the National Telecommunications Development Master Plan. These included the National Telephone Program (NTP), the Regional Telecommunications Development Project (RTDP), and the Municipal Telephone Project (MTP) or Telepono sa Barangay (TSB).

- National Telephone Program (NTP) – The NTP was a universal access program implemented from 1990 to 1997, costing PHP1.16 billion. It aimed to build an integrated telephone network in the country, particularly in Regions III, IV, and V. The network consists of telephone exchanges, transmission links, telegraph systems, subscriber cables, as well as telephone sets (JICA 2002a).

[11] Mr. Wilson Chua (Founder, Bass – Bandwidth and Signal Statistics) in response to Author's data request on July 19, 2023.
[12] Albert et al. (2021, p. 27-28)

- Regional Telecommunications Development Project (RTDP) - The RTDP Northern Luzon was carried out in Regions I and II in two phases: Phase 1 from 1981 to 1987 and Phase 2 from 1988 to 1995. A subsequent project was implemented in Region III from 1993 to 2000. Both projects were financed by the Japan International Cooperation Agency (JICA) through ODA loans with a total loan of PHP242 million (JICA 2003). The scope of the project was revised during its implementation as new telecom operators entered the market. Ultimately, RTDP facilities recorded a low utilization rate due to the private telcos operating in the same areas and the use of cellular mobile telephone systems becoming prevalent. Hence, market competition and the emergence of better technology overtook the project areas and landline facilities.
- Municipal Telephone Project (MTP)/Telepono sa Barangay (TSB) (Republic Act 6849 or the Municipal Telephone Act of 1989) - With a loan commitment of USD45 million financed by the Export Development Corporation (EDC) and the Credit Commercial de France, the project aimed to build telephone lines for local to international telephone services in 3,319 barangays and 14 municipalities. The government invited private telcos to take over the program. However, due to its unprofitability and high capital requirements, no private telcos became interested. In 2004, the TSB loan eventually concluded with incomplete outputs (Yao-Endriga 2000a, 2000b; NEDA 2018).

As the market overtook government initiatives, all three projects were not able to improve the telephone services in the long term. The government continued paying the debts until 2011 (Bagayaua-Mendoza 2008).

The Philippine and Chinese governments inked a contract in April 2007 for Zhong Xing Telecommunication Equipment (ZTE) Company to provide internet access to all government offices. The Export-Import Bank of China was to provide a loan for the USD 329 million national broadband network (NBN) project (Philippine Daily Inquirer 2018). The contract was canceled in October 2007 due to allegations of corruption against high government officials pertaining to the proposed project (ABS-CBN News 2016).

Introduction of competition but with service obligations

Another strategy of the government was to assign service obligations to operators in profitable segments of the sector. Beginning in the late 1980s, competition was introduced in the sector on the condition that operators of cellular mobile telephone systems (CMTS) and international gateway facilities (IGF) were to fulfill universal service obligations (USO), which require a minimum number of local exchange lines or public calling offices. These operators were supposed to use the profits from their IGF and CMTS activities to subsidize the expenses of providing local exchange services. Nevertheless, because of declining income from foreign services, a lesser demand for LEC in rural regions, and the proliferation of mobile telephony, the USO's implementation under the NTC's Service Area Plan became unsustainable. Therefore, the NTC has generally loosened the USO's enforcement while also extending it to 3G licensees (King-Dominguez and Acebedo 2013).

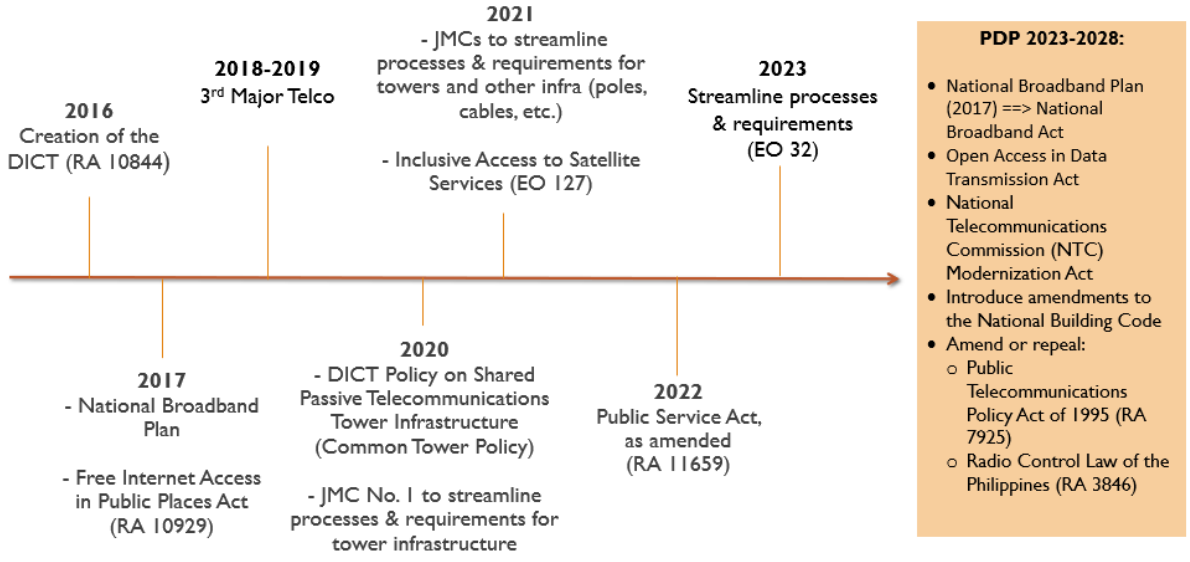
There was no mention of the Internet in RA 7925 or the Public Telecommunications Policy Act of the Philippines of 1995. Universal Access was defined in the Implementing Rules and Regulations (IRR) of RA 7925 as "the availability of reliable and affordable telecommunications service in both urban and rural of the country" (NTC Memo Circular 08-09-95, p. 1). In the declaration of national policy on telecommunications development, the relevant objectives of RA 7925 include (1) the recognition that the basic objective of

government is "to develop and maintain viable, efficient, reliable and universal telecommunication infrastructure using the best available and affordable technologies" (Sec 4a); (2) that network expansion shall prioritize improving and expanding basic services to areas not yet served (Sec 4b); (3) that spectrum shall be allocated "to service providers who will use it efficiently and effectively to meet public demand for telecommunications service" (Sec 4c); (4) fair, just, and reasonable rates and tariff charges (Sec 4d); and (5) that "public telecommunications services shall be provided by private enterprises" (Sec 4e). In line with the objective to let the private sector lead, the law mandated the privatization of "all telecommunications facilities currently owned and/or operated by the government for public use" (Sec 22).

Current initiatives

There have been no significant policy issuances relating to broadband for two decades since the Philippines first connected to the Internet in 1994 and the passage of RA 7925 in 1995. Starting with the creation of the DICT in 2016, the sector has undergone significant policy and regulatory reforms (See Figure 8).

Figure 8. Timeline of key policies and strategies affecting broadband



Source: Authors' compilation

The National Broadband Plan

The DICT produced the first National Broadband Plan (NBP) in 2017. It is the key document that outlines the strategies to achieve universal, faster, and affordable internet access. Specifically, the vision of the NBP is to have a "A resilient, comfortable and vibrant life for all, enabled by pervasive, inclusive, affordable, and trusted broadband internet access." (DICT 2017, p. 28). It involves three main strategies:

- Policy and Regulatory Reforms in telecommunications/ICT, specifically administrative reforms and reforms to increased competition and market entry;

- Government Investment in Broadband Infostructure to complement the existing infostructure of telcos; and
- Support to stimulate broadband demand to increase broadband take-up rate, interventions to stimulate demand will focus on local content development and promotion, conduct of capacity building and information outreach programs, and introduction of incentives to broadband users.

