A4AI ALLIANCE FOR AFFORDABLE INTERNET

The Affordability Report 2013

Contents

Executive Summary

Three in five of the world's people are not connected to the Internet. This digital divide hampers economic and social progress.

This Affordability Report represents the first step in the Alliance for Affordable Internet's ongoing efforts to understand why some countries have succeeded in making Internet access affordable and universal, and what others can do to catch up quickly.

The report presents the results of a new 'Affordability Index', which ranks nations across communications infrastructure and access and affordability indicators fundamental to achieving affordable Internet. It also explores the key barriers to affordability.

The Affordability Index: An Overview

The Affordability Index is a composite index, comprised of both secondary and primary data. It covers 46 emerging and developing countries. Malaysia tops the overall rankings followed by Mauritius, Brazil, Peru and Colombia – all middle-income countries. Morocco is the top performing developing country.

Top Five Emerging Countries	Top Five Developing Countries
Malaysia	Morocco
Mauritius	Indonesia
Brazil	Kenya
Peru	Nigeria
Colombia	Uganda

The Affordability Index also considers the cost of Internet access for the two billion people living on less than US$2/day in the countries we studied. For this population, the UN Broadband Commission target of entry-level broadband services priced at less than five percent of average monthly income is far from attainable. In the 46 countries studied, the cost of entry-level broadband exceeds on average 40 percent of monthly income for people living on US$2/day, and in many countries exceeds 80 percent or even 100 percent of monthly income.

Ensuring Affordability: Towards a Path for Development

Our research also identifies a number of key barriers to affordability and suggests ways to overcome them. These include:

Competition Is Not A Silver Bullet. It is clear that competition alone, or the introduction of a particular number of players in a market, is not a sufficient condition to ensure affordable access to broadband services in emerging and developing countries. Well-rounded policies and regulations that stimulate both supply of and demand for broadband are a must.

Overcoming the Infrastructure Barrier Remains a Priority to Ensure Affordable Access. Investment is not taking place fast enough to connect rural, remote and peri-urban areas. Further, the generally low infrastructure scores suggest a need for policies and regulations that lower investment risk and cost structure for industry while creating an enabling environment, with clear incentives and increased regulatory certainty. This can be done by facilitating resource sharing across network operators and other infrastructure providers as well as by creating public-private partnerships (PPPs) to subsidize infrastructure projects. PPPs that are based on an open access framework can play an important role in accelerating mobile broadband infrastructure. Regulators across all regions must take steps to establish clear policies and plans that support the expansion of broadband networks and reduce the costs associated with market entry. Spectrum policy and regulation must also be forward-looking and provide the opportunity for investment while also encouraging innovation.

Reducing Prices and Closing the Access Gap for Under-Served Populations is Critical for Development. Through subsidies and market incentives, governments play a key role in securing the benefits of infrastructure investment in non-commercially attractive areas while at the same time addressing the socio-economic barriers that prevent the market from achieving scale. Targeted subsidies are often administered through universal access and service funds (UASFs). The experience of Morocco, Pakistan and Colombia demonstrate how targeted subsidies are harnessed to bolster local content and services. Another direct approach to fostering demand is to reduce taxation on the telecommunications sector.

National leadership is a critical ingredient to maximize the positive impact of broadband on jobs, productivity, economic growth and innovation. Many countries have taken steps in the right direction by implementing broadband policies, but many of these policies are far from being comprehensive enough to address the barriers to improving affordability. Several countries are moving towards broad-based plans that seek to create a virtuous cycle, expanding usage at the base of the pyramid while also strengthening infrastructure investment to meet expanding demand.

Conclusions

Broadband markets that price Internet access out of reach for the majority of people are neither socially nor economically efficient. Although there is a need for much more detailed research into the drivers of affordability, this report already suggests several relatively straightforward steps that countries can consider to break this impasse. Liberalizing the telecommunications industry is not enough; the state also has an important role to play, through facilitating or underwriting strategic investments, subsidizing access for underserved communities and implementing effective and transparent regulations, such as open access to subsidized infrastructure. However, active participation of all stakeholders in hammering out a concrete plan of action is perhaps the single most important step to move from high prices and low uptake to low prices and high demand.

Introduction

Introduction

Three in five of the world's people are not connected to the Internet.[1] In developing countries only 31 percent of people are online; and in the world's 49 least developed countries, less than 10 percent have Internet access.[2] This digital divide hampers economic and social progress, as the Web is becoming increasingly important in the developing world as a tool to set up businesses, drive improvements in health care and education, and increase government accountability to citizens.

Infrastructure barriers to access are dissipating as undersea cables and wireless networks spread around the world, but high costs remain a major bottleneck to bringing the next billions online. In developed countries, the average cost of broadband Internet[3] is one to two percent of monthly per capita income – less than a daily coffee. In the developing and emerging countries covered by the Affordability Index, an entry-level broadband subscription costs over 27 percent of average earnings, as much as most people allocate to basic food needs and much more than they can spend on health and education combined. For those with a poverty line income of US$2/day, the cost of broadband is even more prohibitive, reaching almost 90 percent of monthly income in Zimbabwe, for instance.

The goal of the Alliance for Affordable Internet (A4AI)[4] is to achieve the UN Broadband Commission target of entry-level broadband services priced at less than five percent of average monthly income. This will enable billions of people in developing countries to come online and make universal access a reality.

This Affordability Report represents the first step in A4AI's ongoing efforts to understand why some countries have succeeded in making Internet access affordable and universal, and what others can do to catch up quickly. As this report shows, the key to affordability is the policy and regulatory environment that shapes incentives for the different actors in the market. We argue that reforms to make markets more open, competitive and socially efficient are often the best and quickest way to drive prices down and increase broadband use.

The report is organized into two main sections. Part I presents the Affordability Index methodology and key findings. Part II explores the key barriers to affordability, and proposes a set of policy recommendations that will help to bring affordable access to the next several billion people in developing countries.

[1] "The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries email, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc). Access can be via a fixed or mobile network". Revision and Additions to the Core List of ICT Indicators, Partnership on Measuring ICT for Development, 2009

[2] ITU 2013 & Broadband Commission 2013: http://www.itu.int/go/mis2013

[3] "Fixed (wired) broadband refers to fixed (wired) highspeed access to the public Internet (a TCP/connection), at downstream speeds equal to, or greater than, 256 kbit/s. This can include for example cable modem, DSL, fibre-to-the home /building and other(wired) broadband subscriptions. It excludes wireless broadband services." "Wireless broadband refers to wireless highspeed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than 256 kbit/s. This can include satellite Internet, terrestrial fixed wireless and fixed wireless access. It also includes broadband terrestrial mobile wireless access." Measuring WSIS Targets, A Statistical Framework, Partnership on Measuring ICT for Development, (ITU), 2011.

[4] A4AI is a global coalition of more than 30 members drawn from the public, private and not-for-profit sectors. Please visit a4ai.org for more details.

The Affordability Index: An Overview

1. The Methodology

The Affordability Index is a composite index, comprised of both secondary and primary data. We combine secondary quantitative data on infrastructure, access and affordability collected from reliable sources, with primary data gathered via a multi-country expert survey. (Please see Annex A for a detailed description of the methodology).

Following the methodology established for the World Wide Web Foundation's (Web Foundation's) Web Index[5], countries receive an overall 0 to 100 score for the Index, with higher scores indicating higher current levels of affordability combined with strong policy and regulatory conditions for advancing affordability in the future. The primary survey assesses each country's policy and regulatory environment against a set of best practices that Alliance members have identified as critical to open, fair and effective broadband markets (see Text Box and Annex B).

A4AI Policy and Regulatory Best Practice Recommendations

1. Liberalized market with an open, competitive environment[1]

a. Nurture healthy market competition.
b. Regulator established as an effective and independent expert agency[2].
c. Promote evidence-based policymaking and regulatory processes that include meaningful public participation.

