A4AI ALLIANCE FOR AFFORDABLE INTERNET

A global coalition working to make broadband affordable for all

Affordability Report 2021

A NEW STRATEGY FOR UNIVERSAL ACCESS

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A global team of 25 independent researchers assisted the Alliance in conducting the 72 comprehensive policy surveys in 2020 that inform the report's findings this year and provide the basis for the policy scores in the Affordability Drivers Index. We thank them for their contributions.

Any errors remain the author's alone.

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A4AI ALLIANCE FOR AFFORDABLE INTERNET

WORLD WIDE WEB FOUNDATION

Welcome letter from the Executive Director

Welcome to the 2021 edition of the Affordability Report!

We have seen the impact that affordable and meaningful access has for people around the world — and we have seen the consequences for those kept offline and how they are digitally excluded in education, the economy, and from their communities. In our recently released Costs of Exclusion report, over $1 trillion USD has been lost in economic potential due to the digital gender gap. Universal Service & Access Funds (USAFs) can help close this gap.

Digital exclusion is no longer just about being beyond the reach of the infrastructure that makes internet access possible. Affordability, social norms, personal security, and privacy are all part of the system that keeps billions offline. Any comprehensive policy for universal access must therefore keep these topics in mind.

Our 2021 Affordability Report takes stock of connectivity trends today, along with our first Good Practices case studies from the Covid-19 pandemic**, to suggest a new future for Universal Service & Access Funds.** It builds from broader theories of industrial policy — namely the 'moonshot thinking' that relates to the public-private partnerships that sent the first human beings to the moon — to re-examine the shortcomings of USAFs today and suggest new ways forward for these institutions. Our vision of affordable and meaningful access for ALL demands new approaches to universal access.

This report also includes an update of the Affordability Drivers Index (ADI). An annual composite score of broadband policies and market factors across 72 low and middle income countries, the ADI has been a tool for identifying barriers and championing leaders for affordable internet access.

This report challenges us to think about what Universal Service & Access Funds have achieved in the past decades but to not limit our thinking to just what they have done.

There is much more they could do. There is much more we must do to connect the world.

Universal access is not a fantasy, but it is also not our guaranteed future. Serious policy and regulatory action is required. With this report, we invite you to join us on the journey to universal access that is affordable and meaningful to all.

Sonia Jorge
Executive Director
Alliance for Affordable Internet

Executive Summary

This report is the eighth edition of the Affordability Report. Released annually by the Alliance for Affordable Internet (A4AI), the report summarises the state of internet affordability around the world and of the policies and regulations that affect it.

Information and communication technologies (ICTs) have had a transformational impact on our world. This effect has been no more present than over the past two years as much of the economy, government, education, and health have moved online in response to the global pandemic. However, despite this impact, vast inequalities exist. Women, especially rural women, remain excluded from the 'digital revolution'.

The latest update of the Affordability Drivers Index (ADI) indicates that, overall, conditions continue to improve towards greater affordability. However, progress remains slow – too slow. Governments have not taken the required actions to accelerate internet access worldwide in a way that would help attain the Sustainable Development Goals, grow the economy, and help people realise their potential.

Universal Service & Access Funds (USAFs) could act as catalysts for action to drive down the price of internet access, expand coverage to the millions that remain unconnected, and build the inclusive foundation for a robust digital economy. USAFs have historically fit to a contained brief of intervening only where there are market failures. But they hold a unique position within the telecommunications sector that makes them well positioned to advance progress towards universal internet access.

Our report builds from new innovations in industrial policy that focus on reorganising political and economic institutions to work in harmony towards a common goal. This theory spans issues of organisational competence and structure, financing and funding models, market regulation, and modes of participation and partnership across public, private, and community sectors.

Top Ten, Affordability Drivers Index (Overall)		
1	Malaysia	89.27
2	Colombia	87.82
3	Costa Rica	87.15
4	Peru	83.39
5	Argentina	81.94
6	Thailand	81.02
7	Turkey	75.89
8	Mexico	75.22
9	Morocco	73.31
10	India	72.32

Top Ten, Affordability Drivers Index (LDCs Only)		
1	Senegal	63.85
2	Cambodia	61.26
3	Benin	61.20
4	Uganda	60.46
5	Rwanda	58.03
6	Myanmar	55.82
7	Nepal	55.66
8	Tanzania	55.55
9	The Gambia	52.33
10	Bangladesh	50.04

There are several potential interventions and reforms for USAFs to better deliver on a mission for universal internet access. Built from the theory's seven pillars for action, they span from operational details to governance strategies.

Pillar	Focus Area	Example Gov't/USAF Policy
VALUE	*Creating and pursuing values other than profit through market mechanisms*	Community-led and peer-to-peer digital skillbuilding
MARKETS	*Shaping markets rather than just rescuing market failures*	Device subsidisation
ORGANISATIONS	*Developing public sector capacity and enabling cross-functional government strategy*	Multi-stakeholder universal access policies and national broadband plans
FINANCE	*Providing essential capital support and using fiscal policy coherently*	Device taxation, fronting capital for major investments with multi-year returns
DISTRIBUTION	*Building infrastructure that guarantee affordable access, regardless of ability to pay*	Public access points, municipal networks, and open backbone infrastructure
PARTNERSHIP	*Engaging a wide diversity of actors across the sector in support of the mission*	USAF-backed projects for new innovations and complementary methods
PARTICIPATION	*Governing with transparency to enable inclusive participation*	USAF board compositions, with private sector and civil society inputs

Governments must modernise the USAF mandate to build inclusive, strong digital economies. USAFs offer the pre-existing infrastructure to pursue a mission for universal internet access. However, governments must enable these institutions to evolve with the growing impact of the ICT sector with timely policies, adequate resources, and a mandate to build a coalition of actors across the sector.

1. **Adopt a universal access strategy with a modern, ambitious USAF mandate that includes institutional coordination in policy design and implementation stages**
2. **Commit adequate resources — financial, political, and human — to the USAF to deliver on its mandate**
3. **Open USAFs with transparency and wide stakeholdership, and build a coalition of actors for universal internet access**

There is still time to act and meet the international goals set for universal, affordable access to the internet by 2030. But these goals will not be met without radical thinking and new approaches that move legacy institutions from their ways of working at inception to new strategies for a new era of digital technologies.

Despite the impact of ICTs, vast digital inequalities persist throughout the globe

Digital technologies have transformed the global economy. Industry estimates value the global e-commerce sector at $4.2 trillion USD — roughly equal to the gross domestic product (GDP) of all low and middle income countries in Latin America and the Caribbean combined (Adobe, 2021; World Bank, 2021). Across different income groups and levels of internet use, online retail is a growing commercial trend (LIRNEasia, 2019; OECD, 2017).

Even beyond the private benefits of online shopping, countries see economic returns on greater digitalisation. Greater rates of both mobile and fixed broadband use correlate with higher average incomes and increase in GDP over time (ITU, 2020). Countries with these higher rates of digitalisation also tended to fare more resiliently, economically speaking, through the Covid-19 pandemic than those with lower rates of internet use (ITU, 2021). The internet has added not only new ways of doing business, but grown new sectors of the economy.

These new sectors — collectively known as the 'digital economy' — have become panacea for post-Covid economic resilience by political leaders across the world and across the political spectrum.

Through and post-Covid, political leaders have invoked digital technologies and the digital economy more broadly as a driver for further expansion and growth. And yet, the foundational issue of individual access to the internet remains a key political issue.

A digital economy: diverse perspectives, universal aspiration

"We want the digital transformation to power our economy"
Ursula von der Leyen, 2020

"Our government is using digital technology to stimulate growth in economy"
Nana Akufo-Addo, 2021

"Digital economy must create new jobs"
Joko Widodo, 2020

"Covid-19 is the first global pandemic of the Information Age. It has rapidly accelerated the digitalization of services, the delivery of goods, and our means of communication. This has created a unique window of opportunity."
Kaja Kallas, 2021

"The digital economy is an important area for the future growth of the world economy."
Xi Jinping, 2021

"In other words, let us not waste this time [post-Covid]. This is a time for us to retrain; this is a time for us to retool; this is a time for us to refurbish."