Under the Plan, entry-level broadband connection to the internet must have a minimum speed of 2.0 Mbps (DICT 2017).

Competition and liberalization measures

The DICT issued the policy guidelines for the entry of a new major player (NMP) in the public telecommunications market (DICT Memorandum Order No. 1, s.2018; DICT Memorandum Order No. 2, s.2018). The selection criteria were based on the highest committed level of service (HCLoS) model, which included the following: the national population coverage, minimum average broadband speed, and capital and operational expenditures. The Mislatel consortium, later named Dito Telcommunity, led by Udenna Corporation and China Telecom, was selected as the NMP in 2018 and awarded the Certificate of Public Convenience and Necessity (CPCN) in 2019.

In 2021, access to satellite services was liberalized, enabling direct access to all satellite systems, whether fixed or mobile, international or domestic, to build and operate broadband facilities to offer internet services (EO 127 s.2021)

Passed in 2022, the Public Service Act amendment (RA 11659) removed foreign equity restrictions in the ownership of telecommunications and other industries that are considered public services but not public utilities.

Facilitation measures

Similar with most countries, the Philippines has identified infrastructure sharing as one of the strategies in realizing the vision laid out in its National Broadband Plan (NBP).[13] The DICT's Common Tower Policy (Department Circular 008) was released in May 2020, setting the policy guidelines on the sharing of passive telecommunications tower infrastructure for macro cell sites. Independent tower firms were mandated to lease their towers to telecommunications carriers, value-added service providers, and information and communications (ICT) service providers. The DICT required that certain passive telecommunications tower infrastructure provide enough access slots for co-locating active ICT equipment.

Through joint issuances, several agencies, including the DICT, Anti-Red Tape Authority (ARTA), Department of the Interior and Local Government (DILG), and others introduced the following measures to rationalize the processes and requirements for the issuance of permits:

- JMC No. 1, s. 2020: "Streamlined guidelines for the issuance of permits, licenses, and certificates for the construction of shared passive telecommunications tower infrastructure"

[13] see DICT (2017) for the discussion on infrastructure sharing and interconnection

- Revised JMC No. 1, s. 2021: "Revised and expanded streamlined guidelines for the issuance of permits, licenses, and certificates for the construction of shared passive telecommunications tower infrastructure"
- JMC No. 1, s. 2021: "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 cable and facilities to accelerate the rollout of telecommunications and internet infrastructure"

More recently, the President issued Executive Order 32 s.2023, streamlining requirements for constructing telecommunication and internet infrastructure to be complied by the national and local government units. It specifies processing time that should be followed and mandated cities and municipalities to provide one-stop shop services in submitting construction permits and certificates.

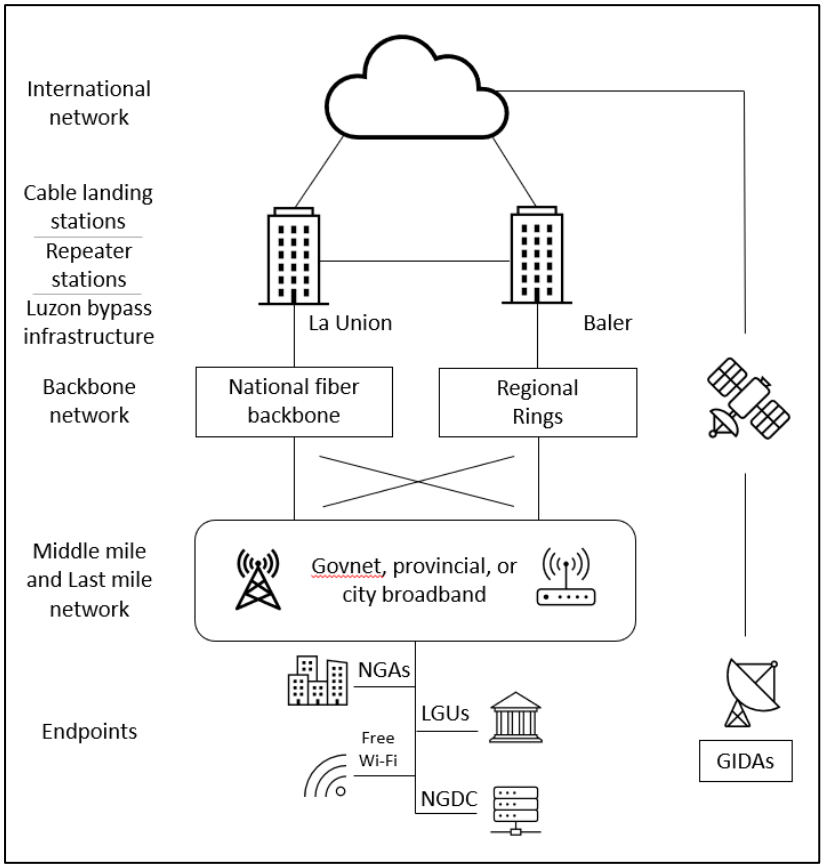
Further policy reforms planned

The Philippine Development Pan 2023-2028 identified other reforms. Its legislative agenda includes institutionalizing the National Broadband Program (National Broadband Act) and amending the national building code to ensure that buildings can be capacitated with quality and reliable ICT services. The administration shall also pursue the passage of the Open Access in Data Transmission Bill to remove the legislative franchise requirement to liberalize the building of networks and access to spectrum, particularly for rural and geographically disadvantaged areas in the country (NEDA 2023b).

3.2 Philippine Integrated Infostructure

Prior to 2016, there was hardly any government-supported broadband infrastructure. Since then, the DICT has been investing in the Philippine Integrated Infostructure (PII) under the National Broadband Plan (Albert et al. 2021). The **National Broadband Program** is composed of cable landing stations, National Fiber Backbone, Accelerated Building of towers and fiber to interconnect national and local government agencies and provide provincial and city broadband and satellite overlay (See Figure 9).

Figure 9. National Broadband Program Infrastructure



Note: GovNet = Government Network Program; NGAs = National Government Agencies; LGUs = local government units; NGDC = National Government Data Centers; GIDAs = geographically isolated and disadvantaged areas
Source: DICT (2023)

Component 1 is the **National Fiber Backbone** that connects the islands of Luzon, Visayas, and Mindanao. Starting in 2021, it shall activate NGCP's fiber optic cables across the country. Its expansion is expected to benefit Regions II, IV-A, V, VIII, X, NCR, Davao City, and Benguet in 2023, Visayas in 2024, and Mindanao in 2025 (DICT 2023).

The government-owned fiber network will be complemented by the commercial fiber networks of telecommunication companies such as PLDT, Globe, and Converge. It will cover 28,000 kilometers across the country (Daguno-Bersamina 2023). According to the DICT, the Luzon portion of the National Fiber Backbone is now 70% completed, while the expansion to Visayas and Mindanao is expected to finish by 2026. To ensure redundancy, the government hopes private investors will establish additional cable landing stations off the tip of Mindanao since most of the country's cable landing stations are concentrated in Luzon, with a few in Visayas (Daguno-Bersamina 2023).

Component 2 is the system of cable landing stations connected via the **Luzon Bypass Infrastructure (LBI)**. This serves as the NBP's gateway to international connectivity and may also be used to land more capacity into the network.

The LBI is a joint project by the DICT, Meta (Facebook), and Bases Conversion Development Authority (BCDA) that aims to provide the government with 2TBPS internet capacity. The keys to the landing stations and repeater stations were turned over to the DICT in November 2021.

Component 3 is on tower buildup for the country's geographically isolated sites and identified missionary areas. This will cover the middle mile and last mile segments of the network.

The "**Accelerated Tower Build"** will accelerate the building of telecommunications towers and collocate microwave radio equipment in government-owned towers in missionary areas where private telcos cannot penetrate. In April 2023, the first tower was built in Boac, Marinduque, with a capacity to connect at least 42 government facilities.