2. Policies and practices to encourage lower cost structure for industry

a. Streamlined processes for infrastructure deployment and sharing[4].
b. Effective spectrum management[6]
c. Enable innovative usage through unlicensed spectrum and opportunistic reuse within rules that avoid harmful interference (e.g. harmful interference with spectrum assigned to mobile operators). Established local and/or regional Internet exchange point (IXP)[7].
d. No luxury taxation or excessive customs/tariffs on telecom goods and services required for Internet access[8,9].
e. Effective Universal Service Fund Administration (if one exists)[10].
f. Reasonable effort to systematize data collection of key indicators to measure effectiveness.

Guiding Principles

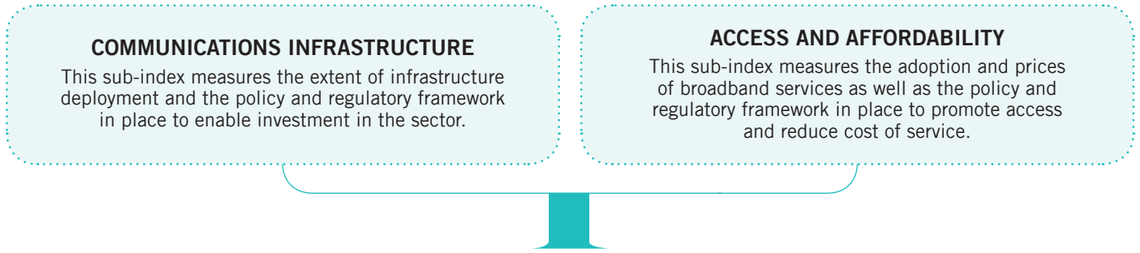
- Internet freedom and the fundamental rights of expression, assembly, and association online must be protected.
- Access to the Internet is a significant enabler of economic growth and human development.
- Open and competitive markets are the most effective way to drive reduced delivery costs, affordable consumer pricing, and new innovations.

[1] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 2
[2] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 1.4
[3] Potentially in conjunction with the national body responsible for anti-trust regulation or competition policy, as appropriate.
[4] Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world, 2010 (Berkman Center) – Chapter 1.3 and 4
[6] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 4
[7] Assessment of the impact of Internet Exchange Points – empirical study of Kenya and Nigeria, 2012 (Analysys Mason, Internet Society)
[8] Global Mobile Tax Review 2011, 2011 (Deloitte, GSMA)
[9] Mobile telephony and taxation in Kenya, 2011 (Deloitte, GSMA)
[10] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 6.4

We also compute two sub-indices. The communications infrastructure sub-index focuses on policy issues and procedures that reduce entry barriers and encourage competition, such as simplified licensing frameworks. The access and affordability sub-index focuses on direct interventions to provide free or subsidized access, such as the efficient use of universal access funds (Please see Annex C for detailed Index structure).

[5] Designed and produced by the Web Foundation, the Web Index is the first multi-dimensional measure of the World Wide Web's contribution to development and human rights globally. It covers 81 countries, incorporating indicators that assess the areas of universal access; freedom and openness; relevant content; and empowerment. See: thewebindex.org

Affordability Index Structure



Affordability Report data were collected in tandem with the 2013 Web Index. The Web Index covers 81 countries, whilst the Affordability Index focuses exclusively on the 46 emerging and developing countries in this sample, where affordable access to the Internet remains a critical development concern.

Given the wide income disparities that exist in many emerging and developing countries, "average" GNI per capita is not a very useful metric to assess the real costs of Internet access. This Affordability Report therefore also measures affordability for the world's poorest people (those living on US$2/day or less) and not just for a hypothetical "average" earner.