Mia Mottley, 2020

"Recovery must be, in Latin America, green, digital, and people-focused." *"La recuperación tiene que ser necesariamente para el caso de América Latina verde, digital y enfocada en la gente."*

Sergio Díaz-Granados, 2021

Despite high ambitions for what the digital economy can do, hard policy choices remain about universal internet access for millions of people around the world. Universal and affordable internet access was named as one of the indicators (9.c) within the Sustainable Development Goals, although policymakers are on pace to miss this target (UN, 2021; Iglesias, 2020). Latest ITU figures estimate only around half the world's population have used the internet (ITU, 2020). Industry estimates suggest half a billion people live where there is no mobile internet coverage (GSMA, 2021). For these ambitions to be realised, policymakers must address this issue.

Digital inequalities persist across gender, geography, and income. On average, women are less likely to use the internet than men (ITU, 2020). They are also less likely to own a smartphone, and even where the gender ratio in internet use is near equal, other inequalities reduce women's likelihood to have higher-quality means of meaningful connectivity (GSMA, 2021; Web Foundation, 2020). Across different parts of the world, people living in rural areas are less likely to use the internet than those in urban areas (OECD, 2020; A4AI, 2020; LIRNEasia, 2019). Both within and across countries, lower incomes correlate with lower rates of internet use (García-Escribano, 2020). In turn, those disadvantaged across multiples of these inequalities — for example, rural women, who tend to also have lower than average incomes (Chalaby, 2018) — are the most likely to be excluded from the digital world.

These inequalities limit the potential of the digital economy, holding consequences for us all. Recent research from A4AI-Web Foundation studied the digital gender gap in 32 low and lower-middle income countries around the world and estimated the cost of this exclusion amounts to over $1 trillion USD over the course of the past decade (A4AI, 2021). The lost economic opportunity from the ability of the digital economy to scale — because of inequalities along the lines of gender, geography, and income — impedes the potential for the digital economy to meet the ambitions that political leaders describe.

As a consequence, if policymakers cannot make the necessary investments in universal access — estimated to be $428 billion USD for universal 4G mobile broadband access — then the consequent economic ambitions will never be realised (ITU, 2020). This holds micro- and macroeconomic consequences for the economy and affects attainment of the Sustainable Development Goals across multiple thematic areas (A4AI, 2021).

Governments looking to grow their digital economy should focus on inclusive foundations for that growth. While policy speeches today characterise the digital economy as the solution to all political woes, ICTs will not be able to fully realise any of them without universal internet access that enables everyone to benefit from the technology. This requires policy choices to be made — sooner rather than later — to make internet access universal, affordable, and meaningful. Without these policy goals and interventions, access remains limited and inequal, and the contribution of ICTs to economic and social goals of a country remains partial.

The size and type of contribution that ICTs will make in the post-Covid decade will be determined by the broadband policies set in place this year.

Governments have not taken enough action to close the digital divide and to build inclusive, strong digital economies

Each year, A4AI updates the Affordability Drivers Index (ADI). It is a combination of policy assessments and market factors that correlate with more affordable internet prices for consumers. This year keeps the scores from the 2020 policy survey and updates with latest available market information. This year's Index indicates that while progress has been made, the pace of change remains too slow.

The ADI leaderboard remains similar to last year. Among the 72 countries included within our analysis, the top ten countries overall and among Least Developed Countries (LDC) classification remain similar. In both categories, nine of ten countries in the Top Ten last year remain: the only exceptions are the returns of India and the Gambia, knocking the Dominican Republic and Mali out, respectively.

WHAT IS THE AFFORDABILITY DRIVERS INDEX?

The ADI is a tool developed by the Alliance for Affordable Internet (A4AI) to assess how well a country's policy, regulatory, and overall supply-side environment is working to lower industry costs and ultimately create more affordable broadband. In particular, policymakers and relevant stakeholders can use this tool to identify where progress is needed most.

The ADI does not measure actual broadband prices, nor does it tell us how affordable broadband is in a given country. Instead, it scores countries across two main policy groups:

- **Infrastructure** — the extent to which internet infrastructure has been deployed, as well as the policy framework in place to encourage future infrastructure expansion; and
- **Access** — current broadband adoption rates, as well as the policy framework in place to enable equitable access.

High ADI scores correlate with reduced broadband costs on both the industry side and for consumers. As Figure B shows, there is a positive and statistically significant correlation between a country's ADI score and the affordability of a 1GB mobile prepaid broadband plan — reaffirming that improving policies and regulations to lower industry costs should be a priority for all, and particularly for low- and middle-income countries.

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1	Malaysia	89.27
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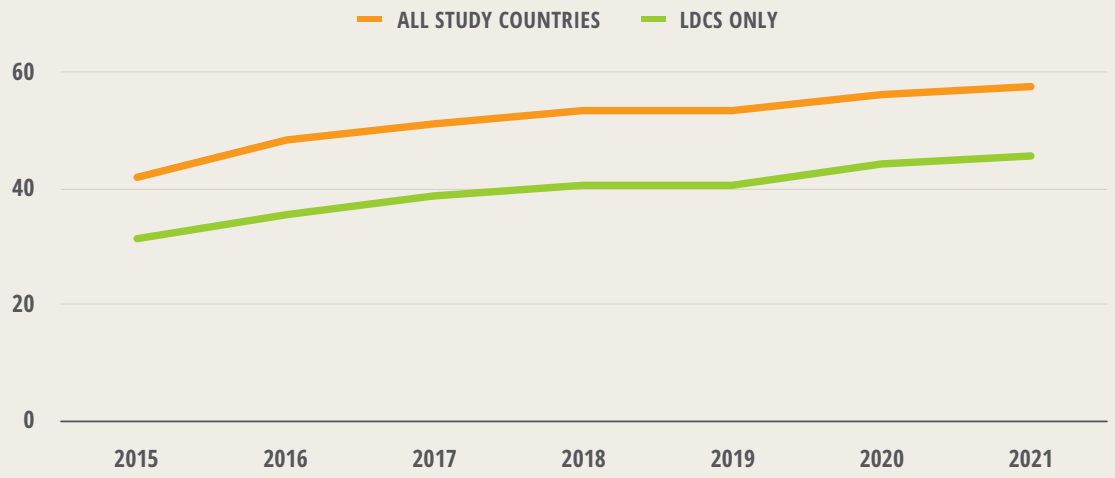
10	Bangladesh	50.04

Overall, countries jockey among their peers for an exact position, but most countries have kept to the general, slow trajectory of gradual improvement.

Some exceptions apply. Key risers from last year include Sierra Leone and Liberia, both of which saw large improvements of 3G network coverage. Nicaragua was one of the largest receders, with lowering rates of smartphone penetration.