Component 4 of the NBP shall expand DICT's fiber optic to interconnect government agencies to provide fast, secure, and efficient fiber connectivity and improve public services. The "**Accelerated Fiber Build**" connects about 1033 government agencies, where 98 percent are operational (DICT 2023).

Component 5 involves the use of **Satellite Overlay**. This component enables immediate broadband service to isolated locations where deployment of fiber network facilities is not possible or difficult.

Table 10 shows the budget proposal (NEP) vs. budget allocation (GAA) for the NBP since 2018.

Table 10. Investment in broadband infostructure – NEP and GAA, 2018-2023

Year	NEP	GAA
2018	1,176,621,000	50,621,000
2019	43,329,000	1,043,329,000
2020	196,461,000	296,461,000
2021	902,194,000	1,858,194,000
2022	1,500,000,000	1,500,000,000
2023	1,500,000,000	1,880,000,000

Note: NEP = National Expenditure Program; GAA = General Appropriations Act
Source: NEP (2018-2023); GAA (2018-2023)

3.3 Infrastructure Sharing

Infrastructure sharing is an approach chosen to reduce the cost of broadband rollout to encourage more players in the market. As mentioned above, the DICT issued the Common Tower Policy in 2020. Furthermore, the government seeks to leverage its existing infrastructure assets to drive down the cost associated with civil works, by unlocking government-owned facilities like DICT towers, NGCP fiber cores and electricity poles to market players, and allowing them to utilize existing network corridors such as railways, roads, airports, seaports for the rollout of fiber networks. The government, however, is yet to release comprehensive guidelines covering (1) systems interconnection and integration model standards; (2) fee structure for interconnection; (3) dispute resolution; (4) repository of available infrastructure; and (5) infostructure sharing regime.

Infrastructure Sharing through Utility Poles

One practical way to expand broadband coverage is to leverage the use of **existing utility poles** of electricity distribution facilities, which can help save enormous amount of money on civil works as opposed to when telecommunications companies construct their own poles. As discussed by Schubert (2020), fiber deployment via aerial cables attached to utility poles, is seen as a cost-effective measure for expansion as opposed to underground installation which is more expensive and time-consuming to build. More particularly, underground deployment comprises around 80-90 percent of the overall cost of establishing the fiber network. A drawback of utilizing aerial deployment, however, is that fiber connections are more prone to weather disturbances –a fact that policymakers should also consider.

Under Republic Act 9136, or the "Electric Power Industry Act of 2001" and Section 5c, Rule 7 of its IRR, distribution utilities (DUs) are allowed to engage directly or indirectly in business related activities that would help maximize the use of their assets. A portion of the income[14] derived from such activities will then be used to reduce the distribution wheeling charges[15] levied on to the DU by the Energy Regulatory Commission (ERC). In July 2010, the ERC released some guidelines on the submission, evaluation, and approval of lease of properties by DUs (Resolution no. 18, series of 2010). The guidelines apply to electric cooperatives, privately-owned distribution utilities, LGU-owned and operated distribution systems, and qualified third parties operating in waived areas of franchised DUs. DUs are permitted to lease pole spaces, lots, as well as other facilities, equipment, and materials, subject to the approval of the ERC. In a memorandum circular released by the National Electrification Administration (NEA)[16] in 2018 (MC 2018-055), the annual pole rental rate was set at four hundred and twenty pesos (P420.00) per cable position, per pole.

While the DUs and telecommunications companies both have the incentive to go into infrastructure sharing arrangements on utility poles, several issues emerged during the actual implementation. A published media release by the NEA (2022) reveals a disagreement with the Federation of International Cable TV and Telecommunications Association of the Philippines (FICTAP) on the standard pole rental rate[17]. The FICTAP views this rate too high and appealed for involvement in the formulation of a new rate. The NEA on the other hand, presented the detailed computation of their pole rental rate, and vowed to review their computation through a technical working group. Another concern raised by FICTAP is the proliferation of unlicensed telecommunication companies engaging into joint pole agreements with DUs, affecting their members' operations. In response, the NEA released a memorandum (Memorandum no. 2022-55), requesting all electric cooperatives to require telecommunication companies to present proof (ex. permit, license, or any equivalent document) that they are allowed to operate within the DU's franchise area before engaging into legally binding arrangements.

The success of a cross-sector infrastructure sharing is highly influenced by the level of cooperation and collaboration among the partners, strengthened by a conducive regulatory framework (UN ESCAP 2021). In the case of infrastructure sharing arrangement between electricity distribution utilities and telecommunication companies on utility poles, much of the

[14] Shall not exceed 50 percent of the net income derived from the arrangement.
[15] "Distribution wheeling charges" refers to the charge/cost imposed by the ERC to the DU for the use of the electric distribution system or related services. The electric distribution system refers to the system of wires and facilities covering the delivery points of the transmission/sub-transmission system to the point of connection to the consumers.
[16] The NEA is a government-owned and controlled corporation that oversees the performance of the electric cooperatives.
[17] See Serafica and Oren (2022b) for similar concerns raised by other associations of cable TV operators

issues stem from not having a thorough guidelines that considers both parties of the sharing agreement. There also exist no guidelines on pricing, which creates an avenue for disagreements. Lastly, the existing guidelines released by the NEA induce both parties to behave independently instead of collaboratively. The following are sections in the guidelines (NEA MC 2018-055) that exhibit this:

- Request to Attach. *"Section 3. Right of Way for others Party's - No guarantee is given by the Lessor that any necessary permission from other property owners, municipalities or other entities for the use of its poles by the Lessee shall be granted. If objection is made and the Lessee is unable to satisfactorily settle the matter within a reasonable time, the Lessor may require the Lessee to remove its Attachments from the pole involved and the Lessee shall within fifteen (15) days after receipt of said notice, remove its Attachments from such poles at its sole expense; otherwise the Lessor may affect the removal at the expense of the Lessee."*
- Maintenance. *"Section 16. Each party shall maintain, at its own expense, its own facilities on Standard Joint Poles. Lessor shall, at its own expense, maintain its poles in good condition and whenever necessary, shall replace the same also at its own expense, specifically but not limited to the replacement of rotten poles. Each party shall transfer its own Attachments to the new pole at its own expense. Lessee shall conduct regular inspection and examination of its cables and facilities and shall identify its own cable attached to the pole through a color coding tag or any identifying mark/design known to the Lessor."*
- Maintenance. *"Section 19. Whenever there is a change in the road elevation due to government infrastructure project and which will affect the specified vertical clearance between two lines, both parties shall elevate their own facilities at their own expense."*

3.4 Communal and institutional access: Free Wi-Fi for All Program

The Free Wi-Fi Internet Access in Public Places was a program initiated by the Department of Science and Technology – Information and Communications Technology Office in 2015 (DOST 2015), which was transferred to the Department of Information and Communications Technology in 2016 when it was created through RA 10844.[18] The program was institutionalized in the Free Internet Access in Public Places Act (RA 10929) in 2017. Key elements of the program include:

> *Coverage* - The Free Wi-Fi for All Program shall provide wifi hotspots to be installed in public places such as government hospitals and health centers, national and local government offices, public libraries, public parks, plazas, public schools, State and Local Universities and Colleges, TESDA institutions, transport terminals, and other identified open public areas across the country (Sec. 4);
> *Speed* - Ensure that the minimum internet speed per user is two megabits per second (2 Mbps) or as prescribed by the National Broadband Plan, whichever is higher (Sec 5f);
> *Funding* – A special fund, the Free Public Internet Access Fund (FPIAF), was created under the management of the DICT to provide financing for the implementation of the Program. The FPIAF shall be funded out of the Spectrum Users Fees collected by the NTC and other sources to be identified by the Department of Budget and Management (Sec 17).

[18] The free wi-fi program was called Juan Konek in 2015; Pipol Konek in 2018; and Free Wi-Fi for All in 2020 up to the present.

