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POLICY BRIEF

ACCELERATING UNIVERSAL DIGITAL CONNECTIVITY

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ABSTRACT

Although countries in the Asia and the Pacific Region (APR) have made tremendous technological progress over the last decade, that progress has also increased digital inequalities across the region. The COVID-19 pandemic has highlighted the need for global connectivity, especially for access to education, work and healthcare. Universal connectivity is a fundamental element of an inclusive and sustainable world; thus, as with income inequality and other human development indicators, digital inequality trends must be reversed. Universal, affordable broadband availability can largely improve a population's quality of education, healthcare, standards of living, and more. Digital inequalities disproportionately impact low-income populations, people living in rural areas and small island developing nations, those who lack literacy and digital skills, and people from traditionally disenfranchised groups, such as women and girls, persons with disabilities and ethnic minorities. The lack of regulations, funding, infrastructure, and digital skills all contribute to the unavailability of universal, affordable broadband access across the APR. This chapter discusses how addressing digital inequality should be at the forefront at both the public and private sectors' agenda. Efforts should include expanding accessibility, creating relevant content, enabling digital literacy, and ensuring affordable connectivity and digital solutions, therefore better preparing individual countries and the global community, as a whole, for a more connected, inclusive and sustainable future.

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INTRODUCTION

Even with all the progress made over the last few decades, the United Nations Development Programme (UNDP) has reported that widespread disparities remain in human development and continue to widen across many dimensions and regions (UNDP, 2019).[1] The digital divide, or lack of universal affordable digital connectivity, is one manifestation of this trend. As depicted in Figure 1, gains have occurred in basic capabilities (UNDP, 2019). As with other measures of human development, those at the bottom have made advances in the basics of Internet access, such as basic mobile connectivity and limited Wi-Fi kiosk access. However, divergence appears in enhanced capabilities, including unlimited data consumption on high-speed mobile and fixed connections at home and access to cloud-based productivity tools. Gaps in enhanced capabilities exceed those in the basic ones, and gaps have continued to rise.

Figure 1: Human development, from basic to enhanced capabilities

Source: UNDP (2019)

[1] According to the UNDP, income inequality is on the rise—the richest 10 percent have up to 40 percent of global income whereas the poorest 10 percent earn only between 2 to 7 percent. Income inequality has increased nearly everywhere in recent decades, but at different speeds. And if one takes population growth into account, inequality in developing countries has increased by 11 percent (UNDP, 2021).

With rapid progress in technologies, **digital inequality runs the risk of widening at an accelerating pace over time. This undermines the achievement of fundamental freedoms to make life choices.** As with income inequality and other indicators of human development, reversing trends toward digital inequality calls for urgent steps in the near future.

The foundational role of connectivity in human development has found wider recognition in recent years (UNDP, 2019; Broadband Commission, 2020a). **Universal connectivity now appears as a fundamental element of an inclusive and sustainable world** – for improving the quality of education and health care, standards of living, personal safety, freedom of choice and overall life satisfaction. One cannot achieve the United Nations (UN) Sustainable Development Goals (SDGs) without universal affordable broadband availability. The global COVID-19 pandemic has only amplified the importance of connectivity for social and economic inclusion, including access to education, healthcare, remote work and political participation. COVID-19's impact on childhood education has proven particularly acute.

With its tremendous economic and cultural diversity, the Asia and the Pacific Region (APR) very much exemplifies what we see globally on broadband availability and adoption. The data show that the **APR has made significant progress over the last decade increasing the availability and affordability of Internet connectivity,** but more than half of people in the APR remain offline, and fixed and mobile broadband remains unaffordable in most APR countries. The data also show that digital inequality **disproportionately impacts the following groups in the APR:** low-income populations residing in the least developed countries; those located in rural areas, in small island developing nations and in landlocked developing countries; those lacking literacy and digital skills; and those from traditionally disenfranchised groups, such as women and girls, persons with disabilities and ethnic minorities. The Broadband Commission for Sustainable Development, a joint initiative by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) to promote universal broadband Internet access, has observed that digital inequality persists around the world even in countries with high-speed connectivity infrastructure (Broadband Commission, 2020b).

Global efforts to close the digital divide have not aimed high enough. Basic connectivity targets will simply lead to greater inequalities in basic and enhanced capabilities in the future. **New goals should reflect where technology is going, not where it is today** (or, worse yet, where it was 10-20 years ago). Achieving aggressive digital inclusion targets will need a coordinated and concerted effort, one that incorporates proven, as well as new, technological, financial, and regulatory approaches.

Currently, regulatory, marketplace and technological hurdles impede efforts to achieve universal affordable broadband access across the APR. These include regulatory uncertainty and fragmentation, lack of access to financing, uneven availability of infrastructure and technologies, lack of service affordability and consumability, uneven digital skills attainment (and literacy), and unequal relevance and accessibility of online content.

"Universal connectivity calls for more than simply creating access; it also will entail creating relevant and accessible content, making intensive efforts to expand digital literacy, and ensuring affordable connectivity for all"

Fortunately, governments and network operators have a growing menu of technology options available to them for delivering cost-effective, affordable connectivity to underserved and unserved communities. Funding for digital infrastructure primarily comes from three sources – the private sector, governments, and international financial institutions (IFIs) (in the case of emerging markets); but providers will need to consider innovative financing mechanisms in order to spur market entry, expansion, and technology and business-model innovation.

In this chapter, we discuss efforts across the APR to accelerate universal digital connectivity.[2] In the first section, we provide an overview of the state of global broadband access and UN and ITU goals and efforts to achieve global universal digital connectivity and discuss the implications of the COVID-19 pandemic for global efforts to expand Internet connectivity. In the second section, we provide an overview and analysis of digital connectivity across the APR. In the third section, we discuss marketplace, technological, and regulatory hurdles that impede efforts to achieve universal and affordable broadband across the region. In the fourth section, we provide an overview of different approaches both the private and public sectors have taken and could adopt for financing the extension of affordable broadband access. In the fifth section, we assess various technology options available to governments and network operators looking to extend affordable broadband access to underserved and unserved communities. Finally, in the sixth section, we give an overview of successful policy approaches that Asian-Pacific and other governments have taken to help close digital divides in their countries.

"Universal connectivity now appears as a fundamental element for improving the quality of education and health care, standards of living, personal safety, freedom of choice and overall life satisfaction. One cannot achieve the SDGs without it"

[2] In this paper, the Asia-Pacific Region (APR) is comprised of 38 countries: Afghanistan, Australia, Bangladesh, Bhutan, Brunei, Cambodia, People's Republic of China (including Hong Kong, Taiwan, Macau), Democratic People's Republic of Korea, Fiji, India, Indonesia, Iran, Japan, Kiribati, Lao People's Democratic Republic (PDR), Malaysia, Mongolia, Myanmar, Maldives, Marshall Islands, Federated States of Micronesia, Nauru, Nepal, New Zealand, Papua New Guinea, Pakistan, Philippines, Republic of Korea, Samoa, Singapore, Sri Lanka, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu and Viet Nam. The 12 least developed countries (LDCs) in the APR are Afghanistan, Bangladesh, Bhutan, Cambodia, Lao PDR, Myanmar, Nepal and Timor-Leste. The 12 small island developing states in the APR are Fiji, Kiribati, Maldives, Marshall Islands, Federated States of Micronesia, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The 10 low-income countries (LICs) in the APR are the Democratic People's Republic of Korea, India, Indonesia, Mongolia, Pakistan, the Philippines, Sri Lanka and Viet Nam. The 10 remaining countries in the APR are Australia, Brunei, China, Iran, Japan, Malaysia, New Zealand, Singapore, Republic of Korea and Thailand. The five landlocked developing countries in the APR are Afghanistan, Bhutan, Lao PDR, Mongolia and Nepal.