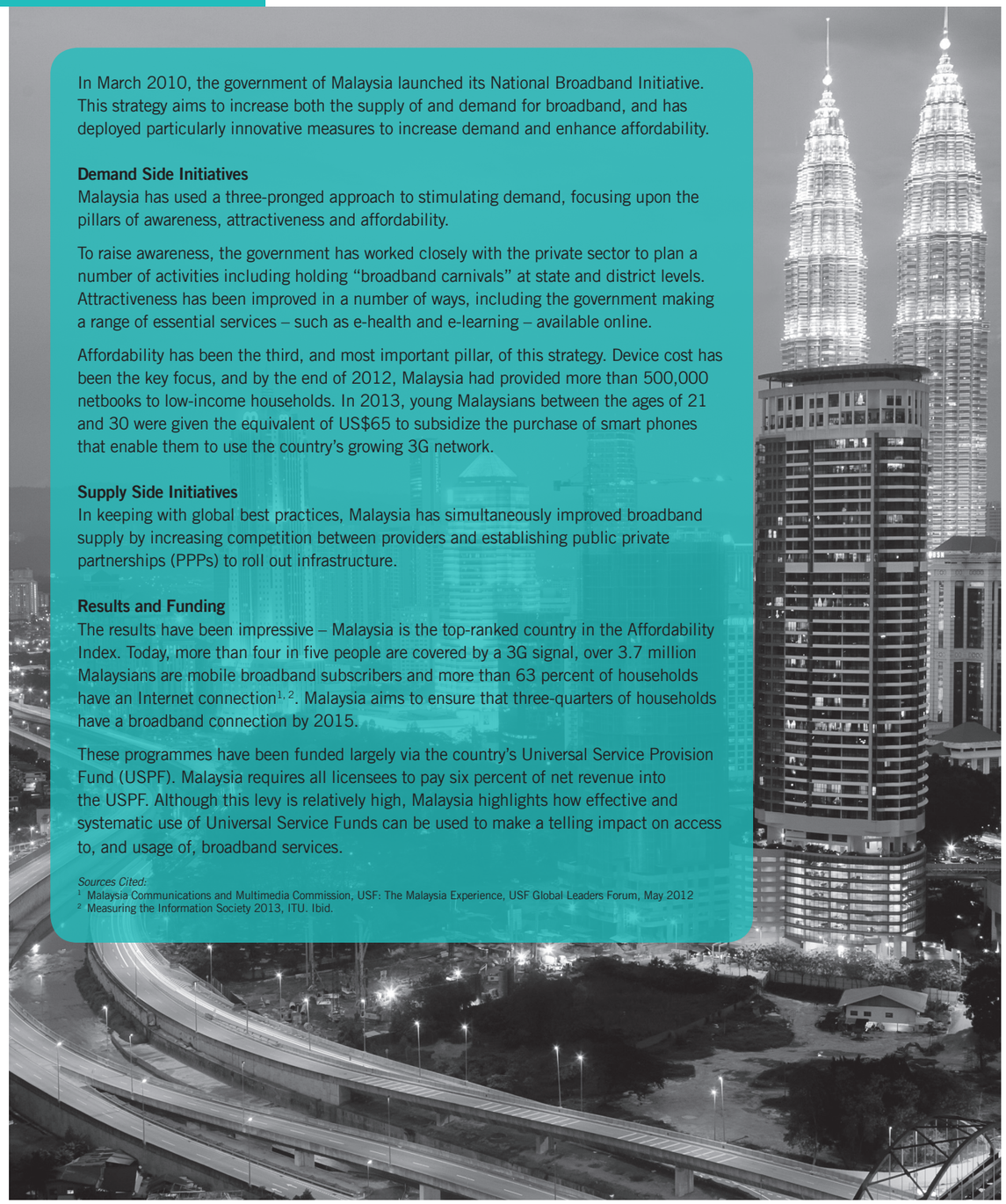
Affordability Index 2013: Results

Rank (Overall Composite Score)		Sub-index: Communications Infrastructure	Sub-index: Access and Affordability	Affordability Index: Overall Composite Score
1	Malaysia	71,6	72,2	68,6
2	Mauritius	61,7	76,9	65,5
3	Brazil	52,6	72,6	58,0
4	Peru	61,1	60,8	56,4
5	Colombia	55,9	63,6	55,0
6	Thailand	48,6	66,8	52,6
7	Morocco	40,5	72,1	50,9
8	Ecuador	46,6	64,3	50,1
9	Costa Rica	38,7	71,5	49,5
10	Mexico	42,6	65,1	48,2
11	Jordan	48,7	58,3	47,9
12	South Africa	41,4	63,2	46,5
13	Hungary	48,5	53,6	45,2
14	China	50,4	48,1	43,3
15	Jamaica	29,3	69,6	43,2
16	Botswana	51,7	46,0	42,9
17	Indonesia	47,3	49,8	42,5
18	Kenya	34,2	60,1	40,7
19	Nigeria	30,7	61,2	39,3
20	Namibia	31,5	57,9	38,0
21	Uganda	33,4	54,8	37,3
22	Tanzania	40,4	43,1	34,9
23	Turkey	32,3	49,6	33,9
24	Senegal	34,3	47,3	33,7
25	Zambia	32,7	48,0	33,2
26	Egypt	31,1	48,5	32,5
27	Venezuela	32,6	45,3	31,7
28	Tunisia	36,6	39,6	30,8
29	India	27,3	45,6	28,8
30	Ghana	29,9	42,2	28,4
31	Philippines	24,0	46,6	27,5
32	Pakistan	27,9	42,2	27,2
33	Argentina	28,9	37,9	25,5
34	Kazakhstan	17,5	49,4	25,4
35	Nepal	28,5	37,8	25,2
36	Bangladesh	28,2	36,9	24,6
37	Burkina Faso	20,2	41,3	22,4
38	Rwanda	38,0	21,5	21,6
39	Benin	21,0	37,0	20,5
40	Cameroon	21,4	30,4	17,1
41	Viet Nam	14,6	28,7	12,3
42	Mali	13,9	26,2	10,5
43	Ethiopia	0,0	28,2	3,7
44	Zimbabwe	4,7	23,1	3,6
45	Malawi	26,2	0,0	3,1
46	Yemen	11,3	9,7	0,0

Malaysia tops the overall rankings followed by Mauritius, Brazil, Peru and Colombia – all middle-income countries. Morocco is the top performing developing country (see Annex D for detailed Index ranks by groups of countries).

With a score of 68 out of 100, Malaysia performs well across both sub-indices. The country has focused on expanding 3G infrastructure through public-private partnerships (PPP), while also reducing infrastructure deployment costs. Access has been enhanced through the provision of subsidized training and equipment to low-income communities, funded by an effective universal service fund. Further details are provided in the case study below.

Case Study: Malaysia



In March 2010, the government of Malaysia launched its National Broadband Initiative. This strategy aims to increase both the supply of and demand for broadband, and has deployed particularly innovative measures to increase demand and enhance affordability.

Demand Side Initiatives

Malaysia has used a three-pronged approach to stimulating demand, focusing upon the pillars of awareness, attractiveness and affordability.

To raise awareness, the government has worked closely with the private sector to plan a number of activities including holding "broadband carnivals" at state and district levels. Attractiveness has been improved in a number of ways, including the government making a range of essential services – such as e-health and e-learning – available online.

Affordability has been the third, and most important pillar, of this strategy. Device cost has been the key focus, and by the end of 2012, Malaysia had provided more than 500,000 netbooks to low-income households. In 2013, young Malaysians between the ages of 21 and 30 were given the equivalent of US$65 to subsidize the purchase of smart phones that enable them to use the country's growing 3G network.

Supply Side Initiatives

In keeping with global best practices, Malaysia has simultaneously improved broadband supply by increasing competition between providers and establishing public private partnerships (PPPs) to roll out infrastructure.

Results and Funding

The results have been impressive – Malaysia is the top-ranked country in the Affordability Index. Today, more than four in five people are covered by a 3G signal, over 3.7 million Malaysians are mobile broadband subscribers and more than 63 percent of households have an Internet connection[1, 2]. Malaysia aims to ensure that three-quarters of households have a broadband connection by 2015.

These programmes have been funded largely via the country's Universal Service Provision Fund (USPF). Malaysia requires all licensees to pay six percent of net revenue into the USPF. Although this levy is relatively high, Malaysia highlights how effective and systematic use of Universal Service Funds can be used to make a telling impact on access to, and usage of, broadband services.

Sources Cited:

[1] Malaysia Communications and Multimedia Commission, USF: The Malaysia Experience, USF Global Leaders Forum, May 2012

[2] Measuring the Information Society 2013, ITU. Ibid.

Morocco, the top performing developing country with a score of 51 out of 100, scores close to Malaysia on the access and affordability sub-index. This is the result of strong demand-driven policies, encapsulated in "2013 Digital Morocco", a plan aimed at intensifying usage through a focus on affordability of both devices and access. However, with mobile broadband prices hovering around 20 percent of per capita monthly incomes, and about 80 percent of monthly incomes for those living in poverty (less than $2 per day), Morocco's government still has much work to do. Morocco plans to remove luxury taxes, equip all schools in Morocco with broadband access and ICT training, and establish PPPs to offer devices to marginalised sub-segments of the population.

Top Five Emerging Countries	Top Five Developing Countries
Malaysia	Morocco
Mauritius	Indonesia
Brazil	Kenya
Peru	Nigeria
Colombia	Uganda

At the bottom of the table, countries such as Ethiopia, Vietnam or Zimbabwe illustrate a complex set of dynamics that affect market incentives, investment and ultimately affordability. Ethiopia – which scores just 3.7 out of 100 – has effectively no competition in the market. The national telecom operator remains a monopoly provider for all services and has failed to expand access across the country, especially to rural and underserved communities. Zimbabwe, ranked third last, has introduced some competition for mobile broadband services, but has largely failed to support infrastructure expansion and has also imposed strict barriers to entry and to investment in general.

Similarly, in Vietnam, which scores 12.3 out of 100, the government has taken steps to liberalize the market for mobile-broadband access, but has largely been ineffective when it comes to expanding access to rural and remote areas. Over 70 percent of the country's population live in rural areas, including about 36 million citizens who live under the US$2/day poverty line and effectively have no possibility of access. This situation persists despite the presence of several operators in the market. Vietnam also suffers from a lack of relevant local content to serve the needs of local businesses and citizens.

For Two Billion People in Developing Countries, Affordable Broadband Access is Impossible

The emerging and developing countries examined in this study are home to around two billion people living on less than US$2/day. For this population, the UN Broadband Commission target of entry-level broadband services priced at less than 5 percent of average monthly income is far from attainable.

In the 46 countries studied, the cost of entry-level broadband exceeds on average 40 percent of monthly income for people living on US$2/day, and in many countries exceeds 80 percent or even 100 percent of monthly income.[6] In Zambia, for example, there are over 10 million people who live in extreme poverty. These Zambians would have to spend at least 35 percent of their income to afford mobile broadband services, or 135 percent of their income to obtain fixed broadband. In China, close to 360 million people live on US$2/day or less and would have to spend 25 - 38 percent of their income to access mobile or fixed broadband.

If one considers the gender gap in incomes across all the countries studied, the affordability picture would be even bleaker. In several countries in Africa, women earn on average 30 - 50 percent less than men, limiting women's purchasing power and therefore their ability to benefit from broadband in general.[7]

Cost of Broadband for Populations Living in Poverty in Selected Countries

Selected Country Examples	Affordability Index Rank	Total pop. living on less than $2 per day	Fixed Broadband as % of income at $2 per day	Mobile Broadband as % of income at $2 per day
China	14	359,575,234.51	38.0	25.4
Colombia	5	7,016,538.13	30.7	48.9
Nigeria	19	124,159,302.92	63.9	21.3
Peru	4	3,577,091.91	29.5	23.8
Philippines	31	36,817,437.65	37.5	18.9
Zambia	25	10,444,784.70	134.9	35.4