The budget allocation for 2017 was set at about PHP1.8 Billion. The number of live sites since 2018 increased from 1482 in August 2018 to 10311 in July 2021. Note that the appropriations significantly increased to PHP2.7 billion in 2021. See Table 11 for the appropriations for the Free Wi-Fi project.

Table 11. Free Public Internet Access Fund

Year	NEP
2017	1,758,161,000
2018	1,739,700,000
2019	1,166,401,000
2020	1,414,453,000
2021	2,725,461,000
2022	2,550,655,000
2023	2,500,000,000

Note: NEP = National Expenditure Program
Source: NEP (2017-2023)

Although the budget allocation for 2022 and 2023 is at about PHP2.5 Billion, the live sites have shown a decreasing trend, with 4,518 live sites in June 2022, 3,796 in May 2023, and 2,594 in September 2023. The actual number of live sites as of September 2023 falls below the target of 104,493 sites by 2025 (NEP 2017-2023; CPBRD 2019-2023; Free Wi-Fi for All 2023). See Table 12 for the number of live sites per region from 2018 to 2023.

Table 12. "Free Wi-Fi for All" program: Number of live sites, 2018-2023

Region	August 2018	July 2019	June 2020	July 2021	June 2022	May 2023
NCR	468	696	896	1520	831	854
CAR	11	19	39	142	118	97
I	113	165	208	415	268	144
II	25	28	135	229	121	191
III	91	208	318	1026	241	232
IV-A	142	192	308	1,136	265	290
IV-B	18	83	96	500	155	404
V	57	179	325	837	487	392
VI	88	307	536	1,083	406	153
VII	165	314	357	549	314	222
VIII	90	156	220	334	123	34
IX	62	92	165	592	371	246
X	37	86	176	585	210	203
XI	17	49	138	448	249	141
XII	4	16	46	128	18	27

XIII	86	102	193	400	215	125
BARMM	8	16	38	387	126	41
Total	**1482**	**2708**	**4194**	**10311**	**4518**	**3796**

Note: Per column, Red to Green filled cells represent low to high values
Source: CPBRD (2021; 2023)

Among the regions, NCR has significantly more Wi-Fi live sites, with about 50 live sites per city, in contrast to about one live site for every two cities/municipalities in Region XII, one live site for every three cities/municipalities in BARMM, and one live site for every five cities/municipalities in Region VIII. Additionally, regions XII, VIII, and BARMM have the least number of live sites, considering their respective population and number of cities/municipalities. Regions NCR, IV-B, V, and IX have the highest number of live sites per city/municipality. See Table 13.

Table 13. Free Wi-Fi for All Hotspots, Live Sites as of May 19, 2023

Region	Live sites	GIDA (2022)	Population (2020)	People per live site	Cities and municipalities	Live site per city/municipality
NCR	854	0	13,484,462	15,790	17	50.2
CAR	97	385	1,797,660	18,533	77	1.3
I	144	159	5,301,139	36,813	125	1.2
II	191	262	3,685,744	19,297	93	2.1
III	232	189	12,422,172	53,544	130	1.8
IV-A	290	204	16,195,042	55,845	142	2
IV-B	404	408	3,228,558	7,991	73	5.5
V	392	1034	6,082,165	15,516	114	3.4
VI	153	607	7,954,723	51,992	133	1.2
VII	222	160	8,081,988	36,405	132	1.7
VIII	34	319	4,547,150	133,740	143	0.2
IX	246	520	3,875,576	15,754	72	3.4
X	203	407	5,022,768	24,743	93	2.2
XI	141	418	5,243,536	37,188	49	2.9
XII	27	286	4,901,486	181,537	49	0.6
XIII	125	151	2,804,788	22,438	73	1.7
BARMM	41	954	4,404,288	107,422	119	0.3

Note: Per column, Red to Green filled cells represent low to high values; Some live sites are under maintenance
Source: Free Wi-Fi for All (2023); DOH (2023); PSGC (2022); PSA (2021)

Implementation issues[19]

The Free Wi-Fi project has experienced notable implementation issues, resulting in a low performance rate since the program started in 2015 and was institutionalized in 2017. According to COA reports, a total of 1,047 deployed live sites compared to the target of 7,058 in 2017, while only 4,914 live sites were available by the end of 2018 compared to the target of 13,024 sites. The DICT attributed the decreasing number of live sites to the termination of service contracts with providers. While the obligation rate was 93.7 percent in 2020, only 8.4 percent of the budget was disbursed. This means project completion was delayed or bid out near the end of the year. In 2021, there is only a 35.3 percent obligation rate and a 13.3 percent disbursement rate, while the obligation rate and disbursement rate in 2022 are at 28.3 percent and 26.8 percent, respectively. The number of live sites has declined from 10,311 in July 2021 to 3,796 in May 2023. With the low implementation rate of the program, the goal of 104,493[20] sites by 2025 may not be realistic.

Among 14 contracted projects in 2016, 13 were suspended, and 2 had no accomplishments. Based on the 2017 Commission on Audit (COA) Audit Report for DICT, the main reasons for delay or suspension of contracts include the lack of permits from LGUs, followed by delayed issuance of suppliers' colocation or request-to-attach, lack of terminal points, armed conflict in Mindanao, lack of joint pole agreement, and change order of other sites. COA suggested that the procurement and implementation could be improved by securing necessary documents during pre-procurement and pre-bidding conferences, coordinating and securing permits with LGUs before implementation, conducting ocular inspections for the sites, and consulting with private telco owners to secure joint pole agreements.

An issue on the partnership of DICT and United Nations Development (UNDP) to implement a free Wi-Fi project was highlighted in 2018. This includes the transfer of PHP1.36 billion inclusive of a 5 percent service fee from DICT to UNDP for project implementation (6,000 sites). On top of this, as part of the financial agreement between DICT and UNDP, a 3 percent fee for general management support (GMS) services will also be charged. Based on COA's audit observations, the special appropriations are expected to be used to implement the project. The 2018 GAA and RA 10929 have no provision for allocating GMS to be transferred and managed by a non-government organization. There were no supporting documents to prove the DICT's lack of capacity prior to seeking UNDP's assistance. Although the partnership is allowed under RA 10929, the law states the DICT to lead the implementing agency to oversee the implementation of the project, and the implementing agencies mentioned in the GAA are supposed to be government agencies. However, in the procurement document, both UNDP and DICT are core members of the Project Board of the technical working group created for the implementation and administration of the project. In addition, the 1.36 billion transferred to UNDP is considered a donation. Hence, equipment, supplies, and property ownership would be transferred to UNDP.

COA noted that the partnership with UNDP was impractical since UNDP's contracted suppliers could not provide timely delivery of services. The delayed implementation, non-activation, deactivation, and poor connectivity of sites are due to insufficient or lack of planning, network monitoring system, and impact assessment. The DICT committed to

[19] CPBRD (2018-2023); Cruz (2023)
[20] CPBRD (2023)

adopting the Connect-Harness-Innovate-Protect (CHIP[21]) framework to expedite the building of free Wi-Fi sites, including proposing an end-to-end solution from backbone to live sites to ensure the sustainability of the program. In addition, COA commented that the program's performance target of a 10 percent increase per year in the number of places with broadband access or connectivity should be further classified. It also added that the program should rethink how much of the budget would be given to public places and SUCs, which would yield better social and economic outcomes, and whether the building of free Wi-Fi sites should be more concentrated in underserved and unserved areas than in urban areas.