OVERVIEW

According to the latest ITU data, global Internet user penetration is currently at **51 percent, or about 4 billion people online, meaning that about 3.7 billion people around the world still do not have access to the Internet** (ITU, 2020a). Global Internet user penetration is 44 percent in developing countries, but only 19 percent in the least developed countries (LDCs). According to the ITU, the proportion of all women using the Internet globally is 48 percent, against 55 percent of all men (ITU, 2020a). More men than women use the Internet in every region of the world except the Americas, which has near-equality (ITU, 2020a).

Lack of Internet access also stymies the potential of children and young people. According to a new report commissioned by United Nations International Children's Emergency Fund (UNICEF) and the ITU Development Sector, 2.2 billion, or **67 percent of children and young people aged 25 years or under, lack Internet access at home** (UNICEF and ITU, 2020). In East Asia and the Pacific, 46 percent of children and young people aged 25 years or under (369 million) lack home Internet access. In South Asia that number is 86 percent (768 million young people) (UNICEF and ITU, 2020). Stark differences appear between rich and poor countries, with 94 percent of children and young people in low-income countries lacking Internet access compared to 13 percent in high-income countries.

In 2016, the United Nations General Assembly passed a resolution stressing the importance of "applying a comprehensive human rights-based approach in providing and in expanding access to Internet," requesting "all States to make efforts to bridge the many forms of digital divides" (UNDP, 2019, p.233). This expansion must be consistent with general human rights principles: "The same rights that people have offline must also be protected online, in particular freedom of expression" (UNDP, 2019, p.233).

UN Secretary-General António Guterres's **Roadmap for Digital Cooperation represents a call to connect, respect, and protect the online world.** It includes concrete actions in the following areas: achieving universal connectivity by 2030—everyone should have safe and affordable access to the Internet; ensuring digital inclusion for all, including the most vulnerable—under-served groups need equal access to digital tools to accelerate development; and strengthening digital capacity—fostering skills development and training around the world (UN Secretary-General, 2020; UN, 2019).

The Broadband Commission for Sustainable Development,[3] established in 2010 by the ITU and UNESCO, aims to boost the importance of broadband on the international policy agenda and expand broadband access in every country, thus accelerating progress towards national and international development targets (Broadband Commission, 2020a). The Broadband Commission has established **seven Advocacy Targets seeking to expand broadband infrastructure and Internet access and use by populations around the world:**

- **Advocacy Target 1 (policy):** By 2025, all countries should have a funded national broadband plan or strategy, or include broadband in their universal access and services (UAS) definition.
- **Advocacy Target 2 (affordability):** By 2025, developing countries should make entry-level broadband services affordable, at less than 2 percent of monthly per capita gross national income (GNI).
- **Advocacy Target 3 (connectivity):** By 2025, broadband-Internet user penetration should reach 75 percent of the world's population overall, including 65 percent in developing countries, and 35 percent in least-developed countries.
- **Advocacy Target 4 (skills):** By 2025, 60 percent of youth and adults should have achieved at least a minimum level of proficiency in sustainable digital skills.
- **Advocacy Target 5 (digital finance):** By 2025, 40 percent of the world's population should be using digital financial services.

[3] In September 2015, the Sustainable Development Goals (SDGs) replaced the Millennium Development Goals (MDGs) as the international policy framework for socioeconomic development and poverty reduction.

- **Advocacy Target 6 (SMEs connectivity):** By 2025, lack of Internet connectedness among micro-, small- and medium-sized enterprises (SMEs) should be reduced by 50 percent, by sector.

- **Advocacy Target 7 (gender equality):** By 2025, gender equality should be achieved across all targets (Broadband Commission, 2020b).

The Broadband Commission has observed, "achieving affordable universal connectivity is essential for achieving the 17 Sustainable Development Goals (SDGs) and making good on our pledge to Leave No One Behind" (Broadband Commission, 2020a, p.20). According to the Broadband Commission, four of the 17 SDGs include targets related to information and communications technologies (ICT), and at least 38 other targets rely on universal and affordable access to ICT and broadband to reach SDG achievement (Broadband Commission, 2020b, p.4).

"The lack of regulations, funding, infrastructure, and digital skills all contribute to the unavailability of universal, affordable broadband access across the Asia-Pacific Region. Reversing trends toward digital inequality calls for urgent steps in the near future"

THE IMPACT OF COVID-19

As noted above, the global COVID-19 pandemic has amplified the importance of connectivity for social and economic inclusion. According to the Broadband Commission, "the pandemic and its socio-economic impacts have underscored the urgency of concrete, coordinated actions across all sectors and geographies. With less than ten years remaining until 2030, now is the time to establish digital connectivity as the foundational pillar for our shared Global Goals" (Broadband Commission, 2020a, p.2).

While the impact of the COVID-19 pandemic has manifested in numerous settings implicating connectivity to the Internet, **its impact on childhood education appears particularly acute.** Based on an August 2020 UN policy brief, school closures and learning disruptions resulting from the COVID-19 pandemic have impacted 94 percent of the world's student population; in low- and lower-middle-income countries, up to 99 percent of the student population has been affected (UN, 2020). This amounts to nearly 1.6 billion learners in more than 190 countries and on all continents, producing the largest disruption of education systems in history (UN, 2020, p.2, 5). According to the UNDP, as a result of school closures and the lack of affordable broadband, 60 percent of children are simply not receiving an education, leading to global education levels not seen since the 1980s (UNDP, 2020a; UNDP 2020b). Some 23.8 million children and youth (from pre-primary to tertiary schools) may drop out or not have access to school in the coming year because of the pandemic's economic impact (UN, 2020, p.2, 10).