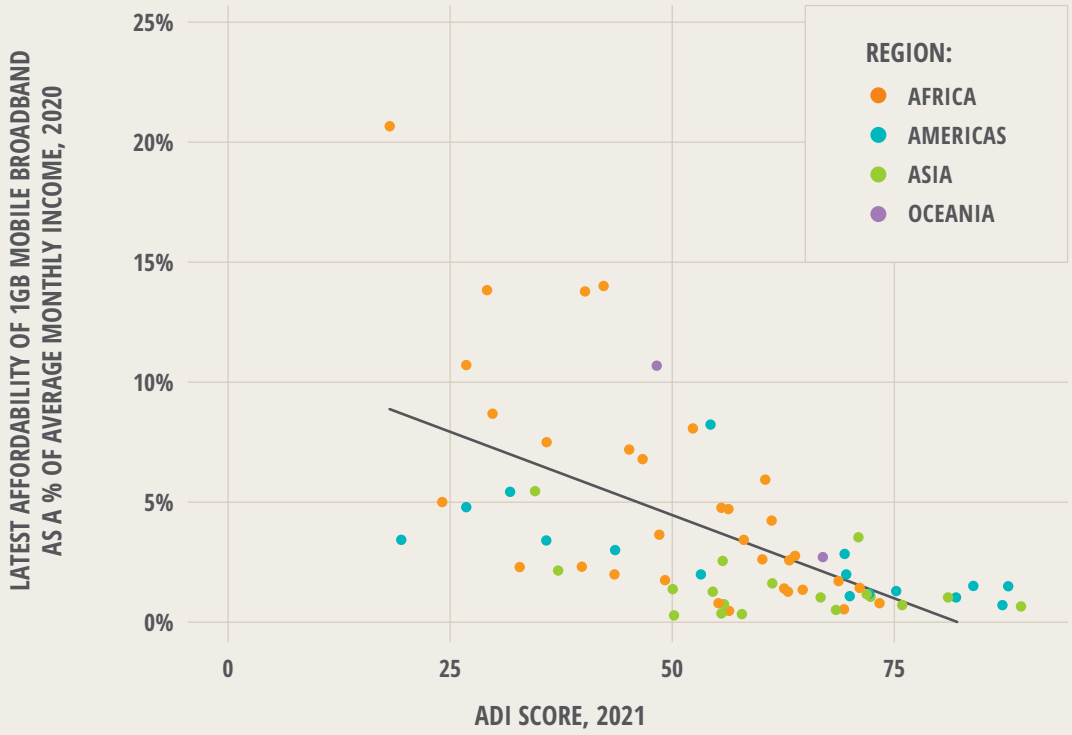
Figure A. Average ADI Scores, 2015–2021[1]



Source: Alliance for Affordable Internet, 2021

1 For consistency, the averages only include countries which were in the ADI in 2015 and are all based on the scores from the revised 2018 model. This will mean some differences emerge between published scores in 2015–2017 and the averages here.

Figure B. Comparison of 2021 ADI Scores vs Latest Affordability (2020)



Source: Alliance for Affordable Internet, 2021

ADI scores continue to positively correlate with the affordability of data in a country. Countries with higher scores on the Index have some of the lowest costs of connectivity. As measured by the cost of 1GB mobile broadband, only one of the top sixteen countries on the ADI – Jordan – fails to meet the historic '1 for 2' standard for internet affordability. At the other end, countries with the lowest scores have wide variance in their affordability, with some of the most dire cases exceeding 12% of the average monthly income.

Despite their connection with affordability, ADI scores have not moved substantially over time. Since 2016, average scores on the ADI, which are normalised based on collective performance of all the countries, have risen only 3.6% on an annual basis. In the same period, the policy scores have only increased by a little over 5%. This indicates an underwhelming policy response in low and middle income countries as relates to broadband policy.

This matches with unaffordable data for millions of people around the world. In the latest available data from A4AI, internet prices remain unaffordable by the '1 for 2' affordability target in 52 of the 95 low and middle income countries recorded (A4AI, 2021). Almost one billion people live in these countries where prices are unaffordably high. Even within countries with affordable internet prices, income inequality still means that millions more also face this affordability barrier.

The dearth of policy action runs in contrast to the political priority that is expressed by governments about digital technologies. **While ICTs have enjoyed political popularity as a means by which governments have chased dreams and cast visions of a better future, the reality remains that data and devices are unaffordable for millions of people around the world (A4AI, 2021).**

There is clear and broad intent for ICTs to be a core part of many countries' plans to recover economically from the Covid-19 pandemic. However, in contrast to this, **governments are failing to convert words into action by adopting the broadband policies and universal access strategies that will build an inclusive foundation for a robust digital economy.** Something must change.

Universal Service & Access Funds are an essential part to a successful, comprehensive broadband policy strategy

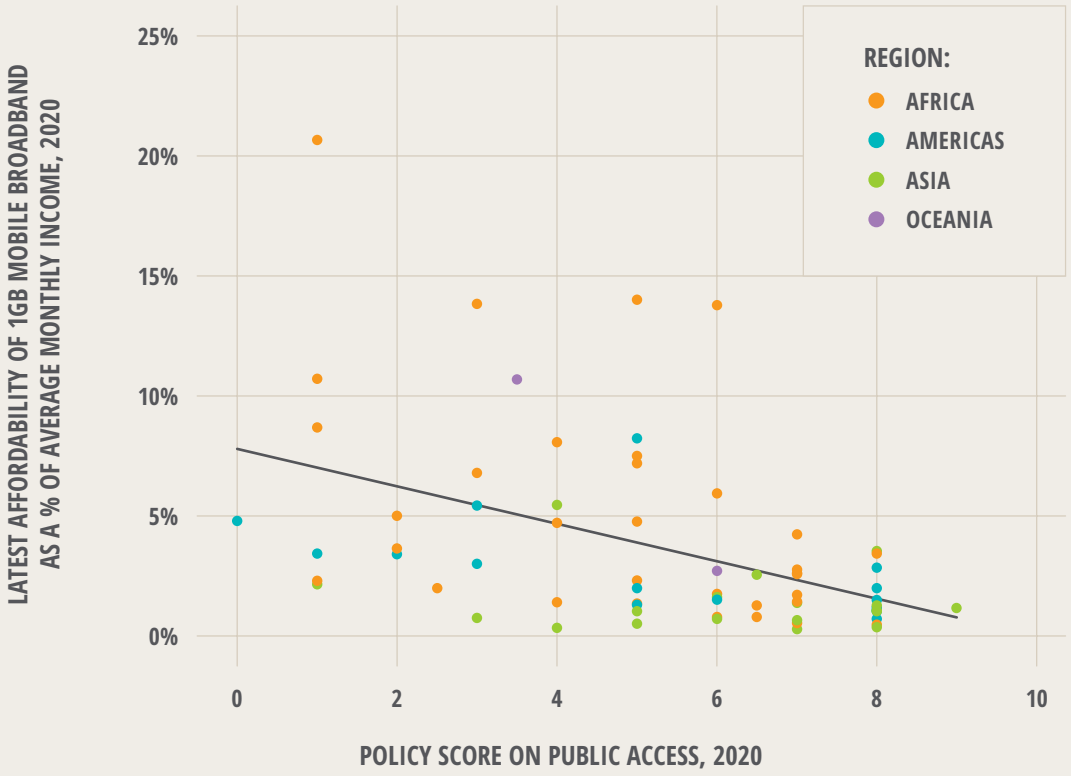
The Affordability Drivers Index (ADI) monitors policy progress across six different thematic clusters. They are the regulatory environment, broadband strategy, universal and public access, infrastructure and sharing, spectrum management, and gender and map according to A4AI's good policy and regulatory practices, as endorsed by its membership (A4AI, 2021). These clusters are based on the average score of fifteen policy indicators gathered thematically every other year in a comprehensive policy survey commissioned by A4AI.

Of the various policy areas monitored by A4AI since 2015, investments through USAFs and public access have been the most effective policy area in driving down the cost of connectivity. Leading countries in the Asia-Pacific region have been driven to their position in part by having the highest regional averages for public access strategies and positive USAF interventions (A4AI, 2020). Universal and public access strategies were identified as being the strongest policy correlation to affordable internet prices in previous editions of the Affordability Report (A4AI, 2018).

Table 1. ADI Thematic Policy Clusters.