Due to the backlog of the government in establishing free internet access sites in public places, Senate Resolution No. 59 was filed in the 19th Congress seeking to review the implementation of RA 10929 as well as the Open Distance Learning Act (RA 10650). In an oversight hearing of the House Appropriations Committee in May 2023, the DICT reported that from the deployed sites of about 11,000 in 2018, active live sites decreased to about 3,900 in July 2022, mainly due to non renewal of many Wi-Fi sites by the past administration. The unutilized funds were returned to the treasury, while the funds for 2023 would be available in March 2023. For the first half of 2022, the utilization rate of DICT is only 19 percent, and the procurement rate is 8 percent. Apart from the underutilized funds, the DICT has to clean house, particularly review past programs and address issues, such as payables and projects without contracts. As of May 2023, NCR has an average of 50 live sites per city, compared to all other regions, which have an average of 0-6 live sites per city/municipality.

3.5 Communal and institutional access: Leveraging satellite technology for GIDAs

PhilSA's Introducing Non-Geostationary Satellite Constellations Test Deployments to Improve Internet Service (INCENTIVISE) Project in 2020, in collaboration with the Department of Science and Technology - Advanced Science and Technology Institute (DOST-ASTI) and USAID-Better Access and Connectivity (Beacon), aiming to reduce the digital divide using emerging space technologies, particularly in geographically isolated and disadvantaged areas (GIDAs) where fiber connection is not feasible. They opened a call in 2021 to satellite internet providers to test deploy their products and services in remote and rural areas in the country to test viability towards commercial service. Satellite provider participants include SpaceX's Starlink, Amazon's project Kuiper, AST SpaceMobile, and OneWeb. They are expected to test deploy internet services in 2023 (PhilSA, USAID, and ADB 2022).

In March 2023, PhilSA installed Starlink (low Earth orbit satellite) to provide internet access to public schools and government offices in geographically isolated parts of the country, specifically in Dingalan, Aurora and Jomalig, Quezon. Later in October 2023, it also installed a Starlink terminal in Basco, Batanes in October 2023. PhilSA also previously collaborated with DOST-ASTI and Bangko Sentral ng Pilipinas (BSP) in 2022 by providing satellite internet services to rural banks in Batangas. Some of these satellite providers expressed the need for the government to simplify licensing and provide clear and fair use of spectrum. The agency also supports regulatory reforms to encourage the growth of the satellite industry (PhilSA 2023a, 2023b).

The Broadband ng Masa Program particularly focuses on providing internet connectivity in geographically isolated and disadvantaged areas (GIDA) using satellite technology. The DICT tapped Starlink, with funding drawn from the Free Wi-Fi Program in 2022, while the GAA

[21] While the CHIP Conceptual Framework was adopted in February 2021, expecting to help build 5,000 towers a year for the next three years (Parrocha 2021), only 3,796 live sites are available as of May 2023.

allotted a budget of PHP71,908,000 for 2023 (Rosales 2023a; Dela Cruz 2022). Another company, Astranis, signed a deal with the local ISP, HTechCorp. to provide two dedicated satellite internet services in the Philippines via MicroGEO satellites, which can connect up to 10 million people and 30,000 barangays. It is expected to launch in 2024 with the first satellite, "Agila", connecting schools, hospitals, and community centers (Sheetz 2023; PCO 2023).

It is yet to be determined how these efforts would expedite the rollout of the Free Wi-Fi for All Program, with the number of live sites declining since 2022. Moreover, how the initiatives of the Broadband ng Masa in partnering with satellite internet service providers such as Starlink and Astranis would benefit or integrate with other government programs such as PhilSA's INCENTIVIZE project and the DOST-ASTI's project that use the same satellite technologies as a network in providing internet connectivity in rural communities.

3.6 Communal and institutional access: Tech4Ed-DTC project[22]

Tech4ED started in 2015 under the DICT's ICT Literacy and Competency Development Bureau (ILCDB) Tech4Ed project management teams at the central and regional offices. It aims to provide connectivity, ICT equipment, learning resources, and e-government services to underserved communities. Depending on the memorandum of agreement between DICT and partner organizations in building Tech4ED centers, DICT provides the digital platform, equipment (subject to availability of funds), and internet through the "Free Wi-Fi for All" Project. In contrast, the partner organizations (e.g., LGUs, schools, libraries, etc.) typically provide equipment, space, and personnel.

In partnership with ITU, the program upgraded into the Tech4ED-Digital Transformation Center (Tech4ED-DTC) Project, transforming Tech4ED centers into DTCs, self-sustaining centers providing ICT-enabled services and opportunities for ICT skills development such as basic and intermediate digital literacy training, capacity building for policymakers for designing and implementing digital skills programs, and MSME training, particularly for unserved and underserved areas. These centers would provide physical facilities for training, co-working, or events venues; virtual platforms containing online and training courses, learning modules, and e-government services; and center managers. The DTCs will focus more fully on providing training and digital literacy besides providing physical facilities that the Tech4ED centers mainly provide.

The ITU provides capacity-building and training resources, such as CISCO NetAcad + skills for all and HP life learning management systems. DICT also partners with other organizations providing centers with platforms such as Tekno-Aklatan content (National Library of the Philippines), MSME content (DTI Negosyo Center), DOST-Starbooks, UP-LEAP (also available offline), DA -Agricultural Training Institute, and learning management system. Depending on the center type, Tech4ED centers cater to farmers, MSMEs, students, and citizens.

The DICT conducted a census with central and regional offices, including identifying the program's sustainability issues. The creation of Tech4ED centers majorly depends on the availability of partner organizations/institutions that could provide space, personnel, Wi-Fi, and other equipment and geographic areas. It can be created through the initiative of the DICT Tech4ED offices or partner organizations. For example, CAR has fewer Tech4ED centers,

[22] Mr. Mike Kenneth Venus of the Department of Information and Communications Technology's Tech4ED/DTC Project (Interviewed by authors on September 29, 2023).

partly attributed to the region's number of Geographically Isolated and Disadvantaged Areas (GIDA). In contrast, Region V has many partner organizations that can be tapped. The majority of the operational Tech4ED centers are school-based, followed by LGU-based and public library-based (See Table 14). Non-operational Tech4ED centers ceased to operate due to the COVID-19 pandemic, the discontinuity of funding and support from its partner organization, and natural calamities.

In 2022, there are 1,891 partner-managed Tech4ED centers, excluding school-based centers, wherein 54 percent are operational (See also Table 2). As of September 2023, 23 of 36 target DTCs are already operational. The funding for the Tech4Ed-DTC project is requested every year through the General Appropriations Act (GAA). Currently, the DICT is collaborating with the National Library of the Philippines (NLP) and the DTI Nagosyo Center Project management unit to improve public library and Negosyo center-based centers to Level 1 DTC standards, in line with the Philippine Digital Workforce Competitiveness Act (RA 11927).

Table 14. 2022 Tech4ED census statistics by center type

Center type	Operational	Non-operational	Total
School	917	1417	2334
LGU	693	655	1348
Tech4ED for schools	259	403	662
Public library	158	93	251
DICT Provincial Training Center	66	16	82
Negosyo center	54	26	80
National government agencies	53	28	81
Others (private sectors, NGOs, etc.)	37	68	105
FITS center	19	7	26
Total	**2256**	**2713**	**4969**

Table 15. Partner-managed Tech4ED centers based on the 2022 census (excluding school-based centers)