According to a recent UNDP report, "[t]he closure of schools can widen the digital gender divide due to unequal access to the Internet and technologies" (Rivera et al., p.8). As discussed below, there is a persistent gender gap in Internet utilization, with women and girls less likely than men and boys to own Internet-enabled devices and connect to the Internet, especially in South Asia. If women and girls are less likely than men and boys to access the Internet at home and therefore have less access to online educational content, then **a school closure is likely to more acutely and detrimentally impact girls than boys.**

The broader social and economic impacts of the COVID-19 pandemic appear equally startling. The World Bank has projected that – for the first time in 20 years – an additional 150 million people could sink into extreme poverty in 2021 as a result of the pandemic (The World Bank, 2020; UNDP, 2020c). Another study, by the Pardee Center for International Futures at the University of Denver, finds that COVID-19 could drive the number of people living in extreme poverty to over 1 billion by 2030, with a quarter of a billion as a direct result of the pandemic (UNDP, 2020c). Because of COVID-19 pandemic's triple hit to health, education, and income, **the UNDP has forecast an overall decline in the global Human Development Index for the first time since 1990** (UNDP, 2020a). These factors surely will place a drag on efforts to close the digital divide.

In its most recent State of Broadband report, the Broadband Commission has conceded that, at current rates of growth, **it will probably not achieve its 2025 connectivity goals** (Broadband Commission, 2020b, p.21). Forecasts based on current growth projections suggest that global Internet adoption by 2025 may only reach 70 percent, five percentage points below the 2025 Advocacy Target (Broadband Commission, 202b, p.21). For LDCs, the 2025 forecast level only comes to 31 percent, four points below the Advocacy Target (Broadband Commission, 202b, p.21). Changing this trajectory will require a coordinated and concerted effort, one involving increased vigour and incorporating new technologies, business models, and regulatory approaches.

"Internet access alone is not sufficient to induce online activity. Barriers include poor quality throughput and reliability, cost of Internet access and devices, and lack of relevant content or digital skills, among other factors"

THE STATUS OF DIGITAL CONNECTIVITY IN THE ASIA-PACIFIC REGION

Below is an overview of the current status of digital connectivity across the 38 countries of the APR. The region has seen significant progress; indeed, many of its countries are global leaders in digital connectivity. At the same time, **more than half of people in the APR remain offline,** with significant and persistent rural and gender divides in access, while affordability remains a challenge in less-developed and insular countries across the region.

Global Internet user penetration currently runs 51 percent, or about 4 billion people online (ITU, 2020a). In the APR, penetration currently runs 45 percent, or about 2 billion people online (ITU, 2020a; ITU, 2020b). As a reference point, in 2005, the APR had an Internet user penetration rate of 9.5 percent, or about 355 million people online.

At the country level, Internet user penetration varies widely across the APR. This is consistent with patterns seen globally. Internet user penetration is over 80 percent in countries such as Australia, Brunei, Hong Kong (China), Japan, Republic of Korea, Macau (China), Malaysia, New Zealand and Singapore. By contrast, in populous and less-developed countries, such as Bangladesh, India and Pakistan, user penetration only reaches 20 percent (ITU, 2020c).

A significant gender gap persists in Internet utilization as well. The proportion of all women using the Internet in the APR runs at 41 percent, against 48 percent of all men (versus 48 percent and 55 percent globally, as noted above), and — cause for even greater concern — the gap appears to be growing (ITU, 2020a; UTA, 2020b, p.3-4). The gender gap in Internet use also correlates with one in mobile device ownership, globally and in the APR (ITU, 2020a, p.6). At the same time, the mobile gender gap varies widely across Asia (GSMA, 2020). South Asia has the largest mobile gender gap of any region worldwide – a 23 percent gender gap in mobile-device ownership and a 51 percent gender gap in mobile-Internet use – while the most digitally mature low- and middle-income countries (LMICs) in East Asia and the Pacific have more equal levels of mobile ownership and use (GSMA, 2020).

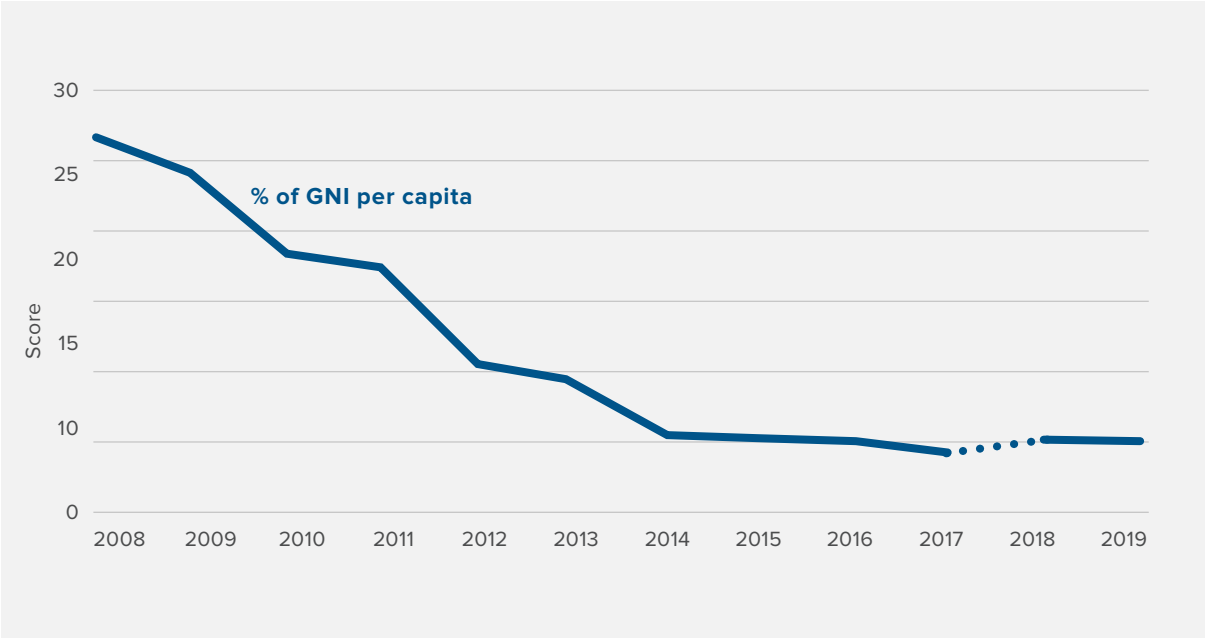
Most of the world's population accesses the Internet through mobile networks. While 97 percent of the global population and 95.4 percent of the APR population live within reach of mobile network coverage, only 51 percent globally and 45 percent in the APR are online (ITU, 2020a, p.8).[4] This indicates that Internet access alone is not sufficient to induce online activity. As discussed below, the quality (throughput and reliability) and cost of Internet access (including data consumption limits), as well as the cost of devices, availability of relevant content, digital skills and other factors, impact whether and how people access the Internet.

The Broadband Commission's second 2025 target would make entry-level mobile and fixed broadband services affordable in developing countries, at less than 2 percent of monthly per capita GNI. For mobile broadband, the Commission defines entry-level service as providing at least 1.5 Gigabytes (GB) of monthly data consumption on at least a 3G mobile network connection; for fixed broadband, this would mean at least 5GB of monthly data consumption on a connection providing at least 256 kilobits (kbits)/second (ITU, 2020a, p.5). On these measures, the APR as a whole has made significant progress over the last decade or so and now fares well compared to other regions.