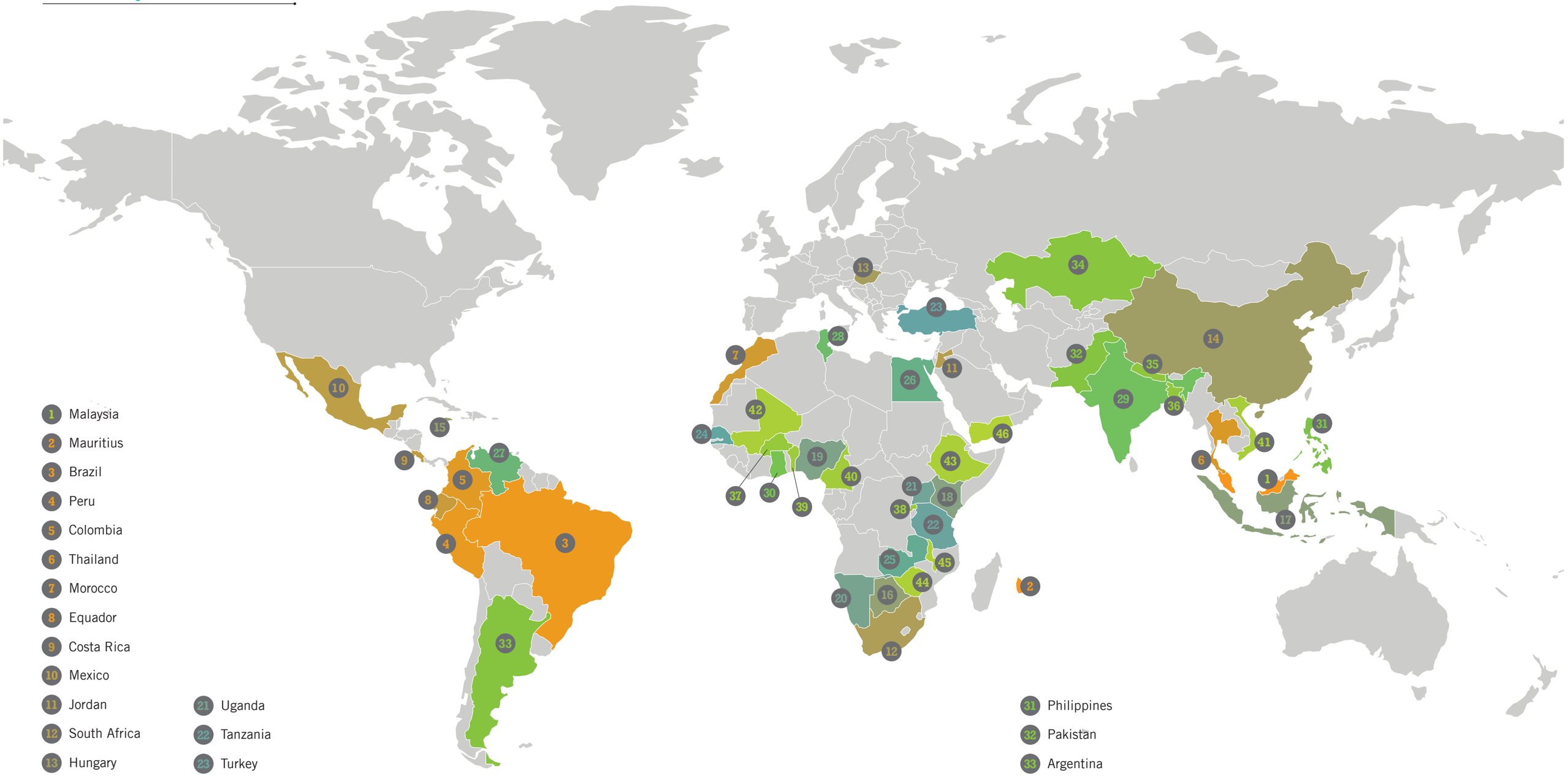
This stark illustration of the scale of the challenge means an integrated approach is needed. Holistic policies that consider broadband access as a tool for socio-economic development and increase both supply of and demand for broadband must be put in place.

One glimpse of how this could be achieved is available in Colombia, which ranks fifth on the Affordability Index. Through the *Vive Digital* (Digital Life) programme and the country's universal access fund, the country is subsidizing the expansion of fibre networks in rural areas and has an extensive program to provide digital literacy support to individuals and micro and small businesses. These efforts aim to increase affordable access across the country – but with a clear focus on providing affordable access to broadband in areas currently not served at all.

[6] These calculations are based on the assumption that those earning US$2 earn the maximum US$2 a day. Additional research will be conducted to assess the extent of affordability based on average and minimum incomes for those living under the US$2/day poverty line.

[7] Research ICT Africa: Lifting the gender veil on ICT statistics in Africa (2013). Available at: http://www.researchictafrica.net/presentations/Presentations/2013_Gillwald_Deen-Swarray_-_Lifting_the_gender_veil_on_ICT_statistics_in_Africa.pdf

Affordability Around the World



1 Malaysia
2 Mauritius
3 Brazil
4 Peru
5 Colombia
6 Thailand
7 Morocco
8 Equador
9 Costa Rica
10 Mexico
11 Jordan
12 South Africa
13 Hungary
14 China
15 Jamaica
16 Botswana
17 Indonesia
18 Kenya
19 Nigeria
20 Namibia
21 Uganda
22 Tanzania
23 Turkey
24 Senegal
25 Zambia
26 Egypt
27 Venezuela
28 Tunisia
29 India
30 Ghana
31 Philippines
32 Pakistan
33 Argentina
34 Kazakhstan
35 Nepal
36 Bangladesh
37 Burkina Faso
38 Rwanda
39 Benin
40 Cameroon
41 Viet Nam
42 Mali
43 Ethiopia
44 Zimbabwe
45 Malawi
46 Yemen

Ensuring Affordability: Towards a Path for Development

1. Competition Is Not A Silver Bullet

Our research suggests that many emerging and developing countries have made some gains towards affordability by promoting a competitive landscape and making national level commitments to the development of the Information and Communications Technology (ICT) sector. However, it is clear that competition alone, or the introduction of a particular number of players in a market, is not a sufficient condition to ensure affordable access to broadband services in emerging and developing countries. A4AI's preliminary research is inconclusive in terms of the correlation between market concentration and broadband prices, which confirms our view that, in addition to market structure, other important factors have a role to play in a truly competitive market.

Affordable universal access depends on multiple variables, from government's ability to partner with the private sector to support infrastructure investment and sharing agreements, to clear and effective regulation, to universal access strategies and funding mechanisms informed by the needs and realities of those they intend to serve. Understanding these interlinked factors allows countries to carve a path to affordability that focuses on eliminating current market or regulatory barriers, while at the same time implementing a framework for progress that recognizes inequality of access as a long-term economic inefficiency, and is therefore designed to improve social as well as commercial outcomes.

Clarifying the Role of Policy and Regulation

Policy
A policy framework provides a vision of the ICT sector with specific guidance for achieving that vision. Policies generally establish principles and strategic objectives for the sector, such as for example, to accelerate rollout of broadband networks, to develop relevant applications and content, and to facilitate adoption and use. Guidance is then provided on how to achieve the strategic objectives, and may include increasing competition, improving sector governance, reorganizing state-owned operators, and extending service to underserved areas.

Regulation
Regulation involves the design and enforcement of legal instruments to establish the rules of the market and implement the strategic objectives established by the policy. For example, to ensure increased and effective competition, regulators need instruments that facilitate market entry (e.g., technology and service-neutral licensing regimes) as well as instruments that define a clear scope for intervention should anti-competitive behavior be identified (e.g., regulations that require on-going market analysis and outline the regulatory intervention necessary if an operator is determined to have Significant Market Power).

Ensuring Effectiveness
Many countries adopt the right policies and regulations, but fail to enforce and implement them in a strategic and planned manner. Others are still far from achieving a policy and regulatory framework that is forward looking and coherent with the pace of development in the sector. This is often due to insufficient oversight or regulatory development. For example, one in three developing countries have no legal definition for "significant market power" or proper regulatory guidance in place to conduct thorough and on-going market analysis, two important instruments for determining market capture and to assess the impact of policy and regulations in the market and for socio-economic development. In many other countries, regulators are not compelled to hold public consultation periods during rule making, or provide comparative market and tariff information to users and potential entrants. This creates uncertainty in the market place and deters potential investors and innovators from entering the market.