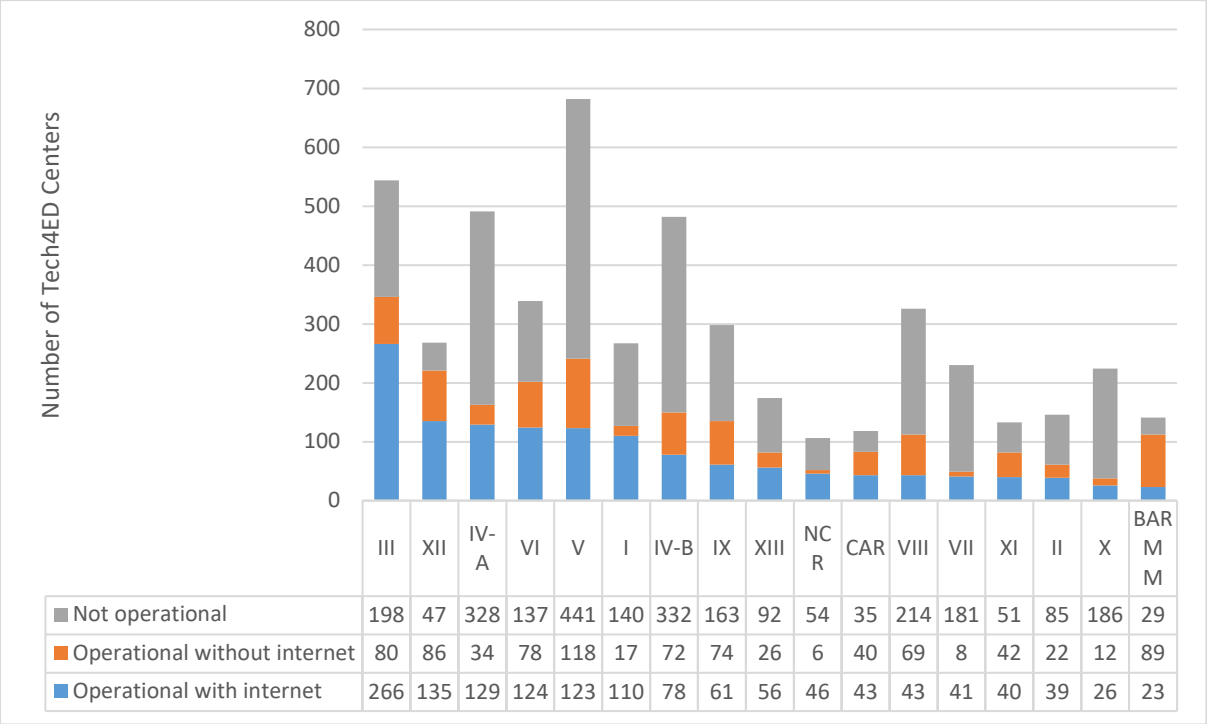
Operational with internet and CM	602
Operational with internet	45
Operational with CM and no internet	326
Operational without internet and CM	41
Non-operational	877
Total	**1891**

Note: CM = center manager

Tech4ED centers by region

Regions V, III, IV-A, IV-B, and VI have the highest number of Tech4ED centers. Many centers are not operational, particularly in regions IV-A, IV-B, X, VII, and VIII. Over 70 percent of Tech4ED centers in Regions XII, BARMM, and CAR are operational. However, many of them do not have internet access. Operational centers within these regions can focus on providing internet access to accommodate households without internet at home. See Figure 1.

Figure 10. Tech4ED centers by region, 2022



	III	XII	IV-A	VI	V	I	IV-B	IX	XIII	NCR	CAR	VIII	VII	XI	II	X	BARMM
Not operational	198	47	328	137	441	140	332	163	92	54	35	214	181	51	85	186	29
Operational without internet	80	86	34	78	118	17	72	74	26	6	40	69	8	42	22	12	89
Operational with internet	266	135	129	124	123	110	78	61	56	46	43	43	41	40	39	26	23

3.7 Initiatives to boost demand for broadband

3.7.1 E-government

The government is also prioritizing the digitalization of its services with the following DICT e-government priority projects: (1) eGov PH App to streamline government services utilizing digital transactions; (2) eLGU, providing easier access to all local government services such as permits, clearances, contributions, and payments; (3) eGovCloud, a centralized cloud services where the government can store and manage data; (4) eTravel for more efficient travel-related transactions; (5) eGovPay, a single payment gateway to simplify and standardize payment transactions; and (7) eReport, to serve as a platform where individuals can file complaints or feedback regarding government services (Delfin 2023). The Digital Government Masterplan (DGMP) 2023-2028 will serve as the overarching framework to transform public administration and create a digitally-enabled government delivering efficient, fast and quality services through the integration of platforms and services, technologies, skilled workforce, and ICT infrastructure (Varilla 2023).

3.7.2 Education

The provision of ICT in DepEd schools was initiated by the Gearing Up Internet Literacy and Access for Students (GILAS) program, a multi-sectoral initiative composed of government, private, social development community, and donor community, which started in 2005. It provided an internet package to 3,306 public high schools, including an internet laboratory with 10-20 computers, a free one-year internet connection, basic training for teachers and school heads, and one year of technical assistance. In 2011, the program was turned over to DepEd to continue its advocacy. Through DepEd's Internet Connectivity Program (DICP) and DepEd Computerization Program (DCP), public high schools receive subsidies for internet services and the provision of computers ("Private sector turns over GILAS" 2011; ITU n.d.).

DepEd continues to implement its Computerization Program (DCP), providing public schools with computers, ICT equipment, and internet connection (DepEd 2010; DepEd 2022). As of SY 2020-2021, over 80 percent of public schools have functional computers. About 64.2 percent of elementary schools, 72.2 percent of junior high schools, and 67.3 percent of senior high schools have internet access. Regarding the ratio of computer to student, three (3) senior high school students share a computer, while nine (9) Junior high school students share one computer, and 19 elementary students share one computer (DepEd 2022). See Table 16. The DCP received a fund of PHP11.3 billion from the 2022 National Expenditure Program, twice the amount allocated in 2021 (DepEd 2021).

Table 16. Functional computers and internet connectivity: SY 2020-2021

Level of education	Percentage of schools with computers	Ratio of computer to student	Percentage of schools with internet
ES	81.6%	1:19	64.2%
JHS	84.1%	1:9	72.2%
SHS	81.5%	1:3	67.3%

Source: DepEd 2022

The DepEd Digital Education 2028 (DepEd Digi-Ed), launched in October 2023, to provide free Wi-Fi in schools. In cooperation with the ISPs, 25 schools were chosen by Starlink for a pilot project, while 2000 were given satellite internet connectivity. It is currently developing the Matatag portal for students to access educational resources and materials, as well as procuring Digi-Ed Learning Carts (computer-labs-on-wheels), while digitalization of learning resources is expected to start in 2024 (OVP 2023).

In addition, the DOST-ASTI launched the Resilient Education Information Infrastructure for the New Normal (REIINN[23]) project in 2022 as a response to ICT infrastructure challenges of educational institutions due to the shift to remote learning during the COVID-19 pandemic. The initiative supports remote learning, especially in rural areas, using LTE technologies (LokaLTE/local community network, LokalFi, and LokalFlix). The project initially planned to use the UHF TV frequencies. However, due to regulatory issues, it resorted to using Wi-Fi (LokalFi) instead. Its 2nd component, RuralCasting, uses datacasting technology to provide digital learning content (Set Top Box and EdukasTV). As of September 2023, it benefitted communities in Luzon (i.e., Rizal (2), Zambales (1), Benguet (2), and Nueva Vizcaya (1) and plans to also serve more communities across the country (Martinez 2023).

Since the launch of the project in 2022, only six (6) communities have benefitted from the initiative. The project was unable to use UHF TV frequencies due to regulatory issues. The team stressed that policy reforms are needed to maximize the opportunity of the project. These include allowing alternative and "bottom-up" strategies to make the project sustainable, enabling the government entities to perform quasi-telco functions such as importing equipment and using frequencies for disaster management and providing internet to the unserved and underserved areas, and empowering communities through community-buy in to take care of their own networks, subject to their capacity (Martinez 2023).

[23] with funding from the DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD)

3.7.3 Health

The National E-health Program was launched in 2014 to increase access to healthcare services, particularly in rural areas, and manage health information using ICT, guided by the Philippines eHealth Strategic Framework and Plan 2014-2020 (DOH n.d.). Together with the Philippine Health Insurance Corporation and the Department of Science and Technology, some of the target outputs identified are to establish an internet connection to the barangay level, particularly to rural health units and barangay health stations, hospitals, and rural healthcare units to use Philhealth Eclaim system, utilize interoperable health information system, and telemedicine/teleconsultation be made available.