Figure 2 shows how the cost of **fixed broadband in the APR has declined from 26.76 percent of per capita GNI in 2008 to 5.1 percent of per capita GNI in 2019** (ITU, 2021a). Figure 3 shows how the cost of **data-only mobile broadband in the APR has declined from 7.92 percent of per capita GNI in 2013 to 2.36 percent of per capita GNI in 2019** – approaching the Broadband Commission's target. However, the rate of decline in the percent of monthly per capita GNI for both fixed and mobile broadband has slowed in the last few years, indicating a need for further interventions to achieve the Broadband Commission's goals.

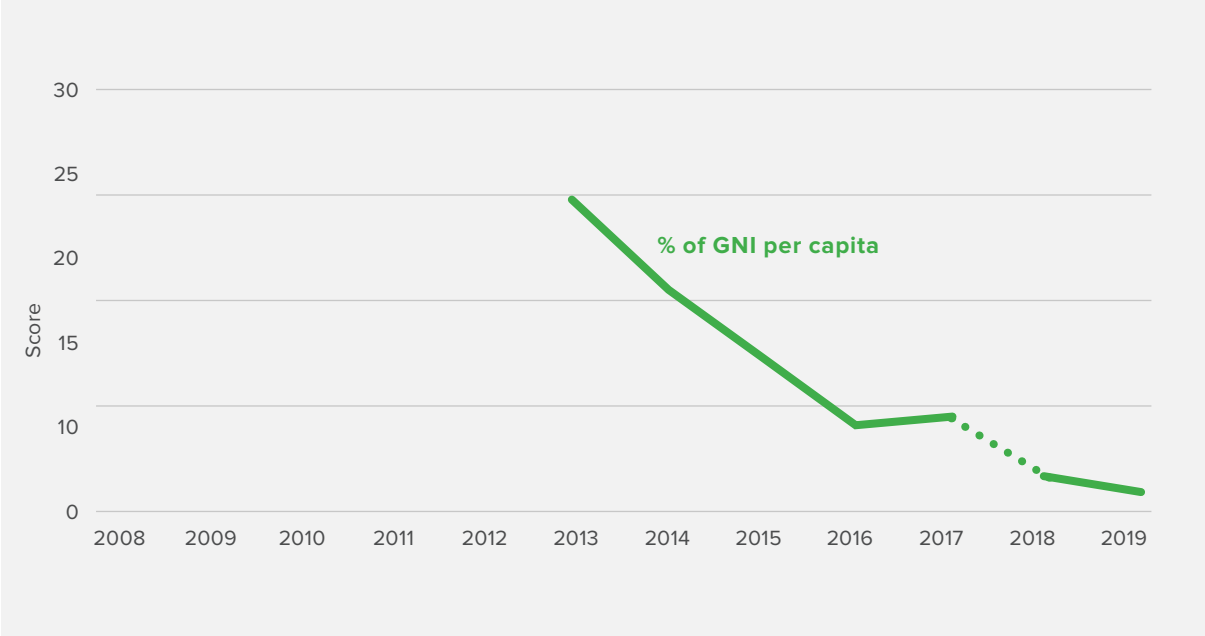
[4] 81.8 percent of the world's population and 91.5 percent of the APR population is covered by a 4G LTE network, capable of providing mobile broadband connectivity (ITU, 2020a).

Figure 2: Decline in fixed-broadband data cost in Asia-Pacific, 2008-2019
(% GNI)



Source: ITU (2021a)

Figure 3: Decline in mobile-broadband data cost in Asia-Pacific, 2008-2019
(% GNI)



Source: ITU (2021a)

Table 1 shows that **fixed broadband expenditure in the APR amounts to 5.1 percent of per capita GNI, compared to 8.73 percent globally** (ITU, 2021b). Likewise, **mobile-data-only packages amount to 2.36 percent of per capita GNI, compared to 3.18 percent globally.** Pricing for mobile voice and short-message service (SMS) and voice, SMS, and data in the APR also compares favourably with the rest of the world (ITU, 2021b).

Table 1: Comparison of fixed, mobile and voice telecommunications cost in Asia-Pacific vs. World average (% GNI)

	World	Asia-Pacific
Fixed-broadband basket (5GB)		
% of GNI p.c.	8.73	5.1
US$	26.66	21.55
PPP$	42.44	33.85
Mobile-cellular basket low usage (70 min + 20 SMS)		
% of GNI p.c.	2.9	1.95
US$	11.8	9.38
PPP$	18.67	13.53
Low usage voice and data basket (70 min + 20 SMS + 500 MB)		
% of GNI p.c.	5.73	4.59
US$	15.07	13.46
PPP$	23.86	19.98
Data-only mobile broadband basket (1.5 GB)		
% of GNI p.c.	3.18	2.36
US$	13.22	9.88
PPP$	19.93	14.82
High usage voice and data basket (140 min + 70 SMS + 1.5GB)		
% of GNI p.c.	10.3	6.54
US$	25.27	22.02
PPP$	37.76	31.34

Source: ITU (2021b)

At the same time, the APR is perhaps the most economically and socially diverse region on the planet, a fact reflected in widely varying digital service affordability across APR member states. **While the price of fixed broadband is affordable in several countries (primarily developed economies) in the APR, it remains unaffordable in several markets** (Table 2). Those countries with the highest percentage of per capita GNI in the APR tend to be low-income states, landlocked developing countries, and small island developing states (ITU, 2021c).

"More than half the APR population remains offline. Broadband remains unaffordable and access divides persist between urban and rural areas, with women and girls less likely to be online than men and boys"

Table 2: Fixed-broadband tends to be the least affordable in the least developed Asia-Pacific countries (% GNI)

Global Rank	Economy	% of GNI p.c.	US$	PPP$	Tax rate included (%)
1	Macao (China)	0.12	7.8	9.72	0
3	Hong Kong (China)	0.51	21.43	26.23	0
4	China	0.57	4.53	7.87	0
8	Brunei	0.72	18.53	33.02	0
9	Iran	0.73	3.33	10.64	9
12	Singapore	0.76	36.99	44.01	7
26	Sri Lanka	0.98	3.32	10.12	19
28	Japan	1.02	35.21	35.81	8
36	Australia	1.18	52.3	45.51	10
37	Republic of Korea	1.23	31.48	36.02	10
41	New Zealand	1.32	44.97	40.49	15
67	Tonga	2.15	7.71	10.07	15
68	Mongolia	2.16	6.43	17.72	10
70	Nepal	2.3	1.84	5.38	13
72	Malaysia	2.38	20.75	50.4	6
80	Bangladesh	2.83	4.13	10.15	15
81	Bhutan	2.84	7.3	21.96	5
85	India	3.06	5.16	17.08	18
88	Maldives	3.11	24.11	31.68	6
94	Thailand	3.6	19.84	51.41	7
95	Viet Nam	3.65	7.3	17.77	10
99	Fiji	3.83	18.68	29.53	9
102	Philippines	4.16	13.27	34.23	12
118	Micronesia	6.7	20	20.47	0
131	Indonesia	8.69	27.81	78	10
133	Lao PDR	8.85	18.14	48.25	10
134	Samoa	8.86	30.92	42.48	15
137	Cambodia	10.43	12	29.36	10
138	Pakistan	10.6	13.95	50.69	0
140	Marshall Islands	12.65	49.95	N/A	0
141	Myanmar	12.81	13.99	55.01	5
143	Afghanistan	15.13	6.94	23.61	0
152	Vanuatu	22.31	55.21	51.82	15
159	Papua New Guinea	30.67	64.65	78.52	10
161	Timor-Leste	32.31	49	76.22	5

Source: ITU (2021c)

In terms of entry-level fixed-broadband service, nine countries in the APR meet the Broadband Commission's 2 percent threshold for 5GB of data: Australia, Brunei, China (including Hong Kong and Macau), Iran, Japan, New Zealand, Republic of Korea, Singapore and Sri Lanka. None of the APR LDCs, landlocked developing countries, or small island developing states meet the 2 percent threshold for fixed-broadband services.