Policy Cluster	Included Indicators
Regulatory Environment	Licensing, regulator transparency and competency, market competition, evidence-based decisions
Broadband Strategy	National broadband plan, guidelines for public investment
Universal & Public Access	Universal Service & Access Fund (USAF) strategies, end-user subsidies, public access investments
Infrastructure & Sharing	Rights of way and tower zoning, public facilitation of infrastructure sharing
Spectrum Management	Time-bound forward planning, allocation transparency, unlicensed permissions
Gender	Gender targets

Figure C. Scatter plot, Universal and public access policy score 2020 v latest affordability



Source: Alliance for Affordable Internet, 2021

USAFs have a mixed history — however, several success stories shine through. It is misleading to say these institutions have gone without criticism. Industry reports have targeted USAFs for reform, citing how they are funded, how they distribute funds, and how they measure and track impact, among other criticisms (GSMA, 2013; 21st Century Financing Models Working Group, 2021). Research from A4AI-Web Foundation has also called out USAFs for underperforming in their transparency and disbursements (A4AI, 2018).

These are critical areas for improvement of USAFs — but they do not indicate innate faults in how these funds operate. Just as there are bad examples, there are positive examples of USAFs using their authority to invest in new, high-capacity international connectivity; to increase smartphone penetration; and to build new public-private partnerships with operators (A4AI, 2019; A4AI, 2020; A4AI, 2021; A4AI, 2021).

USAFs are not doomed relics of their time — however, they must innovate to meet the needs of the 21st century.

As governments consider building the foundation to their digital economy, they must invest through USAFs to drive inclusive innovation in the sector. USAFs and public access projects, as a policy trend, have proven themselves over the past six years to be the most effective policy tool towards greater affordability. Given the importance of this affordable and universal access as a strong foundation for an inclusive and scalable digital economy, in turn, USAFs become critical institutions for building that economy.

USAFs need a new theory of change to deliver on a mission of universal internet access for all

Universal Service & Access Funds (USAFs) have historically fit to a contained brief of intervening only where there are market failures. They are institutions of their time: frequently established in the context of market liberalisation that moved telecommunications from a single, state-operated monopoly to a number of competing private networks (ITU-CTO, 2002).

They specifically address the potential for a market failure where private interests' profit motives cannot be reasonably sustained against the cost basis of providing access while ensuring telecommunications services are accessible to the widest number of people (ITU, 2013). Geography plays an essential part in this dynamic: in more remote and in less densely populated areas, internet service is a more expensive business (A4AI, 2018).

This is the historical context of Universal Service & Access Funds — but it does not need to be their future. Just as the digital divide has evolved from a simple binary of online/offline to deeper, more qualitative experiences (A4AI, 2020), so too the digital divide has shown to fit not just to geographic lines but along differences of gender, income, and age (A4AI, 2021; ITU, 2020). **These new digital divides are no less urgent to the mission of universal access — but they demand new tactics.**

A new approach to universal internet access

Earlier this year, economist Mariana Mazzucato published *Mission Economy* (Mazzucato, 2021). This Affordability Report builds on the core theory of that book to reimagine Universal Service & Access Funds on how they can deliver on the mission for universal internet access.

This report takes the core theory of the book — 'moonshot thinking' — and applies it practically to how USAFs function in the telecommunications sector. The digital divide is indeed given a brief treatment within the book (Mazzucato, 2021, 153-159): this is an extension and more in-depth application of the book's theory based on the Alliance's legacy of broadband policy monitoring and analysis.

What is this theory? In short, it is about 'setting targets that are ambitious but also inspirational, able to catalyse innovation across multiple sectors and actors in the economy. It is about imagining a better future and organizing public and private investments to achieve that future' (Mazzucato, 2021, 6-7). This resonates with several international policy briefs on the digital divide and their collective agreement that the solution requires contributions from a diversity of financial sources (A4AI, 2018; A4AI, 2019; ITU, 2020).

Universal Service & Access Funds hold a unique position with the telecommunications sector that makes them best positioned to take charge of a mission for universal internet access and to build the necessary coalitions to spur action. While Mazzucato's book calls for us to 'reimagine government as a prerequisite for restructuring capitalism in a way that is inclusive, sustainable and driven by innovation', this report more modestly focuses on reimagining USAFs as a prerequisite for the next generation of broadband policy that is inclusive, sustainable, and driven by innovation.

Table 2. Example policies and practices as pillars of moonshot thinking.

Pillar	Focus Area	Example Gov't/USAF Policy
VALUE	*Creating and pursuing values other than profit through market mechanisms*	Community-led and peer-to-peer digital skillbuilding
MARKETS	*Shaping markets rather than just rescuing market failures*	Device subsidisation
ORGANISATIONS	*Developing public sector capacity and enabling cross-functional government strategy*	Multi-stakeholder universal access policies and national broadband plans
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PARTICIPATION	*Governing with transparency to enable inclusive participation*	USAF board compositions, with private sector and civil society inputs

Source: Alliance for Affordable Internet, 2021, from Mazzucato, 2021

The rest of this chapter connects the seven key pillars of Mazzucato's theory to the current practices of leading governments and USAFs around the globe. This helps to demonstrate that, **in many ways, aspects of moonshot thinking already exist within broadband policy and USAF strategies**. It is simply their integration into a comprehensive mission that is missing.

PILLAR ONE:

Pursuing public value creation through universal access

Expanded internet access holds extraordinary benefits both for users and for societies at large. Increases in broadband penetration have been linked with increases in average gross domestic product (ITU, 2018). The availability of internet access also affected the schooling of over 1.5 billion young people worldwide (Ericsson, 2021). Further advancements are possible in other sectors, just as the preservation of digital divides along the lines of gender, geography, age, and income hold negative consequences (Web Foundation, 2020; A4AI, 2021).

However, these values are not always captured in an un(der)regulated market. The cascading social and economic value of internet connectivity does

not affect an internet service provider's bottom line in the same way as subscription tariffs and user numbers do. This imbalance justifies intervention by the public sector to support greater connectivity, not just when profitability enables an easy choice, but also along the margins and for underserved populations for whom connectivity may not be an economic venture but a social imperative.

Universal Service & Access Funds can and do address this gap by supporting projects and programs that deliver on the social value of universal internet access. Such projects can advance connectivity for a purpose (e.g., education), for a target marginalised or historically excluded group (e.g., women and girls), and for a community (e.g., rural and remote areas that require unique capital investment). Through this, governments can narrow the digital gender gap and the urban-rural digital divide *by design* rather than by coincidence (A4AI, 2020; A4AI, 2021).

An example of this practice comes from the Digital Ambassador Programme in Rwanda. Launched in 2017, this programme trained 5,000 young Rwandans to serve as digital skill trainers in their respective communities (MinICT, 2017). With a specific ambition to address the digital gender gap, half of the positions were reserved for young women and girls (A4AI, 2020). This group then delivered trainings to over 17,000 individuals, with measured, gender-disaggregated results in increased digital confidence (DOT, 2019).

Interventions like the Digital Ambassador Programme demonstrate a space for public policy to intervene and advance public values as they relate to the digital divide. **Governments should not wait on the sidelines to close the digital gender gap or narrow digital divides in society.** Universal Service & Access Funds have a mandate to directly and preemptively respond to these gaps and support connectivity solutions that include the widest number possible.

PILLAR TWO:

Shaping broadband markets towards affordability

Market policies and regulation affect the ultimate affordability of internet access. The Affordability Drivers Index, as a policy tool, builds from policies and regulations that correlate positively with lower internet prices for consumers (A4AI, 2013). The comparison of countries within the Index depends, in part, on comparative analysis of the effectiveness of various policy and regulatory decisions made by policymakers around the world. The rules and regulations in place matter.

Governments should not be wary of this role in shaping future telecommunications. This is a huge responsibility that can, based on the policy decisions made, have positive or negative consequences. However, governments and regulators should not 'limit [themselves] to reactively fixing markets, but must explicitly co-shape markets to deliver' positive social outcomes (Mazzucato, 2021, 20-21).

Universal Service & Access Funds can make unique contributions in moving markets forward by expanding the availability of new technologies within society and reducing cost barriers for users on the margins. The use of the universal service provision in Malaysia offers a compelling example of this practice.