PhilHealth is currently utilizing the eclaim system[24], while the Department of Health, PhilHealth, and DICT released Joint Administrative Order No. 2021-0001 to mandate all healthcare providers and insurers using integrated health systems or other eHealth solutions to comply with the "Standards Conformance and Interoperability Validation" to ensure interoperability of health-related data. The proposed "National e-health System and Services Act" was previously approved by the House of Representatives and was transmitted to the Senate in 2021. However, no action was taken until the end of the 18th Congress. Similar bills were reintroduced and are still pending in the 19th Congress.

With the onset of the COVID-19 pandemic in 2020, the need for telemedicine became apparent. The DOH-NPC released a memorandum circular to guide healthcare providers, telemedicine services providers, and patients in implementing telemedicine services to provide health services and minimize health risks during the pandemic. This includes encouraging healthcare providers to subscribe to DOH telemedicine partners and using electronic medical records and e-prescriptions (DOH 2020). The government also expedited the procurement of essential materials and equipment needed amidst the COVID-19 pandemic, which includes telecommunications services (GPPB 2020). In 2021, DOH-DILG-PHIC Joint Administrative Order No. 2021-0001 extended the guidelines to other stakeholders, such as the medical associations and societies, pharmaceutical outlets, LGUs, and LGU, DOH, and PhilHealth offices (DOH 2021). In 2022, the DOH expressed its plans to create telehealth services nationwide to decongest health facilities and extend health services to underserved and unserved areas in the country (Montemayor 2022).

3.7.4 Emergency response

To enhance connectivity, some rural communities in the Philippines employ signal repeaters, directive antennas, and improvised towers. The DOST has created the Robust and Rapidly Deployable GSM Based Stations and Backhaul for Emergency Response (ROGER) as an alternate channel to ensure communication remains intact during emergencies or disasters. Additionally, private entities have introduced community cellular networks (CCNs) and mobile phone services in rural areas, mirroring initiatives seen in various countries (Serafica and Oren 2022a).

Signal repeaters, makeshift towers, and directed antennas are used in some remote parts of the Philippines to boost connection. As a backup communication channel during emergencies, the DOST has created Robust and Rapidly Deployable GSM Based Stations and Backhaul for

[24] https://www.philhealth.gov.ph/services/eclaims/ (accessed on November 30, 2023)

Emergency Response (ROGER). Like other nations, various private sectors set up mobile telephony and community cellular networks (CCNs) in rural areas (Serafica and Oren 2022a).

An open radio access network (RAN) would be important in telecommunications networks. It promotes interoperability, reduces 5G infrastructure costs, and extends internet connectivity in underserved areas in the country. Asia Open RAN Academy (AORA) and the Department of Science and Technology's Advanced Science and Technology Institute (DOST-ASTI) recently signed a memorandum of understanding to build a local open network laboratory to initiate open RAN solutions, as well as building community labs in provinces to democratize internet access in the Philippines. This will complement the common tower policy implemented by the government, where ISPs use shared towers. AORA would allow sharing of equipment, further reducing costs and increasing efficiency in providing internet connectivity (Antivola 2023).

3.7.5 Community: Cyber for Peace - Technology for Development[25]

The Cyber for Peace initiative spearheaded by LTC Francel Margareth Padilla-Taborlupa started by the 7th Signal "Harbinger" Battalion under the Command and Control Communications and Cyber Systems, eventually becoming an integral part of the 7th Infantry Division's *Serbisyo Caravans,* benefitting communities in the Northern Luzon area. This enabled them to extend their service and expertise to the communities, aiming to harness technology to promote peace and development in remote areas.

This initiative supports the local government units in identifying and addressing the specific needs of rural communities to bridge the digital divide, improve living conditions, and foster economic growth. Recognizing communities' challenges on road access, signal coverage, and electricity, this initiative uses the military's existing capacities and partnerships with the local government units, educational institutions, other government entities, non-government organizations, and private industries (e.g., telecommunications companies) to facilitate providing tailored assistance to far-flung communities. These include providing them access to basic services like electricity (e.g., solar panels), as internet connectivity is often contingent upon these essential services. They also assisted in repairing and maintaining ICT equipment and appliances, as well as providing training on digital literacy and cybersecurity.

One of the communities that was served by the initiative is in Abra. In collaboration with local government officials, tourism was identified as a potential source of income for the community. The initiative helped the community create social media accounts on Facebook and X (formerly Twitter) to promote their tourist attraction, *Kaparkan* Falls. The road to the area is currently paved to make it more accessible to tourists. These efforts will provide more livelihood opportunities for the community.

[25] LTC Francel Margareth Padilla-Taborlupa of the 7th Signal Battalion Commander, Army Signal Regiment Philippine Army (interviewed by authors on October 25, 2023); Morozova-Buss (2023)

4. Conclusion and recommendations

Like other countries around the world, the Philippines is undergoing profound digital transformation. The government recognizes the importance of digitalization for socio-economic growth and development. Thus, digital connectivity is high on the policy agenda.

The last national survey on ICT was conducted before the pandemic, which revealed that only 17.7 percent of households have internet access at home. A new survey[26] will be released next year, hopefully with significantly better results, not only to correct for the previous underestimation (i.e., due to the exclusion of certain types of internet providers) but also to reflect the network expansion of telcos in recent years. As the recent APEC assessment shows, the Philippines performs slightly above the APEC average in terms of telcos' investments in building and maintaining network infrastructures. The country scored high in network coverage, particularly 4G population coverage. Mobile data affordability showed a noticeable improvement from 2021 to 2022. However, fixed broadband remains to be expensive, and the subscription rate is low compared to other APEC economies. The Philippines also lags behind its ASEAN counterparts in mobile network performance and handset affordability. Of particular concern is the gross disparity in access and internet speed across the country. The Philippines must improve mobile broadband speed, make smartphones and fixed broadband data more affordable, and expand fixed broadband coverage to encourage broadband adoption and usage and keep up with the increasing data traffic.

With a National Broadband Plan, the government has finally developed a coherent set of proposed policy, regulatory, and infostructure interventions to ensure the delivery of universal, fast, reliable, affordable broadband internet services. The government has instituted significant reforms in recent years that are expected to deliver major improvements in the deployment of broadband. These include the entry of a third major operator, the liberalization of access to satellite services, and the removal of foreign ownership restrictions in telecommunications. Also remarkable are the various facilitation measures that will reduce the costs and regulatory burden faced by operators. Other planned reforms identified in the PDP 2023-2028 will strengthen the reform agenda for the sector and should help make broadband pervasive, inclusive, and affordable. In particular, the impact of the proposed Open Access in Data Transmission bill could be significant as it is both a liberalization and facilitation measure. It will allow the entry of more firms in the provision of internet services and promote fair and open competition, as well as facilitate network buildout by removing the requirement of a legislative franchise and the associated costs. Thus, its passage could boost digital connectivity, particularly in communities that are currently underserved or unserved[27]. The proposed Rural Wired Connectivity Development Act (Senate Bill 2131) submitted in the 18th Congress of the Philippines sought to incentivize[28] local ISPs to provide connectivity in rural areas by offering tax benefits based on the number of new subscribers connected. However, it has to be refiled in the 19th Congress to be reconsidered.

While full universal service (i.e., access at the household level) may not be feasible in the medium term, ubiquitous access can be a more achievable goal for the country, especially given the substantial public funding that is being allocated for internet services in public places. Moreover, with satellite technologies and service providers now available, connecting GIDAs

[26] MOA was already signed by the DICT and PSA for the procurement for the conduct of NICTHS 2023 – Phase 1: Field data collection in August 2023. https://dict.gov.ph/wp-content/uploads/2023/09/MOA_NICTHS.pdf (accessed on December 7, 2023)
[27] Provisions on net neutrality, however, may have a counterproductive effect. Thus, Serafica and Oren (2023) suggest that these could be undertaken as a separate measure, if needed, after further study.
[28] In terms of the number of subscribers located in a rural area

to the internet is no longer insurmountable. Ultimately, however, increased broadband adoption and usage would be a better measure of success towards digitalization than just broadband deployment. Thus, it is appropriate that initiatives to support demand-side factors are also being prioritized.