"Smart spectrum policy can literally change the cost-economics of deploying wireless networks, expanding access in underserved and to unserved communities, increasing competition, and reducing costs for consumers"

Table 3 shows that, while **the price of mobile-data-only packages in the APR is generally affordable in the developed economies, it remains unaffordable in one low-income state and the majority of landlocked developing countries and small island developing states** (ITU, 2021c).

Additionally, a major urban/rural divide exists in the APR: 70 percent of urban households access the Internet, but only 37 percent of rural households do so (ITU, 2020d). In East Asia and the Pacific, the percentage of children and young people aged 25 years or less with Internet access at home is 72 percent in urban areas, but only 53 percent in rural areas. In South Asia, the percentage of children and young people aged 25 years or less with Internet access at home is 22 percent in urban areas, but only 9 percent in rural areas (UNICEF and ITU, 2020, p.8).

Overall, this review of data shows that while the APR has made significant progress over the last decade with regard to digital services, more than half of people in the region remain offline; access divides persist between urban and rural areas, with women and girls less likely to be online than men and boys. Fixed and mobile broadband remains unaffordable in most APR countries. The COVID-19 pandemic both exacerbates these divides and increases the urgency of taking action to address them.

Table 3: Mobile-broadband data tends to be the least affordable in the least developed Asia-Pacific countries (% GNI)

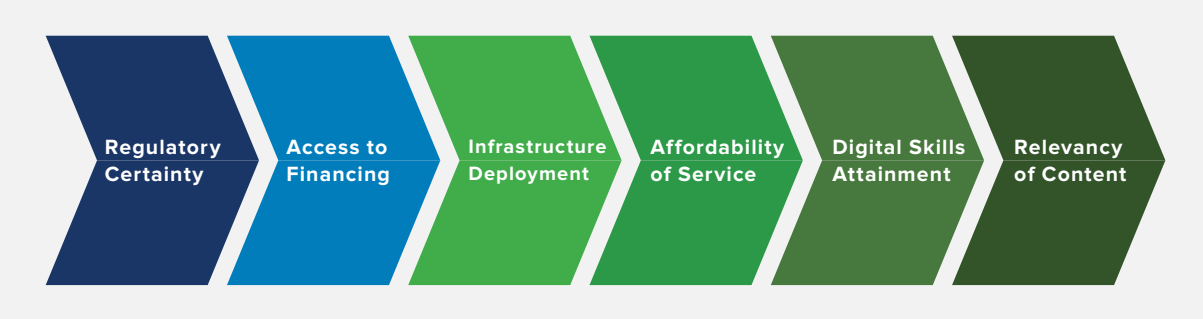
Global Rank	Economy	% of GNI p.c.	US$	PPP$	Tax rate included (%)
2	Macao (China)	0.19	12.14	15.12	0
6	Hong Kong (China)	0.29	12.25	14.99	0
7	Singapore	0.3	14.83	17.64	7
16	New Zealand	0.39	13.15	11.84	15
19	Republic of Korea	0.44	11.24	12.86	10
21	Australia	0.49	21.67	18.85	10
25	Brunei	0.57	14.83	26.42	0
29	Sri Lanka	0.63	2.15	6.56	19
35	Iran	0.75	3.4	10.86	9
36	Indonesia	0.75	2.39	6.66	10
37	Pakistan	0.75	0.99	3.58	0
49	India	0.85	1.43	4.75	18
50	Malaysia	0.85	7.43	18.05	0
56	China	0.96	7.56	13.11	0
57	Myanmar	0.96	1.05	4.12	5
61	Japan	0.99	34.23	34.82	8
66	Viet Nam	1.11	2.21	5.39	10
68	Bhutan	1.13	2.91	8.76	5
79	Thailand	1.44	7.91	20.51	7
82	Tonga	1.5	5.37	7	15
87	Cambodia	1.74	2	4.89	10
89	Philippines	1.78	5.68	14.64	12
91	Bangladesh	1.88	2.74	6.73	21
96	Maldives	2.04	15.84	20.82	6
103	Mongolia	2.24	6.67	18.39	10
106	Nauru	2.47	23.16	N/A	15
110	Fiji	2.74	13.39	21.17	9
111	Nepal	2.75	2.2	6.46	26
119	Lao PDR	3.16	6.48	17.23	10
127	Vanuatu	3.67	9.08	8.52	15
137	Samoa	4.43	15.46	21.24	15
145	Timor-Leste	5.27	8	12.44	5
150	Kiribati	5.71	14.94	N/A	0
162	Afghanistan	9.08	4.16	14.17	0
165	Micronesia	10.06	30	30.7	0
167	Papua New Guinea	10.41	21.96	26.67	10
171	Solomon Islands	16.6	27.66	28.52	10

Source: ITU (2021c)

HURDLES TO ATTAINING GREATER CONNECTIVITY

The following section identifies regulatory, marketplace and technological hurdles that impede efforts to achieve universal affordable broadband access across the APR. Figure 4 represents the range of issues one needs to address in extending broadband and digital services to unserved and underserved communities.

Figure 4: Range of issues for the extension of broadband and digital services



Source: Author

Legal and regulatory issues can offer both inducements and impediments to investment in broadband service deployment. With the right regulatory environment in place, a government can attract investment needed to extend broadband into underserved and unserved communities. **Good regulations can literally change the cost-economics of broadband deployments,** allowing unprofitable investments to become profitable.[5] On the other hand, **the absence of a regulatory framework can discourage investment.** In addition, the **lack of harmonized regulations** (i.e., fragmentation) across a region can discourage investment, especially in small markets, such as small island developing states, which might not attract investment on their own. Moreover, **regulatory uncertainty** (or a constantly changing regulatory environment) creates risk and **can also discourage investment.**

Telecommunications is a capital-intensive industry requiring large-scale multi-year investments prior to delivering services. It is also a scale industry: The incremental costs of delivering bandwidth to customers decline as networks grow larger and serve more customers. This creates high barriers to entry for prospective market participants and holds especially true for first- and middle-mile infrastructure, as well as for mobile wireless and fibre-based fixed last-mile infrastructure. This also holds for satellite communications. Some forms of fixed-wireless infrastructure have lower upfront capital requirements and, therefore, lower barriers to market entry.