Policy makers and regulators have the responsibility to establish a level playing field that incentivizes service providers to enter the market; to innovate by enhancing the efficiency and cost-effectiveness of infrastructure investments; and to deliver services to all, including in currently underserved geographies.

Uganda's experience in the mobile market illustrates how an overly competitive market can in fact be detrimental to users. Fast and consistent economic growth attracted a large number of operators to Uganda, who received licenses to enter the market starting in 2009. However, lack of proper planning and sequencing of steps towards a new market structure created the conditions for intense price wars that first led to lower prices but negatively impacted upon quality of service, and ultimately led to steep tariff increases to generate revenue. Recently, the takeover of Warid Telecom by Bharti Airtel suggests that the complex process of operator consolidation is underway.

Ghana: Competition and the Spread of Mobile Broadband

Ghana's rapid progress in recent years is testament to the power of increased competition coupled with open access policies.

Prior to 2010, nearly all of Ghana's international bandwidth was provided by one submarine fibre optic cable, SAT3[1].Between 2010 and 2013, four fibre optic submarine cables were landed in Ghana, boosting the amount of international bandwidth from 320 Gigabytes to over 12 Terabytes. The arrival of operators Main One, Glo-1, WACS and ACE, unleashed significant competition for international bandwidth and a dramatic fall in the wholesale cost of capacity. Today, the cost of an high speed broadband connection (i.e., E1) in Ghana is less than US$1,000, down from as much as $12,000 in 2006.

This decrease in the wholesale cost has contributed to more widespread and affordable access to broadband in Ghana, mostly via mobile broadband. In 2012, mobile broadband penetration stood at 33 percent, up from 0.24 percent in 2009, giving Ghana a rank of 49 out of 146 countries covered by the ITU's State of Broadband report.[2] The falling cost of prepaid broadband has been instrumental in increasing access for Ghanaian mobile users. Between 2011 and 2012, for example, the cost of a prepaid 500MB mobile broadband package fell by a quarter, from the equivalent of US$14 down to $10.60[3]

Despite the fall in consumer prices and Ghana's impressive mobile broadband penetration ranking, the Government of Ghana is not resting on its laurels. The government recognizes that broadband remains relatively expensive for most Ghanaians and a largely urban phenomenon.

The challenge of taking broadband nationwide – especially to rural areas – has led the government to focus on creating an enabling environment for the development of a terrestrial fibre optic broadband infrastructure that will span the country. Mobile operators in Ghana have taken advantage of this to roll out a number of terrestrial fibre optic networks, including a national backbone network run by the National Communications Backbone Company, a subsidiary of Vodafone, Ghana. Crucially, this national backbone network is intended to be managed on an open access basis, encouraging competition, transparent pricing, interoperability with other infrastructure, devolved local applications and solutions, and, of course, increased access to, and usage of, broadband.[4]

Ghana has placed great faith in open access. It has created a technology-neutral regulatory environment that encourages open access so that in the next few years Ghana will see an increase in broadband infrastructure and services. Support for open access is likely to go beyond the provision of a policy and regulatory environment. Ghana's Ministry of Communications is currently consulting stakeholders over a "new" broadband policy that seeks to make the development of open access broadband infrastructure through public private partnerships (PPP) a central pillar of Ghana's socio-economic development. Clearly, Ghana has been heartened by the experience of increased competition amongst submarine infrastructure providers, and is seeking to ensure that the same happens amongst terrestrial fibre operators.

Sources Cited:
[1] ITU Statistics Database
[2] Broadband Commission, The State of Broadband 2013: Universalizing Broadband
[3] ITU: Measuring the Information Society, 2013 ibid.
[4] Spintrack/InfoDev, Open Access Models: Options for Improving Backbone Access in Developing Countries, 2005, http://www.infodev.org/infodev-files/resource/InfodevDocuments_10.pdf

Overcoming the Infrastructure Barrier Remains a Priority to Ensure Affordable Access

Of the 46 emerging and developing countries examined by the Affordability Index, only five countries score higher on the communications infrastructure sub-index than on the access and affordability sub-index. This suggests that **in most developing countries, further infrastructure investment is needed. Investment is not taking place fast enough to connect rural, remote and peri-urban areas. Further, the generally low infrastructure sub-index scores suggest a need for policies and regulations that lower investment risk and cost structure for industry while creating an enabling environment, with clear incentives and increased regulatory certainty.**

Policy makers and regulators can lower investment risk and cost structures for industry by facilitating resource sharing across network operators and other infrastructure providers as well as by creating public-private partnerships (PPPs) to subsidize infrastructure projects. Many countries in the early stages of network development use PPPs to develop and operate a network while sharing the risks and rewards between public and private sector partners. PPPs can reduce capital risk for network operators and reduce operational risk for government, and they played an important role in bringing international connectivity through submarine fibre optic cable to nearly all countries.

In many countries, one of the most urgent infrastructure-related barriers to affordability is the lack of an open access terrestrial fibre backbone. A lack of terrestrial fibre prevents many countries from fully enjoying the cost savings associated with the introduction of submarine cable competition, since retail operators still encounter huge monopoly prices at the backbone level. A lack of terrestrial fibre also limits the value of Internet exchange points (IXPs), an otherwise important mechanism that reduces the need to route local Internet traffic through expensive international links. Without a terrestrial backbone network in place, a significant amount of domestic traffic must still travel through an international backbone rather than the IXP. In Uganda, the recent announcement of the rollout of a fibre optic network in Kampala holds the promise of reducing broadband access costs and improving local ISPs' service quality and reliability through shared infrastructure[8].

PPPs that are based on an open access framework can play an important role in accelerating mobile broadband infrastructure. Open access policies include co-location requirements, local loop unbundling, bitstream access, and wholesaling, and are strongly correlated with low cost Internet access. The OECD defines open access as "an arrangement that provides effective, wholesale access to network infrastructure or services at fair and reasonable prices, and on transparency and non-discriminatory terms."[9] Open access policies can be adopted in a wide range of settings, including Internet exchange points (IXP), undersea fibre and mobile networks, and can lead to improved competition by ensuring that new market entrants can connect to existing networks instead of absorbing the costs of building their own infrastructure.

One example can be found in Rwanda. Through a PPP with Korea Telecom (KT), the government is creating a 4G Long Term Evolution (LTE) nationwide network. KT has agreed to invest US$140 million to build the network in three years in exchange for an exclusive wholesale business license from the Government of Rwanda for 4G and beyond over the next 25 years. The partnership will also lead to cutting costs for retail operators who will gain access to wholesale mobile broadband.

The wholesale nationwide operator model promotes the expansion of network infrastructure by reducing capital costs and operating expenses. An extensive 2009 Berkman Center study of the broadband marketplace in developed countries found that open access policies are correlated with higher speeds and lower cost access globally.[10] However, a strong regulator is key to ensuring that both passive and vertical providers are following open access principles, providing wholesale access at fair and reasonable prices without discrimination.

The failure of some wholesale national LTE networks, most recently in Kenya in 2012, illustrates the difficulty of aligning incentives of retail operators with public policy goals. **More research and analysis is required to understand the conditions that make the wholesale model successful and applicable in the contexts of emerging and developing countries.**

[6] See: http://www.google.com/get/projectlink/
[9] OECD website: http://oecdinsights.org/2013/03/05/stimulating-competition-through-open-access-networks/
[10] Berkman Centre: Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world (2010). Available at: http://cyber.law.harvard.edu/newsroom/broadband_review_final

Other forms of infrastructure sharing are also possible between network operators through the provision of wholesale mobile access to Mobile Virtual Network Operators (MVNOs), unbundling mobile and fixed broadband services, and IXPs. IXPs, which allow Internet Service Providers (ISPs) to exchange domestic traffic amongst one another, are particularly important for lowering costs and increasing speed of Internet traffic. Kenya's IXP has reduced international connectivity charges by over $1.5 million and increased mobile data revenues by an estimated $6 million.[11] Zimbabwe's Internet Exchange (ZINX) provides a counterexample - by failing to align revenue and cost-sharing among local ISPs, the exchange has led to ISPs duplicating caching infrastructure and reduced the availability of international bandwidth to Zimbabwe's ISP ecosystem.