Based on the review of the policies and strategies, the following areas could be improved to increase universal access and service in broadband:

Monitoring & evaluation

The Free Internet Access in Public Places Act (RA 10929) requires the DICT to prepare an annual report on the status of the program and recommend the policies needed to implement the law effectively (Sec 16). To the authors' knowledge, such a report does not exist or perhaps is not publicly available. The law further requires DICT to collect, monitor, and publish information on the cost, performance, service quality, and compliance with the minimum standards on free public internet access points (Sec 9). The authors were not able to find such a report.

As strongly recommended in the UN ESCAP review of UASFs in the Asia Pacific (2017), transparency is critically important to ensure accountability, strengthen the commitment of stakeholders, and help policymakers make informed decisions. For FWFA and the other government programs discussed above, a robust monitoring and evaluation system must be developed or strengthened if such a system already exists.

Need to address implementation issues and revisit the design of programs

As the lead implementing agency of the FWFA, the DICT under Sec 5 of RA 10929 is mandated to "a. develop a comprehensive plan for the timely and effective implementation and propagation of the Program; b. Coordinate with national government agencies (NGAs), local government units (LGUs), private sector, and concerned organizations to ensure that the comprehensive plan is integrated with the plans and budgets of all agencies mandated to provide free internet access under this Act; c. Prescribe policies and regulations, and coordinate the timely and effective implementation of this Act."

Clearly, the performance of the FWFA, which has now been running for five years or more (if the predecessor program is included), has been below satisfactory. There is a need to revisit the design of the program to ensure that the country's flagship universal access program will fulfill its objectives. Similar assessments should be made for the other programs, such as the Tech4Ed. The experience and mistakes from previous government-funded telecom projects could offer lessons. As presented above, challenges, including the lack of capacity to implement projects, issues on procurement and deployment processes of live sites, lack of coordination among stakeholders (e.g., implementing agencies, contracted suppliers), delay in obtaining administrative requirements and delivery of service of contracted suppliers, have hampered the implementation of the FWFA. Thus, an alternative mechanism that is unencumbered by these constraints might be more suitable while ensuring transparency and accountability. A mix of approaches adapted to the specific demands and unique requirements of unserved and underserved communities could also be explored.

The assessment and possible redesign must not only be focused on ensuring effective implementation but also look at the sustainability of the programs in the medium to long term. According to the law, funding for free internet will come from Spectrum Users Fees, but the fees collected from operators also affect the affordability of mobile services. In general, the sustainability of the funding source and the exit strategy must be incorporated in the design of any program involving full or partial subsidies.

Monitoring industry performance

Although the government has stepped in to provide UAS, the development of broadband in the country is still very much private-sector-led. Hence, ensuring that minimum and advertised internet speed and service standards are maintained throughout the country is critical. The NTC and DOST-ASTI's NetMesh Project, which monitors and evaluates the quality of service (QoS) of internet service providers (ISPs) down to the barangay level (Tetangco 2022), should be maximized.

There is also a need to collaborate with ISPs, particularly telcos and ISPs providing fixed and mobile internet services, as well as satellite service providers for the mapping of broadband nationwide (Rosales 2023b). Currently, data on mobile broadband are available from Ookla and ProjectBass (local level), but these are crowdsourced data.

Data from ISPs, particularly from major telcos in the country would be crucial to more efficiently identify the supply of fixed broadband in the country. PLDT expressed its support in creating a map of assets and equipment owned by telco providers for collaboration between the government and private industry (Rosales 2023b).

In complement to the National Broadband Program, the Philippines should create a national broadband map to track and measure progress in broadband development. As an example, the Federal Communications Commission (FCC), the regulatory body for telecommunications in the United States, is mandated to create a broadband map to identify underserved and unserved areas in the country. An area is categorized as unserved if it lacks any access to broadband service or if the available service does not meet the minimum speed criteria: 25 megabits per second (Mbps) for downloads, 3 Mbps for uploads, and suitable latency for real-time interactive applications. In comparison, an underserved area shares a similar definition but with higher speed requirements: 100 Mbps for downloads and 20 Mbps for uploads. The primary aim of the DATA maps is to pinpoint these underserved and unserved regions, offering guidance for targeted broadband expansion initiatives (Marcus et al. 2023).

Under the FCC Enforcement Advisory No. 2020-03, all facilities-based internet providers of fixed and mobile internet services are required to submit complete and accurate data in the broadband data collection (BDC) every six months. Failure of submission by the ISPs will result in enforcement action or penalties subject to the Communications Act of 1934 or other relevant laws. The FCC established a minimum fine of USD15,000 per violation for ISPs that file incomplete or inaccurate data in the BDC (FCC 2022b).

Interventions to increase demand

To increase the demand for broadband services, particularly for mobile internet, efforts can focus on increasing the affordability of internet-enabled devices and mobile data, as well as

improving the mobile network performance and promoting local relevance of the internet to potential users.

The availability of more comprehensive data is crucial in uncovering digital connectivity disparities among specific sectors or groups and guiding the development of more targeted solutions. The subsequent NICTHS[29] should include socio-demographic profiles, such as individuals' employment status, income, and ICT skills, as well as household income and assets, as recommended by Tabuga and Cabaero (2021). This will help in understanding the factors that may affect internet adoption and non-adoption. Further probing on the reasons for non-adoption, particularly for those who answered that they "do not need internet", is needed to identify issues that could be addressed by policies. In addition, the NICTHS should accurately capture the state of internet access in the country. Survey instruments must ensure that respondents understand that there are small ISPs that also provide broadband services to avoid underestimation of internet penetration (i.e., non-telco ISPs and cable operators) and not just the major telco operators, which should also be captured in the survey (Dabao 2021).

Government initiatives on digital connectivity should ultimately aim towards achieving universal and meaningful connectivity. To measure internet use by activity, additional information on the frequency and duration of internet use per activity and whether the quality of service of internet connection have met the demands for these activities, would provide more insights into the productive use of the internet, such as access to internet for information, education, employment, and social purposes. Digital readiness surveys at the community level could also help design the support or interventions on the demand side. Due to the increasing importance of digital tools for MSMEs, existing MSME surveys could include how and to what extent MSMEs utilize digital technology in their business operations. This would help in measuring the country's success in terms of getting MSMEs online. Moreover, gender dimensions must also be incorporated into these surveys to monitor the extent of the gender digital divide.

Cross-sectoral solutions: Electricity and ICT sector

To leverage available infrastructure, the government could establish comprehensive sharing agreements, particularly beneficial for rural areas. These agreements should encompass dispute-resolution mechanisms, transparent pricing models, and regulatory frameworks aimed at fostering joint planning and decision-making processes to address stakeholders' needs. Moreover, strengthening cooperation and collaboration among partners can be achieved by creating information-sharing platforms and facilitating regular communications.

Addressing the lack of electricity in certain areas of the Philippines becomes crucial as it is a prerequisite for using ICT. Furthermore, deploying fixed broadband networks using electric poles is more cost-effective than building underground fiber ducts. As of the 4th quarter of 2021, there were a total of 1,055,722 (measured by the total potential number of household minus the number of served households) or about 4.59 percent unserved households per distribution unit per province in the Philippines, with ARMM having the lowest household electrification rate of 41.74 percent (FOI 2022).

[29] MOA was already signed by the DICT and PSA for the procurement for the conduct of NICTHS 2023 – Phase 1: Field data collection in August 2023. https://dict.gov.ph/wp-content/uploads/2023/09/MOA_NICTHS.pdf (accessed on December 7, 2023)

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