Starting in 2014, the Malaysian government used its universal service provision to provide a partial subsidy for entry-level smartphone purchases by young people in rural areas (MCMC, 2021). This practice was deployed in partnership with the mobile network operators and lauded as exemplary practice by their trade association as a means to accelerate smartphone ownership (GSMA, 2017). As device prices remain a substantial part of the cost barrier to coming online (A4AI, 2021), Universal Service & Access Funds can guide the market and show leadership by reducing the cost of devices in that country.

Beyond just the USAF, governments have a large influence in the composition of the broadband market. Previous editions of the Affordability Report have detailed how regulatory policies such as licensing frameworks and spectrum allocation and regulatory practices such as consensus-based and

transparent policymaking support greater market competition and the impact that has on affordability (A4AI, 2019). This area has also shown where USAFs can also be improperly used to sustain incumbent operators' position in a market and discourage market competition (TBIGC, 2021). Government policy and the USAF strategy should align — with a vision not of subsidy for entrenched business models but with ambition to achieve the public good of universal internet access.

PILLAR THREE:

Building competence and confidence in public sector

It's not just about what a broadband strategy says — it's also about who is doing it and how it is done. Governments looking to close the digital divide can first build momentum by looking within — and across to other sectors — to align different ministries and policies towards a mission of universal internet access. As with Mazzucato's summary of the United States' space agency's mission to the moon as an application of her theory, 'working interdepartmentally can help reveal the scale of government procurement and leverage a much higher budget for missions' (Mazzucato, 2021, 121). This logic applies to broadband policy, as well.

Public access solutions are an essential part of a universal access strategy, and they can come to a greater scale when combined with other governmental objectives. Such complements appear in projects and campaigns like the UN-led Giga initiative and schools, the Every Community Connected pledge and libraries, and the Ugandan internet backbone network and regional government offices (Giga, 2021; IFLA, 2020; A4AI, 2019). This can also extend to partnerships with other public sector investments such as infrastructure and transport with interventions such as 'dig once' policies, which offer financial and environmental benefits (A4AI, 2021).

Stakeholders also need confidence in policymakers to guide the sector towards positive outcomes. This can be expressed as a form of regulatory certainty, which enables private sector actors to more readily invest with greater confidence in the market's direction. It also comes from the maturity and autonomy of institutions like the Universal Service & Access Fund and the telecommunications regulator. Beyond just a thematic focus on broadband policies and regulations themselves, governments should also take concern about developing institutional capacity to implement them.

Positive examples of such policy practices exist throughout the world. Last year's Affordability Report details the ways by which national broadband plans coordinate and align governmental departments and build stakeholder confidence in the regulatory environment that boosts investment in new infrastructure (A4AI, 2020). Specifically for USAFs, the *Hogares Conectados* (Connected Homes) program in Costa Rica shows the potential extended impact that a USAF-led program has when supported through broader social policy objectives from the government (A4AI, 2019).

In drafting national broadband plans and universal access strategies, governments have the opportunity to align multiple departments and stakeholders across the sector towards a mission-oriented approach for universal affordable broadband.

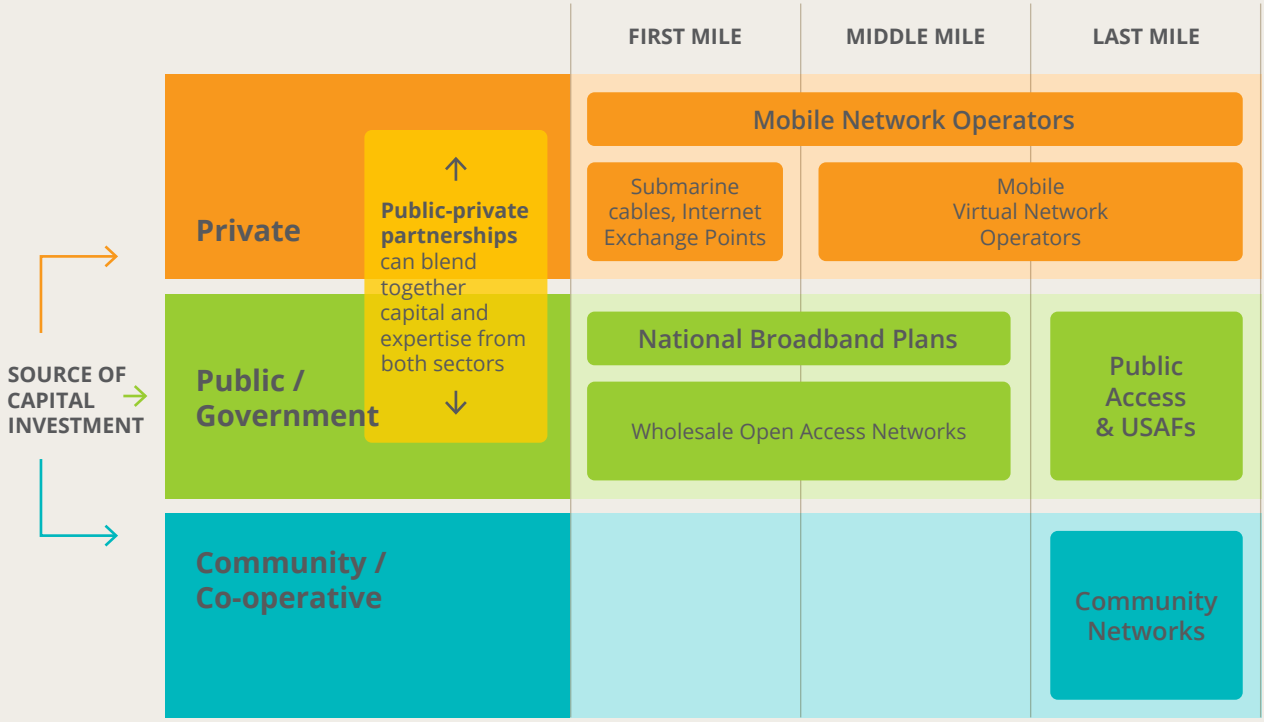
PILLAR FOUR:

Financing bold investments for connectivity

Public financing should not be a dirty word in broadband policy. As emphasised in the 2019 Affordability Report, the public sector is an essential source for capital to support greater investment in new infrastructure (A4AI, 2019). In particular when considering Universal Service & Access Funds, public financing helps 'invest in areas where the required funding [is] large, long-term, and high uncertain' by 'absorb[ing]' a greater degree of the financial risk that what the private sector would tolerate on its own (Mazzucato, 2021, 30).

This applies to expansions in new geographies, particularly rural and remote areas where 'government investment … can crowd in private investment, stimulating funding that might not have happened otherwise and expanding national output' (Mazzucato, 2021, 34). This happened in the construction of essential backbone infrastructure in the form of underwater cables to Vanuatu and the Cook Islands

Figure D. Sources of Capital Investment in ICT.



Source: Alliance for Affordable Internet, 2019

(A4AI, 2020; A4AI, 2021) and the backbone network in Côte d'Ivoire (A4AI, 2020). Here, public financing — through state pension funds, USAFs, and other sources — provided substantial investment capital at the beginning of these projects, which have provided benefits for both the public and private sector.

At the other end of the sector, taxation policy is another financial lever that governments can adjust in (or out of) alignment with the mission for universal access. A number of governments have taken action to reduce the cost of mobile handsets by removing importation duties or other taxes applied to the sale of these devices (A4AI, 2014; A4AI, 2020; A4AI, 2020). In the other direction, a number of countries, especially across Africa, have imposed social media taxes which have a negative impact on the potential economic and social contribution of internet access and have disproportionate effects on the poorest (A4AI, 2018; A4AI, 2018).