Finally, the availability of spectrum for mobile broadband is critical. Regulators across all regions must take steps to establish clear policies and plans that support the expansion of broadband networks and reduce the costs associated with market entry. **Spectrum policy and regulation must be forward-looking and provide the opportunity for investment while also encouraging innovation.** For certain bands that support broadband network service (including 700 and 800 MHz bands), regulators can consider making available the spectrum at lower or no cost, but with appropriate obligations for investment in infrastructure and roll out of services, especially in rural areas and with affordable prices established to serve poor populations.

Innovative players can take advantage of unused or lightly used spectrum to deliver affordable Internet connectivity in developing countries without causing interference. For example, regulators can designate bands of spectrum as free for all purposes (i.e., spectrum commons), which allows for experimentation and innovation, a necessary condition to ensure that the industry is focusing on low cost solutions to provide services to all users, including those with limited incomes. A range of new devices harnesses this spectrum to provide rural access to broadband, or provide machine to machine (M2M) communication amongst devices that help monitor road congestion, improve healthcare patient tracking or track energy use. For regulators, promoting unlicensed use is a low risk proposition, yet one that needs to be considered in the context of current benefits to affordability and long term regulatory implications. Many developing countries have few terrestrial broadcast stations, providing room for experimentation, and policy makers can promote entrepreneurship and innovation in this space.

Reducing Prices and Closing the Access Gap for Under-Served Populations is Critical for Development

Our research shows that, at the global level, a large majority of people for whom broadband access is unaffordable live, not in the poorest countries, but in large (lower) middle-income countries such as India, Brazil, and China, with high income inequality. We found that many of these countries serve high-end broadband customers in urban areas quite well. However, poorer communities in urban and rural areas remain under-served. Demand is weak due to limited disposable income, low levels of digital literacy and limited relevant content. In addition, competition is limited, giving network operators little incentive to invest in new markets. These mechanisms reinforce one another, creating an "access trap" by further limiting demand and discouraging new market entrants. For the hardest to reach, policy makers must make tough decisions about targeting subsidies to maximize social and economic impact. In addition, they should support industry players to experiment with innovative wireless solutions that harness under-utilized spectrum bands to deliver rural access more effectively and affordably.

Through subsidies and market incentives, governments play a key role in securing the benefits of infrastructure investment in non-commercially attractive areas while at the same time addressing the socio-economic barriers that prevent the market from achieving scale. Such initiatives should subsidize infrastructure that will reduce costs and increase access for underserved communities and market segments. Yet governments should also consider ways to increase digital education, promote local and relevant content development, and support ICT entrepreneurship, so affordable access will drive demand for these services, in turn driving additional investment from private sector players seeking to expand mobile broadband markets and unlock related opportunities.

Targeted subsidies are often administered through universal access and service funds (UASFs). While many UASFs have faced implementation difficulties due to political interference, limited administrative capacity or challenges in designing appropriate and fundable projects, others have successfully expanded access for end users in underserved communities or expanded local content and the use of broadband in the provision of public services. The experience of Morocco, Pakistan and Colombia demonstrate how targeted subsidies are harnessed to bolster local content and services. Morocco's UASF, launched in 2004, largely targets the education system. Over 150,000 teachers have been trained to use digital devices with locally relevant educational content, and 40,000 science and engineering students now have broadband connected laptops. Colombia's *Vive Digital* broadband plan invested significantly in access terminals in low-income neighborhoods, and provided over 19,000 training sessions to businesses to help them to connect more effectively with the state online. Further research is needed to understand how best to develop policies and regulations that catalyze an effective private sector response.

[11] Internet Society: Assessment of the impact of Internet Exchange Points (2012). Available at: http://www.internetsociety.org/ixpimpact

Case Study: Pakistan

Pakistan provides an example of how governments can work hand-in-hand with private sector companies to connect underserved communities.

In 2009, the government of Pakistan implemented Broadband for Small Cities and Towns. In addition to providing access, this programme tackled the multifaceted challenges of increasing individual broadband subscriptions, connecting public institutions, providing shared access, and creating greater levels of affordability.

The programme was implemented by the Pakistan Universal Services Company using a one-time least cost subsidy model and a well-defined range of criteria. Operators received a one-off subsidy after they had successfully connected an identified small town or city; obtained a specified number of subscribers that used the service for more than 90 days; established community broadband centres (CBCs) that will run for at least five years; and provided higher secondary schools, libraries and colleges in the towns and cities with 2mbps connectivity for one year, five computers and basic training for teachers.

In addition to stipulating a minimum period for which services must be available, Pakistan has attempted to make services sustainable by creating competition between operators, regulating prices and undertaking rigorous audits to ensure objectives are being met. To create competition between operators, two or more operators whose bids were similarly priced were asked to share an allotted subsidy and all were authorized to provide connectivity in a single town or small city. In order to make services affordable, operators were not allowed to charge rural dwellers more than they charged users in large cities where the cost of providing infrastructure is theoretically cheaper. Furthermore, as a final measure, all operators that received a subsidy had to sign a guarantee which requires them to pay back the subsidy if the shared access points they have established are not operational for a minimum of five years.

The innovative, holistic and highly accountable nature of Pakistan's Broadband for Small Cities and Towns initiative provides an example of how governments can, and indeed must, do much more than simply facilitate broadband connectivity for underserved communities. The initiative has led to approximately 500,000 new broadband subscribers in more than 300 previously underserved towns and cities, created 300 CBCs and connected 1100 high schools, colleges and libraries.

Unfortunately, Pakistan also demonstrates how well-endowed USFs can become cash cows for other arms of government. In June 2013, Pakistan's Economic Coordination Committee (ECC) order the USF to transfer Rs. 50 billion ($465M) to the Ministry of Finance to pay off debts related to the energy crisis. USF policy and regulations should clearly address these possibilities and put safeguards in place to prevent such fund migration.

Another direct approach to fostering demand is to reduce taxation on the telecommunications sector. Despite a commitment to broadband access, many countries tax hardware required for broadband infrastructure and consumer devices such as PCs and mobile phones. In 13 African countries, taxes account for more than 20 percent of total ownership of mobile phones.[12]

In Nigeria, where taxation of the sector has reached extraordinary levels, the Nigerian Communications Commission (NCC) took the initiative to address this problem and established the "Industry Working Group on Multiple Taxation" to eliminate illegal or parallel taxes and multiple regulations imposed on telecommunication infrastructure. Colombia's experience clearly illustrates how tax reductions can have an impact upon adoption. As a result of tax reductions, PC penetration increased by 100 percent in two years, and Colombia is now home to the lowest hardware prices in the region.[13]

[12] Analysys Mason: Lifting Barriers to Internet Development in Africa – Suggestions for Improving Connectivity (2013). Available at: http://www.analysysmason.com/Research/Content/Reports/Internet-development-Africa-May2013/

[13] Pepper, Robert and John Garrity: The Global Information Technology Report (2013). Prepared for the World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf

National Commitments to a Broadband Strategy for Affordability are Essential

National leadership is a critical ingredient to maximize the positive impact of broadband on jobs, productivity, economic growth and innovation. **Whilst many countries have taken steps in the right direction by implementing broadband policies,**[14] **many of these policies are far from being comprehensive enough to address the barriers to improving affordability.** Broadband plans differ across contexts, and address a range of supply-side (competition, spectrum allocation, reducing infrastructure deployment costs) and demand-side (affordability of devices and access, ICT skills development, online and local content and services) policy issues. Several countries are moving towards broad-based plans that seek to create a virtuous cycle, expanding usage at the base of the pyramid while also strengthening infrastructure investment to meet expanding demand.[15] A recent ITU Broadband Commission analysis found that "the introduction or adoption of a broadband plan is associated with a 2.5% higher fixed broadband penetration, and 7.4% higher mobile broadband penetration", suggesting that national commitment to overcoming infrastructure barriers and lowering prices for underserved communities can have high payoffs.[16]

Nigeria received high marks in the Index for setting clear, time-bound targets and interventions for reducing cost, have broad-based plans that address both supply- and demand-side policies.