Access to financing poses one of the greatest challenges facing companies looking to deploy digital services in emerging markets. Below we discuss costs and financing options for achieving universal broadband.

According to the GSM Association for the mobile industry, 3.3 billion people live in areas covered by mobile broadband networks but do not use mobile Internet – a **usage gap** more than four times greater than the coverage gap (GSMA, 2019). In low- and middle-income countries, in addition to unaffordability and low digital literacy and skills discussed above, a perceived lack of relevance and safety and security concerns pose the next most important barriers to mobile Internet use from a consumer point of view (GSMA, 2019). Addressing these barriers will prove critical in further reducing the usage gap and driving digital inclusion (GSMA, 2019). These same issues hinder adoption of fixed broadband services.

If we intend to achieve universal broadband, we will need to make it affordable for more of the world's population. One important piece to the affordabili-

[5] An example of this might be infrastructure-sharing regulations that enable network operators to share the costs of fibre and tower deployments, instead of each network operator having to deploy its own infrastructure.

ty puzzle is **selling broadband access in a way that allows for different types of customers.** A post-paid monthly subscription (often with annual or multi-year commitments) is common in developed markets; it also serves higher-income consumers, businesses and government customers in emerging ones. By contrast, the prepaid or pay-as-you-go model offers Internet access to low-income consumers in developed markets and to most customers in emerging ones. These latter customers often purchase their Internet access in small increments, measured in 10s of Megabytes (MBs) of data consumption, in the same way that they purchase other goods and services. In many markets, such customers are **unbanked:** Fully "two billion adults are still without access to a bank account, but some 1.6 billion people in this group have access to a mobile phone, presenting the opportunity to explore strategies that leverage the widespread use of mobile phones to offer financial inclusion options" (Broadband Commission, 2020b, p.28). As discussed above, the Broadband Commission's Advocacy Target 5 calls for at least 40 percent of the world's population to use digital financial services by 2025. Even as more of the world's population gains access to such services, **Internet service providers need to have payment infrastructure in place that can accommodate both post-paid monthly subscription customers and prepaid pay-as-you-go customers.**

However, even with access to affordable services, many people in the APR still do not use them: a **lack of literacy and digital skills and the lack of relevant content ranked higher than affordability** for low- and middle-income-country consumers surveyed in South Asia and East Asia (GSMA, 2019, p.33). Digital skills – in essence, understanding how to use technology – are critical for fully benefiting from digital services. The Broadband Commission's Advocacy Target 4 calls for 60 percent of youth and adults to achieve at least a minimum level of proficiency in sustainable digital skills by 2025 (GSMA, 2019). For mobile Internet use, **literacy and skills remain the most significant self-reported barrier** across the world, accounting for 37 percent of responses in South Asia and 35 percent in East Asia. For example, in Bangladesh's recent National ICT Household Survey 2018-2019, the number one reason for non-connectivity is '[c]annot use Internet' (GSMA, 2019, p.35). Governments should prioritize digital-skills programs for school children and young people, as well as adults of all ages and for other groups with low adoption rates (Broadband Commission, 2020b).[6]

Finally and crucially, **consumers should have access to content relevant to them and in their first language.** Consumers who are not online report a lack of both as barriers and disincentives (GSMA, 2019). As Internet content becomes more relevant, consumers should prove more willing and able to make productive use of their Internet access. While the English language continues to dominate the Internet, numerous efforts are underway to encourage the development of relevant content in more local languages (W3Techs, 2021).[7]

"In instances when the market alone cannot be relied upon to deliver affordable mobile or fixed broadband to an underserved or unserved community, universal service programs have a role to play"

[6] Numerous mobile and fixed network operators, as well as trade associations, such as the GSMA (with its Connected Society Programme) have implemented programs meant to address the skills gap (GSMA, 2021). Additionally, several major technology companies, such as Microsoft and Amazon, have launched digital skilling programs (Microsoft, 2020; Amazon, 2020; Amazon, 2021).

[7] For example, the Internet Society works with governments, local entrepreneurs and civil society on efforts to develop Internet content in local languages (Internet Society, 2016). In addition, technology companies have various efforts underway to enable consumers to translate content into their first language, including tools such as Google Translate, Bing Translator and Microsoft Translator (Microsoft, 2021).

COSTS AND FINANCING OPTIONS FOR UNIVERSAL CONNECTIVITY

Below is an overview of different approaches open to both the private and public sectors in financing affordable broadband access in underserved communities. Funding for universal service connectivity comes from **three primary sources:** the private sector; governments; and international financial institutions in the case of emerging markets (The World Bank, 2019).

Network operators and service providers will probably play a critical role as key investors in broadband networks through continued and increased levels of commitment to expand network coverage beyond urban population centres – essentially deploying funding from existing operations gained through cost reductions and by raising capital from commercial banks and private investors. Other options include the **network as a service,** in which infrastructure and equipment vendors share investment risk with service providers (e.g., through revenue sharing). In addition, network operators focusing on underserved and unserved communities could **benefit from the emergence of environmental, social and governance (ESG) investing,** in which investors target investments and accept lower returns in exchange for socially beneficial outcomes (Garnett, 2020; Digital Ubiquity Capital, 2021). The World Bank has observed that achieving commercially sustainable investment will require innovations that lower the capital expenditure and operating expense of towers and infrastructure overall, while enhancing demands for mobile and fixed broadband services and corresponding market growth (The World Bank, 2019, p.110).

Some areas will not have scope for profitable deployment of networks and services, and therefore the market alone will not support investment needed for universal broadband. In such cases, **governments must take an increasing role as 'investors' in broadband infrastructure** in order to ensure that countries can achieve their national development agendas. Governments have adopted various approaches to funding these plans: dedicated funds, universal service funds (overseen by the national regulator and in some cases independently administered), direct government subsidies and grants, government equity and loans, public-private partnerships and investment tax zones.[8] It is critical that governments not only invest their resources effectively but also, as discussed below, that they develop policy and regulatory environments that will incentivize and promote investments and market growth.

Multilateral development banks, such as the World Bank, and regional development banks, such as the Asian Development Bank, have supplied funding for infrastructure and projects in general, alongside other donors (The World Bank, 2019, p.110-110). These organizations may lend at preferential rates for long-term projects in some cases, focusing their resources on projects with high economic development impact (Broadband Commission Working Group, 2014). They can also provide equally critical research, consulting, and other resources, usually through non-refundable grants, as well as expertise and knowledge — very useful, for example, in a public-private partnership process. The ITU also has a key role in coordinating technical, economic and regulatory matters relating to ensuring universal, affordable and good-quality broadband connectivity.

"It is critical that governments not only invest their resources effectively but also, as discussed below, that they develop policy and regulatory environments that will incentivize and promote investments and market growth"

[8] According to the Broadband Commission Working Group on Financing and Investment, sovereign wealth funds (SWFs) are another possible source of financing for telecommunication infrastructure projects. SWFs are investment funds owned by the governments of sovereign states and funded mainly by foreign exchange and reserve assets (Broadband Commission Working Group, 2014).