Governmental financial capacity has an enormous potential impact on the broadband market and the affordability of internet services in a country. From investment in backbone infrastructure to taxation policy as applied to smartphones and handheld devices, governments influence how the telecommunications market works, what kind of experiences users have, and how much they are paying for that service.

PILLAR FIVE:

Distributing affordable data to the greatest number

Governments focused on universal access should not wait for a market failure as permission to act. **If a universal access strategy says to wait for a market failure before action, it belies a belief that some communities and some market segments should wait their turn for affordable access to the internet.** Just as there are multiple factors in broadband policy that affect the ultimate price of internet access, there are multiple points of intervention in the network architecture of the

internet where governments can act to reduce the cost of internet access and increase digital inclusion.

Public access points offer an essential, small-scale intervention for USAFs to support universal access. Previous editions of the Affordability Report have lauded certain countries for their positive and consistent use of public access strategies (A4AI, 2018; A4AI, 2019). These countries, and in turn the residents within these countries, have benefited from free or low-cost access to the internet as provided by these public access points. These projects are a frequent strategy of Universal Access & Service Funds because of their manageable scale; however, they should not define the limit of options for USAF strategies nor should they wait for a market failure before operationalisation.

Greater investment in middle-mile infrastructure, such as municipal networks, can provide communal access to more affordable internet prices. The Swedish experience with municipal fibre networks details the positive outcomes of such a strategy (Zager, 2019). These networks offer an option for revenue generation, albeit on a long time scale as the emphasis is placed on inclusive infrastructure rather than immediate return on investment. Also, given the structural division of the wholesale municipal network in comparison to a competitive market of private retail operators (including an incumbent operator and other private networks), this duality reduces monopolisation risks. Urbanisation in the country plays an important factor that suggests this strategy isn't for all situations. However, the model resonates with other projects for wholesale open access networks, featured in previous Affordability Reports (A4AI, 2019).

Opening up first mile infrastructure, such as national backbone networks, offers the potential for greater impact than rent-seeking strategies from governments. Municipal networks and national backbone networks can help provide high-capacity broadband infrastructure that enable further investment and network deployment through the private sector. However, these projects suffer when paired with strategies that focus more on a return on the government's investment over the benefits of widespread affordable and high-capacity broadband infrastructure (Song, 2018; Song, 2021). Simply building the infrastructure is not enough: it must come with a vision for affordable and inclusive internet access that drives a scalable digital economy.

While the 'mission economy' theory focuses on the distribution of wealth, here affordable data can be an allegory for wealth. Mazzucato's book focuses on how 'contracts [can] ensure that the public and private sectors share the risks and rewards of value creation' (Mazzucato, 2021, 189). The close collaboration of public and private sectors in telecommunications has long been part of the sector's history. Indeed, this collaboration has been a problem in a number of countries where large government shareholder stakes in the incumbent (or even multiple) operators have enabled the mission to creep from the public interest to private gains (A4AI, 2019). In turn, this emphasis on distribution may benefit from a focus not on the distribution of *wealth* but on the distribution of *data bandwidth* within and across countries.

PILLAR SIX:

Supporting new partnerships for universal access

The *internet* exists through the *inter*action of several *net*works to more freely exchange information. Just as the internet is technically a combination of different networks, so, too, can its development come from a combination of different business models and strategies.

Universal access strategies should not rely on a single business model. There are several ways to build a network: private business, public monopoly, community networks, fixed, mobile, satellite. The options abound. Governments, as they build their universal access strategies, should 'encourage multiple solutions instead of focusing on a single development path or technology. While missions are targeted towards a specific goal, the goal should be broad enough to encompass numerous projects that together achieve the overall mission' (Mazzucato, 2021, 124).

Realising a mission for universal access depends on multiple business and networking models working in complement to one another. This can be done in forms of competition and also collaboration and

cooperation, including through policy dialogues and project implementation.

Universal Service & Access Funds should explore partnerships with the private sector and with other stakeholders to provide affordable internet access. Examples of such partnerships already exist. The deployment of OpenRAN technology at around 2,000 sites across Ghana in partnership with the private sector demonstrates one way of using new technologies to create new partnerships between public and private sectors (CommsUpdate, 2020). This allows both the public and private sector to contribute expertise and capital into the success of a project.

In addition to the private sector, community networks are key potential allies and collaborators with Universal Service & Access Funds. Community networks, which exist across the globe as viable networking solutions, frequently either lack formal or regulatory recognition that enable them to participate and partner with the USAF, or the USAF itself may have funding limitations that impede these options. An example of positive practice comes from Argentina where, after licences for community networks were established, they were able to participate with the USAF and collaborate on new projects for infrastructure development and deployment (A4AI, 2020). When considering potential partners, USAFs should embrace community networking strategies within their context.

PILLAR SEVEN:

Encouraging broad participation in USAF governance and strategy

Universal Access & Service Funds should be open institutions. This openness extends to its stakeholdership, its governance, and its approach to transparency. People and communities should be included in designing the projects and solutions that serve them. Private sector and other key stakeholders should be included within the governance of USAFs. USAFs should also be open and transparent in how the institution operates and how funds are disbursed. In turn, this openness can set USAFs as key institutions to building a coalition for greater and more equitable connectivity in a country.

USAF projects should be co-designed with the people and communities they aim to serve. The Sanchar Shakti project in India offers one example focused around the inclusion of women in project design in the context of one of the world's largest gender gaps (A4AI, 2020; GSMA, 2021). Other target communities, such as people with disabilities, have been included in some projects (Bleeker, 2019). This type of inclusion can improve project outcomes and reduce the potential for incorrect assumptions to become a stumbling block to successful implementation of a project.

Effective USAF governance models include a wide range of stakeholders at the highest levels. USAFs should not be open only at the project design stage. Positive models practice include the formal inclusion of industry representations on the governing boards of the Universal Service & Access Funds in Ghana and Nigeria (Gifec, 2021; USPF, 2014). This allows for private sector stakeholders to contribute and collaborate in setting the strategy for greater connectivity within the country. USAFs can go even further on inclusion, with intentional efforts to maintain a membership that is diverse on grounds of gender, background, and profession, to ensure that a wide array of voices contribute to setting the agenda for universal access.

Organisational transparency also can create trust and accountability for these Funds to function effectively. Part of this is about opening up datasets around project implementation and fund use. It also extends to creating publicly-set 'milestones so that an agency can decide to stop subsidising failing projects' (Mazzucato, 2021, 128). Through the combination of open data and transparent goals, this 'can help create a sense of urgency, acknowledge achievement, and encourage motivation about progress' (ibid). In turn, this can help increase political buy-in for the USAF's mission over time.

This openness offers a starting point for USAFs to be central institutions in building coalitions for universal internet access in a country. This openness enables other stakeholders to more readily participate in project implementation, strategy setting, and governance of the USAF. This, in turn, can help build the coalition that can accelerate and increase a USAF's ability to effectively deliver on a mission for universal access.

Conclusion: Cause and room for action by USAFs

There are several potential interventions and reforms for USAFs to better deliver on a mission for universal internet access. They span from operational details to governance strategies.

Borrowing from the model of 'moonshot thinking', its seven pillars illustrate new ways of thinking about Universal Service & Access Funds and their potential. These are all possibilities, each with examples of positive practice pulled from USAFs and governments worldwide. However, the comprehensive application of this strategy remains the next step for governments.

Together, these pillars and this mission orientation can help mediate the implementation gap that plagues many USAFs. A strong, clear vision is required as a first step to reset USAFs on a new strategy towards universal internet access. With that vision, governments should focus on building strengths in institutional capacity, greater transparency, and wide sectoral involvement to transition USAFs from their limited role today to leaders in the field.