Nigeria – The Impact of the National Broadband Plan

Nigeria's National Broadband Plan 2013 – 2018 outlines how the Federal Government of Nigeria will increase broadband penetration five-fold to 30 percent by 2018. At present, Internet usage in Nigeria stands at 33 percent, up from 28 percent in 2011 and 24 percent in 2010.[1] However, the broadband penetration rate is only 6 percent. Although cheaper mobile Internet packages have helped increase mobile Internet penetration to 26 percent, the government of Nigeria is aware that the majority of Nigerians cannot afford Internet and broadband services at their current prices. Eighty-four percent of Nigerians live on less than two dollars per day and the World Bank notes that 63 percent live on less than $1.25.[1] A prepaid mobile broadband user subsisting on $2 per day who wanted to use 1GB of data per month would have to spend 22 percent of their monthly income to do so.

In order to increase access to, and usage of, broadband the Federal Government of Nigeria appreciates that Nigeria's broadband ecosystem must be improved. The 2013-2018 Broadband Plan notes that this ecosystem is made up of four critical parts: Investment, Availability, Relevance and Affordability (see Figure 1).

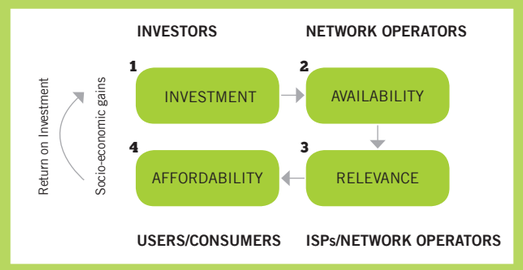


Figure 1: Nigerian Broadband Ecosystem – Nigeria's 2013 – 2018 Broadband Plan

Increased investment will lead to enhanced broadband networks and, therefore, higher levels of broadband availability. Services will need to be more relevant to stimulate demand and so lead people to take advantage of the addition network availability. In turn, these more relevant services must be more affordable in order to drive further demand and generate the return on investment necessary to induce more investment.

Understandably, activities aimed at improving affordability have been given high priority in the 2013- 2018 Broadband Plan. For example, immediate strategic priorities for the Nigeria government are to remove import taxes on mobile devices and to encourage manufacturers of mobile handsets to produce smartphones that cost less than US$30, so that the cost of getting online is reduced. Infrastructure sharing will be encouraged by offering financial incentives to operators. Also, the government will work with Nigeria's regulator, the National Communications Commission (NCC), to define an open access regime that should, amongst other things, encourage the competitive and innovative use of broadband infrastructure, as well as use transparent and non-discriminatory pricing for capacity.

Nigeria's 2013-2018 Broadband Plan can provide an important model for other governments. The time frame for achieving its goals is ambitious and the Plan was developed using a consultative process that involved a wide range of stakeholders, including youth groups, government agencies, civil society, international experts and the private sector. This has generated a genuine feeling of ownership amongst stakeholders and a sense of accountability in government. The Plan also places an appropriate level of emphasis on both supply and demand-side policies; especially those demand-side policies that focus upon improving affordability. This focus on affordability and recognition that the challenge is multifaceted is necessary for all governments intent on increasing broadband use.

[1] *Sources Cited:* ITU Statistics Database 2012

[14] UN Broadband Commission, 2012.
[15] Global Information Technology Report, ibid.
[16] UN Broadband Commission, Planning for Progress – Why National Broadband Plans Matter, 2013.

In Brazil, the National Broadband Plan approved by Presidential Decree galvanized cooperation between the legislative and executive branches of government to: pass laws making broadband infrastructure equipment and smartphone handsets tax exempt; auction licenses for mobile broadband; encourage the development of IXPs; and award the 450 MHz spectrum band to 4G licensees to incentivize the expansion of rural mobile broadband. The private sector responded in kind, expanding infrastructure and bringing the penetration rate for active mobile broadband subscriptions from 22 percent in 2011 to 37 percent in 2012. The country is seeing rapid increases in adoption rates, yet significant challenges still remain. In 2012, approximately half of Brazilians used the Internet. Despite this progress, wealth and geography continue to dictate connectivity. Urban areas generally have a 43 percent penetration rate compared with 10 percent in rural areas.[17] As in other countries that sit near the top of the Affordability Index, policy has played a key role in underpinning progress. The National Broadband Plan (PNBL) and the National Program for IT in Education (Proinfo) can both be credited for the increased percentage of connected Brazilian homes.

In Colombia, less than 20 percent of municipalities were connected to the fibre-optic network before the launch of *Vive Digital* plan in 2011. The plan called for tripling the number of municipalities connected in three years. In 2013, Colombia has already reached this goal, and is on track to connect 96 percent of villages by 2014.[18] Investing in a national network bolstered operator confidence, encouraging new market entrants to a recent 4G telecom licenses auction resulting in improved competition, data growth, and network capacity.

Kenya, with a strong commitment to broadband policy, transitioned from a country with limited national broadband infrastructure to a country that dramatically expanded competition and demand. In the years leading up to 2009, broadband prices were steadily decreasing due to liberalization of international gateway and national backbone network provision. In that year, Kenya benefited from the arrival of four international submarine fibre cables, resulting in a 90 percent decrease in tariffs. When operators were reluctant to pass on these savings to consumers, the Communications Commission of Kenya (CCK), the country's regulator, stepped in to ensure fair play.

Further, in 2008, Kenya switched to a technology and service neutral licensing framework, giving licensees the choice of the technology and equipment they will use to provide service, as well as the ability to provide a range of services and applications to meet shifting market demand. This flexibility encouraged Kenya Telecom and Orange to invest heavily in infrastructure, and a recent 4G license was offered under an open access model to a consortium of firms meeting a set of minimum requirements. Along with falling costs, Kenyan network operators were able to stimulate enough demand for mobile telephony through services such as mPesa that it became profitable for network operators to invest in expanding infrastructure and services. A similar trend is currently underway in mobile broadband.

[17] Brazilian Internet Steering Committee (CGI.br), "Survey On The Use Of Information And Communication Technologies In Brazil 2011."Available at: http://op.ceptro.br/cgi-bin/cetic/tic-domicilios-e-empresas-2011.pdf
[18] Diego Molano Vega, The Global Information Technology Report (2013). Prepared for the World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf

Conclusions and Recommendations

Broadband markets that price Internet access out of reach for the majority of people are neither socially nor economically efficient. By restricting access to affluent segments of the population, they hold back progress in areas such as health and education, and sacrifice tangible GDP growth that would result from higher connectivity levels. While companies with a dominant market position may be able to reap large returns, the incentives for others to invest and innovate are suppressed, meaning infrastructure stagnates, costs remain high and demand remains low.

Although there is a need for much more detailed research into the drivers of affordability, this report already suggests several relatively straightforward steps that countries can consider to break this impasse. Liberalizing the telecommunications industry is not enough, as we have seen; the state also has an important role to play, through facilitating or underwriting strategic investments, subsidizing access for underserved communities and implementing effective and transparent regulations, such as open access to subsidized infrastructure. Civil society groups, for their part, need to be involved in policy discussions alongside government and market players, ensuring that the demands and needs of all social groups are considered, and providing independent evidence of what works. Active participation of all stakeholders in hammering out a concrete plan of action is perhaps the single most important step to move from high prices and low uptake to low prices and high demand.