OPTIONS IN TECHNOLOGY AND INFRASTRUCTURE

There are various technology options available to governments and network operators looking to extend affordable broadband access to underserved and unserved communities, including traditional fibre, coaxial cable and copper infrastructure, various fixed and mobile terrestrial wireless solutions, geo-stationary and low-earth-orbit satellites, and other emerging and experimental technologies. Governments and network operators have a growing menu of options available to them for cost-effective delivery of affordable connectivity.

The **broadband network value chain** (or building blocks) for developing universal, affordable, and high-quality broadband Internet access comprises four broad segments: first mile, middle mile, last mile and invisible mile (The World Bank, 2019). Delivery of fixed or mobile Internet access requires connecting all parts of the value chain, along with supporting infrastructure, such as data centres and a reliable electricity supply, and devices used to access the Internet.

The first mile is where the Internet enters a country (The World Bank, 2019). The network components include international access infrastructure, such as submarine cables, landing stations, satellite dishes, cross-border microwave and fibre links, domain name registration and so on. Countries need connections to undersea cables or via cross-border terrestrial links, particularly for landlocked countries. Many countries in the APR have access to submarine cable systems, either directly through local landing points or through terrestrial connections (ITU, 2020d). However, some small island developing states in the APR, such as Nauru, Kiribati and Tuvalu, lack access to submarine cable systems and therefore must rely on satellite connectivity in the first mile (ITU, 2020d).

The middle mile is where the Internet passes through a country (The World Bank, 2019). The network components here are the national backbone and intercity networks, including the fibre optic cables or copper wires, microwave, satellite links, Internet exchange points (IXPs), local hosting of content, and so on. Once connected to high-speed Internet at the border, countries in the APR require fibre backbones to carry Internet traffic from the border to urban and rural centres; they also require backhaul or metro networks to extend further. Satellite transmission remains important in the APR small island developing states and other rural or remote locations that lack access to terrestrial first- or middle-mile networks. In addition, while most APR countries have IXPs, with the exception of Vanuatu most of the small island developing states do not, nor do Bangladesh, Lao PDR, Mongolia, Papua New Guinea, Timor-Leste and Sri Lanka (Internet Exchange Map, 2021). These countries have their domestic Internet traffic exchanged through points outside their borders, usually through satellite or fibre across international hubs, to reach their destinations.

The last mile is where the Internet reaches the end-user (The World Bank, 2019). Once high-speed Internet arrives at a population centre, via the first and middle miles, network operators provide mobile or fixed Internet access services to consumers, businesses and governments. Network components include central office exchanges, the local loop — historically composed of copper cables, but now increasingly replaced with fibre for last-mile connections in urban or suburban areas — and wireless masts for mobile and fixed wireless connectivity, as well as satellite connections in remote locations that do not permit an economic deployment of terrestrial networks (ITU, 2020e). New developments have also enabled network operators to cost-effectively deploy high-speed last-mile networks to locations outside of population centres. For example, new high-capacity terrestrial fixed-wireless access solutions have become viable in more places, and pilot projects have begun to test other innovative solutions such as drones or balloons. Additionally, new Low Earth Orbit satellite solutions promise to deliver lower latency and higher throughput Internet connections to locations around the world (Broadband Commission, 2017).

The invisible mile consists of the hidden elements vital to ensuring the integrity of the value chain (The World Bank, 2019). These include unseen network components, such as the radio spectrum, network databases (for example, for numbering), cybersecurity and so on, but can also include potential bottlenecks, such as market concentration, multi-layered taxation of activities, lack of access to rights-of-way and inefficient regulations including transborder regulatory issues.

Access to reliable electricity also poses a major constraint to the expansion of digital infrastructure

in some parts of the APR. Bangladesh, Democratic People's Republic of Korea, India, Myanmar and Pakistan are among the 20 countries in the world with the greatest electricity access deficits (IEA et al., 2019). Digital access requires electricity for a range of activities, from charging devices to powering networks. Even in some grid-connected areas, electricity-service quality is often low, with frequent and sometimes long-lasting outages. In addition, some countries have difficulty sustaining electricity costs, adding to the cost of broadband access. **Moreover, the same urban-rural and gender divides that plague Internet usage also impact electricity usage** (IEA et al., 2019). Fortunately, increasing investment in rural electricity mini-grids and off-grid solar has started to offer more cost-effective solutions than grid extensions to remote and rural areas (IEA et al., 2019).

POLICY APPROACHES AND SUGGESTIONS

This section provides an overview of policy approaches that Asian-Pacific and other governments have adopted to help close the digital divides in their countries through a review of competition, spectrum, universal services, and other policies; also included are brief suggestions for further steps that policymakers and regulators could take to improve their chances of success.

A well-designed broadband plan can offer an important blueprint for addressing digital inequality. The Broadband Commission's Advocacy Target One aims for all countries to have a funded national broadband plan or strategy, or to include broadband in their universal access and service (UAS) definition, by 2025. In 2012, the ITU Telecommunication Development Sector developed best practices for national broadband plans, digital agendas, and digital strategies (ITU, 2012).[9] Today, 174 countries worldwide have a national broadband plan, with several countries currently in the process of adopting one (Broadband Commission, 2020b). Broadband plans can also be developed at the regional level. For example, the countries of the Association of Southeast Asian Nations (ASEAN) adopted an ASEAN ICT Masterplan in 2015 (AIM, 2015) and subsequently updated that plan in 2020 to focus more on consumer choice, quality and price (ASEAN, 2020). That plan seeks to move beyond focusing only on connectivity to identifying and supporting isolated or underserved communities, and increasing the demand, usage, affordability and connectivity of broadband services across ASEAN member states (ASEAN, 2020).

While some countries have developed new or updated national broadband plans, many countries have shifted their focus to other matters, such as upgrading their universal access and service definitions or terms of service, or developing broader digital transformation strategies and plans, with connectivity as a core component, among other major issues (Broadband Commission, 2020b). In addition, **governments and regulators need to monitor and evaluate the current state of national plan implementation** (Broadband Commission, 2020b). In some cases, even after publishing and endorsing a national plan, government transitions and competing priorities lead to situations that interrupt or impede effective national plans, calling for revised targets in order to maintain progress on broadband adoption (Broadband Commission, 2020b).

> **"National broadband plans should have five key elements: (1) data collection and broadband definitions, (2) competition policies, (3) spectrum policies, (4) universal service goals and policies, and (5) measures to address adoption gaps.They also need an impartial, independent regulator"**

The Alliance for Affordable Internet Access (A4AI) notes that in 2020, Malaysia stands out with one of the highest three scores for national broadband planning. Malaysia earned this distinction due to the quality

[9] Data unavailable for Democratic People's Republic of Korea, Marshall Islands and Tuvalu.

of its national broadband plan targets and the widespread impact of these targets. Malaysia set targets, led the sector and left evidence of impact in its wake. An array of supply- and demand-side regulatory interventions helped achieve the plan's broadband availability and adoption targets. As a result, Malaysia now enjoys widespread affordable access to the Internet (Alliance for Affordable Internet, 2020).