Policy recommendations: invest USAFs with a mission mindset for universal internet access

Governments must modernise the USAF mandate to build inclusive, strong digital economies. This report offers a new theory of how Universal Service & Access Funds could operate. It builds from theoretical work and practical experience of how space agencies built momentum to send people to the moon. **The mission for universal internet access is no less ambitious but is now more urgent than ever.**

USAFs are adaptable to change and deliver on the public interest. In the context of the Covid-19 pandemic, USAF subsidies helped keep millions of Thai mobile internet users online (A4AI, 2021). **When given the appropriate resources — financial and political —, these institutions can make internet access more affordable and bring new people and communities online.**

Universal Service & Access Funds have been successful parts of broadband strategies worldwide. Our policy research connects the success of universal and public access strategies with the ultimate affordability of internet prices. While the history of these institutions has not been perfect, neither has the track record of progress towards closing the digital divide, narrowing the digital gender gap, and realising universal internet access for all. **The positive examples of progress and achievement lead to a conclusion that USAFs need to be bolder institutions.**

Table 3. Initial steps towards USAF innovation

1. **Adopt a universal access strategy with a modern, ambitious USAF mandate that includes institutional coordination in policy design and implementation stages**
2. **Commit adequate resources — financial, political, and human — to the USAF to deliver on its mandate**
3. **Open USAFs with transparency and wide stakeholdership, and build a coalition of actors for universal internet access**

Source: Alliance for Affordable Internet, 2021

Governments looking to accelerate internet access in their country should consider the political mandate of and the resources committed to the Universal Service & Access Fund. While governments have an ambition for robust digital economies, that strength comes from an inclusive foundation that has the capacity to scale digital marketplaces. That inclusive foundation depends on bringing as many people online as possible and ensuring they have meaningful experiences.

UNIVERSAL INTERNET ACCESS IS NOT JUST A DREAM — WE JUST NEED THE COURAGE TO ACHIEVE IT.

"There is a self-fulfilling prophecy: we get the kind of government organizations we believe are possible."

— Mariana Mazzucato, 2021, 59

Annex 1: ADI Results

Table 4. Full 2021 ADI Results, by income group

COUNTRY	INFRASTRUCTURE SUB-INDEX	ACCESS SUB-INDEX	ADI SCORE	ADI RANK (CHANGE)	WB INCOME GROUP 2021
Malaysia	69.98	98.36	89.27	1 (=)	Upper mid
Colombia	76.13	89.48	87.82	2 (=)	Upper mid
Costa Rica	68.06	96.29	87.15	3 (=)	Upper mid
Peru	77.00	81.20	83.89	4 (-1)	Upper mid
Argentina	68.16	86.37	81.94	5 (1)	Upper mid
Thailand	62.85	89.93	81.02	6 (=)	Upper mid
Turkey	64.97	78.15	75.89	7 (-1)	Upper mid
Mexico	72.78	69.06	75.22	8 (1)	Upper mid
Morocco	62.30	75.95	73.31	9 (-1)	Lower mid
India	60.88	75.50	72.32	10 (-1)	Lower mid
Dominican Republic	58.91	77.19	72.17	11 (2)	Upper mid
Indonesia	55.10	80.45	71.88	12 (-2)	Lower mid
Botswana	52.47	81.61	71.10	13 (=)	Upper mid
Jordan	65.28	68.50	70.94	14 (-7)	Upper mid
Brazil	59.09	72.89	69.99	15 (3)	Upper mid
Ecuador	62.49	68.75	69.59	16 (=)	Upper mid
Jamaica	57.04	73.84	69.40	17 (=)	Upper mid
Mauritius	54.54	76.21	69.34	18 (3)	Upper mid
Nigeria	55.89	73.68	68.71	19 (=)	Lower mid
Pakistan	56.71	72.32	68.42	20 (2)	Lower mid
Fiji	57.95	68.30	66.95	21 (1)	Upper mid
Viet Nam	56.31	69.48	66.70	22 (=)	Lower mid
Ghana	52.99	68.96	64.66	23 (=)	Lower mid
Senegal	55.49	64.91	63.85	24 (-1)	Lower mid
Côte d'Ivoire	52.16	66.95	63.16	25 (-5)	Lower mid
Tunisia	52.16	66.75	63.06	26 (2)	Lower mid
South Africa	49.50	68.51	62.58	27 (1)	Upper mid
Cambodia	45.74	69.79	61.26	28 (-1)	Lower mid

COUNTRY	INFRASTRUCTURE SUB-INDEX	ACCESS SUB-INDEX	ADI SCORE	ADI RANK (CHANGE)	WB INCOME GROUP 2021
Benin	55.84	59.56	61.20	29 (2)	Lower mid
Uganda	56.19	57.84	60.46	30 (-1)	Low
Kenya	53.40	60.06	60.17	31 (3)	Lower mid
Rwanda	46.68	62.76	58.03	32 (=)	Low
China	55.55	53.52	57.84	33 (-2)	Upper mid
Egypt	43.02	63.37	56.42	34 (-2)	Lower mid
Mali	49.01	57.21	56.33	35 (-7)	Low
Myanmar	51.27	53.99	55.82	36 (-2)	Lower mid
Nepal	53.87	51.09	55.66	37 (4)	Lower mid
Tanzania	53.84	50.93	55.55	38 (-3)	Lower mid
Kazakhstan	43.87	60.87	55.54	39 (=)	Upper mid
Algeria	36.75	67.36	55.21	40 (6)	Lower mid
Philippines	41.70	61.18	54.56	41 (4)	Lower mid
Honduras	52.24	50.12	54.28	42 (2)	Lower mid
Bolivia	50.84	49.49	53.20	43 (=)	Lower mid
Gambia	39.47	59.22	52.33	44 (-2)	Low
Sri Lanka	40.08	54.58	50.20	45 (-2)	Lower mid
Bangladesh	46.57	47.79	50.04	46 (1)	Lower mid
Cameroon	42.73	50.00	49.17	47 (-2)	Lower mid
Zambia	42.39	49.14	48.54	48 (=)	Lower mid
Papua New Guinea	46.72	44.24	48.24	49 (5)	Lower mid
Burkina Faso	41.82	46.16	46.66	50 (=)	Low
Mozambique	35.23	49.95	45.17	51 (=)	Low
El Salvador	43.54	38.66	43.59	52 (-1)	Lower mid
Namibia	44.20	37.86	43.51	53 (1)	Upper mid
Malawi	38.85	40.87	42.27	54 (=)	Low
Madagascar	32.27	43.51	40.18	55 (-2)	Low
Angola	31.75	43.36	39.83	56 (-2)	Lower mid
Venezuela	34.11	40.85	39.75	57 (1)	**
Zimbabwe	33.38	40.80	39.34	58 (3)	Lower mid
Laos	31.60	38.47	37.16	59 (-3)	Lower mid
Niger	22.29	45.34	35.86	60 (1)	Low
Guatemala	32.61	34.92	35.81	61 (=)	Upper mid
Afghanistan	29.90	35.23	34.54	62 (2)	Low

COUNTRY	INFRASTRUCTURE SUB-INDEX	ACCESS SUB-INDEX	ADI SCORE	ADI RANK (CHANGE)	WB INCOME GROUP 2021
Sudan	21.91	40.04	32.85	63 (-1)	Low
Nicaragua	20.50	39.41	31.77	64 (1)	Lower mid
Liberia	25.82	30.31	29.76	65 (-2)	Low
Burundi	19.54	35.40	29.14	66 (1)	Low
Sierra Leone	26.16	24.40	26.81	67 (-1)	Low
Belize	31.35	19.19	26.80	68 (2)	Lower mid
Ethiopia	23.33	22.09	24.08	69 (=)	Low
Haiti	18.57	18.17	19.48	70 (-1)	Lower mid
Congo, DR	14.88	19.41	18.19	71 (1)	Low
Yemen	0.00	0.00	0.00	72 (=)	Low

Annex 2. ADI Methodology

The Affordability Drivers Index (ADI) is a composite measure that summarises in a single score an assessment of the drivers of internet affordability in various countries. Benefiting from the research framework established by the Web Index, the 2021 ADI covers 72 countries and focuses on two key aspects driving affordability: telecommunications infrastructure and access to the internet.

Two different data sources are used in the construction of the Index: data from other providers ('secondary data') and data gathered through our own research ('primary data').

The primary data is only collected every two years through a multi-country expert survey. The survey includes questions — scored on a scale of 0–10 — on different issues regarding policy, regulation, and other aspects around broadband and affordable access to the internet. (The questions and the scoring guidance for each of those questions are available in the codebook provided to each researcher.) The questions were specifically designed by A4AI, the Web Foundation, and their advisers. These primary data, based on and aligned with the A4AI Policy and Regulatory Good Practices, attempt to assess the extent to which countries have achieved a policy and regulatory environment that reflects the best practice outcomes. Survey questions were scored based on predetermined criteria by country experts. The scores were checked and verified by a number of peer reviewers.

This year, we conducted a new round of policy surveys on the 72 countries covered by the ADI between April and June 2020 by regional policy experts, including a peer-review process to improve the accuracy of the results.

In addition, we draw on a range of secondary indicators to derive the sub-indices described above as well as the final composite index. All secondary indicators have been updated with the latest available data as of September 2021.

Data sources and data providers

We employ data from several large international databases to measure or proxy the dimensions under study. Before an indicator is included in the Index, it needs to fulfil four basic criteria:

- Data providers have to be credible and reliable organisations, which are likely to continue to produce these data (i.e., it is not a one-off dataset publication).
- Data releases should be regular, with new data released at least every three years. There should be at least two data years for each indicator, so that a basic statistical inference could be made.
- The latest data year should be no older than three years back from publication year.
- The data source should cover at least two-thirds of the sample of countries, so that possible bias — introduced by having a large number of indicators from one source that systematically does not cover one-third or more of the countries — is reduced.

All the indicators included in the ADI are listed below, where they are grouped by sub-index and type (primary sources or secondary sources). The primary indicators (codes A1–A14) are collected via the policy surveys described earlier. The secondary sources include data collected by the ITU, GSMA Intelligence, World Bank, and Packet Clearing House.

The indicators used in the ADI represent a comprehensive set of factors that influence broadband affordability. However, this is not a complete list as there may be other important factors which cannot be included because they do not meet the criteria above.

The factors that the ADI covers are grouped into two sub-indices — infrastructure and access:

1. The infrastructure sub-index measures the current extent of infrastructure deployment and operations, alongside the policy and regulatory frameworks in place to incentivise and enable cost-effective investment in future infrastructure expansion. Variables included in this sub-index include, for example, the amount of international bandwidth available in a particular country, and an assessment of a nation's spectrum policy.

2. The access sub-index measures current broadband adoption rates and the policy and regulatory frameworks in place to encourage growth and ensure provision of affordable and equitable access. This sub-index includes variables such as current internet penetration rates and an assessment of the effectiveness of a country's Universal Service and Access Funds.

Table 5. List of indicators included in the Affordability Drivers Index

TYPE (CODE)	ACCESS SUB-INDEX INDICATORS
Primary (A5)	Clear, time-bound targets in National Broadband Plan for reducing cost & increasing penetration
Primary (A12)	Universal Service/Access Funds (USAFs) used to subsidise access for underserved and underprivileged populations
Primary (A4)	ICT regulatory decisions informed by adequate evidence
Primary (A13)	Specific policies to promote free or low-cost access
Primary (A11)	To what extent have Universal Access/Service Funds (USAF) prioritised infrastructure investments that will reduce costs and increase access for underserved communities and market segments?
Primary (A2)	To what extent does the government ICT regulator perform its functions according to published and transparent rules, with the ICT regulatory decisions influenced by public consultations?
Primary (A14)	To what extent do the country's broadband policies include strategies and programs to improve access and use among women and girls?
Secondary (WI)	Market Concentration, as Herfindahl-Hirschman Index (HHI)
Secondary (ITU_K)	Existence of National Broadband Plan
Secondary (WI_C)	Mobile broadband connections (% of all connections)
Secondary (ITU_EYE)	Cluster of ITU indicators (bundled)
Secondary (ITU_N)	Percentage of individuals using the Internet
Secondary (Mobile_ penet)	Market penetration, as mobile internet unique subscribers
Secondary (Smart_ Phadpt)	Smartphone adoption

TYPE (CODE)	INFRASTRUCTURE SUB-INDEX INDICATORS
Primary (A1)	Flexible, technology & service neutral ICT licensing frameworks
Primary (A8)	Specific guidelines for public infrastructure funding & telecoms subsidies
Primary (A9)	Time bound government plan to make available broadband spectrum for high-speed data services
Primary (A10)	Transparent, competitive, and fair process for increasing spectrum availability
Primary (A3)	To what extent does the regulator and/or the competition commission enforce the country's ICT licensing requirements and regulations?
Primary (A6)	National policies in place facilitating efficient access to public rights of way & tower zoning permissions
Primary (A7)	To what extent does the government facilitate resource sharing across telecommunications operators?
Secondary (ITU_A)	International bandwidth per internet user (bits/s)
Secondary (ITU_L)	Investment per telecom subscriber (average over 3 years)
Secondary (WB_A)	Secure internet servers (per 1 million people)
Secondary (WBE)	Access to electricity (% of population)[2]
Secondary (PCH)	Existence of Internet Exchange Points (IXPs)
Secondary (ITU_EYEbn)	Existence of number portability between mobile network operators
Secondary (3G)	3G Network coverage, by population

Index Computation

There are several steps in the process of constructing a composite index. Some of those involve deciding which statistical methods to use in the normalisation and aggregation processes. In arriving at that decision, we took into account several factors, including the purpose of the Index, the number of dimensions we were aggregating, and the ease of disseminating and communicating it in an understandable, replicable, and transparent way.

The following seven steps summarise the computation process of the Affordability Drivers Index:

1. Take the data for each indicator from the data source for the 86 countries originally covered by the Web Index and the 23 countries that are exclusively part of the ADI, for a total sample of 109 countries. Impute missing data for every secondary indicator for the sample of 109 countries over the period 2015–2019 where appropriate. Broadly, the imputation of missing data was done using two methods: country-mean substitution if the missing number is in the middle year (e.g., have

2 In previous editions of the ADI this indicator was coded as IEAA, Electrification Rate by the International Energy Agency. Due to limited data availability this indicator has changed this year to WBE, Access to electricity (% of population) from the World Bank. Correlation tests have been performed to ensure that the change does not translate into significant changes to the model.

data for 2016 and 2018, but not for 2017), or taking arithmetic average growth rates on a year-by-year basis. For the indicators that did not cover a particular country in any of the years, no imputation was done.

2. Normalise the full (imputed) dataset using z-scores (z=(x-mean)/standard deviation), making sure that for all indicators, a high value is 'good' and a low value is 'bad'.[3]
3. Where applicable, cluster some of the variables, taking the average of the clustered indicators post-normalisation. For the clustered indicators, this clustered value is the one to be used in the computation of the Index components.
4. Compute the two sub-index scores using arithmetic means, using the clustered values where relevant.
5. Compute the min-max values for each z-score value of the sub-indices, as this is what will be shown in the visualisation tool and other publications containing the sub-index values. The formula for this is: [(x –min)/(max – min)]*100.
6. Compute overall composite scores by averaging the sub-indexes (at z-score level).
7. Compute the min-max values (on a scale of 0–100) for each z-score value of the overall composite scores, as this is what will be shown in the visualisation tool and other publications containing the composite scores.

3 As an exception, for the WI indicator, a higher value indicates a more concentrated market and, therefore, weights as a more negative value in the Index's calculation.

A global coalition working to make broadband affordable for all

Alliance for Affordable Internet | 1100 13th St NW, Suite 800, Washington DC 20005

www.a4ai.org | Twitter: @a4a_internet