Regardless of where a country stands in its development process, it should have a plan in place to **address digital inequality.** While a variety of efforts have tried to develop best practices for national broadband plans, each country will design its own plan based on its unique needs. We would highlight **five key elements of national broadband plans:** data collection and broadband definitions, competition policies, spectrum policies, universal service goals and policies, and measures to address adoption gaps. Prerequisites for good policymakers include a stable, transparent, impartial – and ideally independent – regulator, one not subject to undue influence by market actors (Broadband Commission Working Group, 2014).

One cannot solve a problem that one does not understand. This holds for the digital divide as well. **Regulators should be collecting high-quality, finely grained data that track mobile and fixed broadband availability and adoption** at all available speeds across residential, business and government customers. Additionally, regulators should track data on adoption according to income, gender and identification with marginalized groups. Regulators should also garner data from network operators at least yearly and make it publicly available. Data collection should also aim for as finely grained a geographic basis as possible.[10]

The definition of broadband is a key consideration that will impact a variety of policy interventions meant to eliminate digital inequality. The definition of broadband changes over time to reflect advances in technology, market offerings, and consumer demand. Broadband definitions vary widely across the APR and necessarily require some balancing of the realistic and the desired. **If governments adopt an antiquated broadband definition and update it too infrequently, they risk further increasing the digital divide.**

To the extent that a national regulator wants to promote competition, it will need to establish competition rules. **Effective competition needs effective protection, particularly at the early stages of market opening** (Broadband Commission Working Group, 2014). An investor seeking entry into a given market will look for competition rules that offer protection from anti-competitive behaviour by a dominant incumbent or a collusive group. Effective competition requires two main elements: **clear rules and effective enforcement by the appropriate authorities.** Anti-competitive practices subject to proscription — either by general competition, if it exists, or by telecommunication legislation — usually include predatory pricing, undue price discrimination, excessive pricing, margin squeeze, refusal to supply, or other strategies to foreclose the market (Broadband Commission Working Group, 2014).

As discussed previously, most of the world's population accesses the Internet on a mobile or fixed wireless connection. For this reason, **spectrum policy,** or the way in which regulators manage their national radio frequencies, will play a critical role in achieving universal connectivity goals. Smart spectrum policy can literally change the cost-economics of deploying wireless networks[11] – expanding access in underserved and to unserved communities, increasing competition, and reducing costs for consumers. To support network operator deployments, regulators should make spectrum available across a range of low-band, mid-band, and high-band frequencies. They should also allocate sufficient spectrum on an exclusive-use basis for mobile operator networks. Spectrum should also be made available on a non-exclusive unlicensed or license-exempt basis for Wi-Fi, Bluetooth, and a variety of other technologies used for providing fixed-wireless last-mile access. These fixed wireless technologies include those that can operate on low-band (e.g., TV white spaces[12]), mid-band (e.g., 5GHz bands), and high-band spectrum (e.g., millimetre wave bands). The emergence of various types of spectrum-sharing technologies have enabled something called **dynamic spectrum access,** giving regulators tools to allow

[10] The Broadband Commission noted "[s]ome of the data available for measuring progress against the targets is more robust for developed countries and remains a challenge for some developing countries. There may be other methodologies to collect similar, or proxy, datasets, and/or consider reporting on a semi-annual basis rather than annual. As such, further discussion on these challenges, possibilities and trade-offs is required" (Broadband Commission, 2020b, p.39).

[11] By opening up more large swaths of spectrum across complementary the low-, mid- and high-band spectrum, a regulator will enable a wireless network operator to optimize the placement of towers and other network infrastructure and thereby enable the network operator to serve more customers in more places at lower costs.

[12] The TV white spaces are frequencies that have not been assigned or are otherwise not being used by broadcasters and other licensees in the VHF and UHF broadcast bands.

wireless networks operators access to new spectrum bands without displacing governmental or other users. In addition, regulators need to consider licensing for space-based satellite communications and experimental high-altitude platforms.

Universal service programs also have a role in the regulator's toolkit, especially in instances when the market alone cannot be relied upon to deliver affordable mobile or fixed broadband to an underserved or unserved community. The ITU estimates that delivering high-quality broadband to the remaining global unconnected will require **US$428 billion in additional investment over ten years** (ITU, 2020f). To know when to intervene in the marketplace, regulators should establish clear and transparent universal access goals and policies. For example, the Broadband Commission's Advocacy Target 3 states that, by 2025, broadband-Internet user penetration should reach 75 percent of the world's population, 65 percent in developing countries and 35 percent in least-developed countries. This would typically require universal service programs focused on both broadband availability and adoption for the general population and for specified groups. For example, programs could ensure every child has access to broadband Internet or help close the gender gap (ASEAN, 2020; Worldwide Web Foundation, 2018). Universal-service program design should adhere to certain principles, including maintaining technology and competitive neutrality, rewarding efficiency and speed of deployment, minimizing market distortions and holding fund recipients accountable for achieving quantifiable targets.

CONCLUSION

This paper has provided an overview of efforts across the APR to accelerate universal digital connectivity. A consistent theme is the persistence of digital inequality that impacts people across the entire region. The COVID-19 pandemic has shined a bright light on these inequalities and increased the urgency of addressing them. **With rapid progress in technologies, digital inequality runs the risk of widening at an accelerating pace over time.** Addressing digital inequality, therefore, should be at the top of any government's agenda. This inequality disproportionately impacts people in several classes: residents of low income and least developed countries; those located in rural areas, in small island developing nations, and in landlocked developing countries; those lacking literacy and digital skills; and those from traditionally disenfranchised groups, such as women and girls, persons with disabilities, and ethnic minorities.

These digital divides will pose challenges central to development and economic policy as well as the SDGs. We have examined some of the policy decisions that governments will need to make and ways that the private sector and the international community may contribute to digital expansion. Ultimately, universal connectivity will prove a matter of more than simply creating access; it also will entail creating relevant and accessible content, making intensive efforts to expand digital literacy, and ensuring that connectivity and other digital solutions are affordable for all.

LIST OF FIGURES

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UNDP Regional Bureau for Asia and the Pacific
Strategy, Policy and Partnerships

REIMAGINING DEVELOPMENT POLICY AND STRATEGY IN ASIA-PACIFIC

The UNDP Strategy, Policy and Partnerships (SPP) Team of the Regional Bureau for Asia and the Pacific (RBAP) conceptualizes and reimagines strategic directions for sustainable development pathways across the diverse region. The SPP Team conducts rigorous, evidence-based policy and foresight analyses of frontier issues to provide strategic advice for policies and communications. The team also helps build anticipatory institutional capabilities that can better navigate complexity and uncertainty. Through this work, the SPP Team forges partnerships with influential development allies to amplify the voice and impact of the UNDP.

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