Expand Broadband Infrastructure Through the Implementation of Innovative Open Access and PPP Projects

Policy Makers and Regulators	• Develop forward-looking sector policies and strategies with clear incentives and targets for broadband infrastructure investment. • Target public infrastructure investment to areas where investments are deemed non-commercially feasible and develop investment plans through consultation with market players and stakeholders. • Ensure that subsidized infrastructure is competitively and transparently procured and offers access or capacity to all market players in a non-discriminatory way. • Implement passive infrastructure sharing regulations and enforce implementation by monitoring the market and intervene if effective sharing is not taking place.
Private Sector	• Establish local and regional Internet exchange points (IXPs) with support for local caching and fair and transparent rules for participation. • Explore PPP and other investment sharing arrangements to advance innovation and sector expansion. • Enable access at reasonable market rates to international gateway, cable and services.
Civil Society Organizations, Foundations, Academia	• Engage with public and private sectors to ensure that demands and needs of all population groups and users are reflected in infrastructure investment plans. • Participate actively in planning and decision making processes.

Reduce Prices of Broadband and Close the Access Gap

Policy Makers and Regulators	• Streamline licensing process by implementing technology and service neutral licenses. • Eliminate luxury taxation or excessive customs/tariffs on telecoms goods and services required for Internet access. • Bring government services and information online to make the Web a more useful tool, helping to increase demand. • Consider providing or facilitating free or paid public access points. • Facilitate sharing of passive infrastructure, such as backbone, ducting, right of way, and cell towers.
Private Sector	• Support and invest in innovative technologies that can lower cost of service delivery. • Develop services and products that target specific segments and their needs (e.g., women, farmers, schools and health care). • Develop low cost devices. • Disclose pricing and service options to end users.
Civil Society Organizations, Foundations, Academia	• Implement digital literacy and education programs that empower citizens to strategically use ICTs for their benefit (from business development to access to information and entertainment). • Research and assess development impact and cost effectiveness of various public sector broadband interventions in their countries and regions. • Promote and support innovation in service delivery and application development, especially focused on applications and services to meet the demands of populations living in poverty.

Support the Development of National Broadband Plans

Policy Makers and Regulators	• Develop and implement comprehensive national broadband strategies and plans with the input of all stakeholders, including those from other sectors. • Use USF to support rural infrastructure development, public shared access and locally relevant content and application development. • Ensure sufficient broadband-capable spectrum is made available, allocated and used efficiently.
Private Sector	• Innovate in using unlicensed spectrum. • Integrate digital literacy programs in customer engagement initiatives aiming to increase demand. • Support the development of relevant local content in local languages.
Civil Society Organizations, Foundations, Academia	• Actively engage in coordinated efforts to collect sector data and conduct on-going analysis of developments and impact. • Participate and engage with forums and working groups such as the Partnership on Measuring ICT for Development and other international indicators and statistical efforts to harmonize data collection and research efforts across regions.

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Annex

Annex A: Affordability Index Methodology

Affordability Index – Methodology

The Affordability Index is a composite measure that summarizes in a single (average) number the level of Internet affordability in various countries. Benefiting from the research framework established for the Web Index, the Affordability Index covers the same 81 countries studied and focuses on two key aspects determining affordability: communications infrastructure and access and affordability.

Methodology

Two types of data were used in the construction of the Index: existing data from other data providers ("secondary data"), and new data gathered via a multi-country expert survey ("primary data") that was specifically designed by the Web Foundation and its advisers. These primary data, based on and aligned with the A4AI best practices document, attempt to assess to what extent 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 country experts must provide evidence and justification for each score. The scores were checked and verified by a number of peer and regional reviewers (for more details see www.theWebindex.org).

Data sources and data providers

The sources of the secondary data that we use are highly credible organizations that produce consistent and valuable data in various fields. We are grateful to those organizations for allowing us to use and reproduce their data. A complete list of data sources and the individual indicators used from each is available on the Web Index Website: www.theWebindex.org

Indicator Inclusion Criteria

We searched a very large number of international databases to find indicators that measure or proxy the dimensions under study.

Before an indicator is included in the Index, it needs to fulfil five basic criteria:

1. Data providers have to be credible and reliable organizations, who are likely to continue to produce these data (e.g., theirs is not a one-off dataset being published).
2. Data releases should be regular, with new data released at least every three years.
3. There should be at least two data years for each indicator, so that basic statistical inference could be made.
4. The latest data year should be no older than three years back from publication year.
5. 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.

Index Computation

There are several steps in the process of constructing a composite Index. Some of those involve deciding which statistical method to use in the normalization 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 9 steps summarize the computation process of the Index:

1. Take the data for each indicator from the data source for the 81 countries covered by the Index for the 2007-2012 time period (or 2013, in the case of the Web Index expert assessment survey).

   Impute missing data for every secondary indicator for the sample of 81 countries over the period 2007-2012. Some indicators were not imputed as it was not logical to do so. None of the primary data indicators were imputed. Hence the 2013 Affordability Index is very different from the 2007-2012 Indexes computed using secondary data only.

   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 2008 and 2010 but not 2009), or taking arithmetic average growth rates on a year-by-year basis. Most missing data for 2011 and 2012 are imputed by applying the arithmetic average growth rate for the period, to the 2010 number. For the indicators that did not cover a particular country in any of the years, no imputation was done for that country/indicator.

2. Normalize the full (imputed) dataset using z-scores, making sure that for all indicators, a high value is "good" and a low value is "bad".
3. Cluster some of the variables (as per the scheme in the tree diagram), taking the average of the clustered indicators post normalization. For the clustered indicators, this clustered value is the one to be used in the computation of the Index components.
4. Compute the 2 component scores using arithmetic means, using the clustered values where relevant.
5. Compute the min-max values for each z-score value of the components, as this is what will be shown in the visualization tool and other publications containing the component values (generally, it is easier to understand a min-max number in the range of 0 - 100 rather than a standard deviation-based number). The formula for this is: [(x - min)/(max - min)]*100.
6. Compute sub-Index scores by averaging the z-scores of the relevant components for each sub-Index.
7. Compute the min-max values for each z-score value of the sub-Indexes, as this is what will be shown in the visualization tool and other publications containing the Sub-index values.
8. Compute overall composite scores by averaging the sub-Indexes.
9. 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 visualization tool and other publications containing the composite scores.

Choice of weights

This year, given the feedback provided to the Web Index to last year, we have assigned equal weights to each sub-index.

Source: The Web Index 2013 (thewebindex.org)

Annex B: A4AI Best Practices Recommendations

Guiding Principles

- Internet freedom and the fundamental rights of expression, assembly, and association online must be protected.
- Access to the Internet is a significant enabler of economic growth and human development.
- Open and competitive markets are the most effective way to drive reduced delivery costs, affordable consumer pricing, and new innovations.

Policy and Regulatory Best Practice Recommendations

1. Liberalized market with an open, competitive environment[1].

a. Nurture healthy market competition.

- Streamlined licensing process with no legal barriers to market entry.
- Ensure a competitive market structure, with limited or no national government ownership of end user service providers.
- Available access at reasonable market rates to international gateway or cable.
- Transparent disclosure of pricing and service options to end users.
- Permit pre-paid and tiered pricing models.
- Remove barriers to crossing national borders with network infrastructure and traffic.

b. Regulator established as an effective and independent expert agency[2].

- Structural independence from other governmental entities and telecom providers.
- Sufficient and predictable funding stream.
- Creates regulatory certainty with clear, transparent regulations.
- Authority, jurisdiction, accountability and capacity to enforce regulations.
- Effective regulation of anti-competitive behavior when necessary[3].
- Advocate for consumer interests including both immediate service and sustainability.

c. Promote evidence-based policymaking and regulatory processes that include meaningful public participation.

2. Policies and practices to encourage lower cost structure for industry.

a. Streamlined processes for infrastructure deployment and sharing[4].

- Efficient and effective access to public rights of way and tower zoning[5].
- Coordinated with other infrastructure projects (fiber or duct laid during road works).
- Facilitate sharing of backbone, ducting, right of way, and cell tower passive infrastructure.
- Target public infrastructure investment to market failures, through consultation with market players and other stakeholders. Ensure that subsidized infrastructure is competitively and transparently procured and offers access or capacity to all market players in a non-discriminatory way, so as to achieve end user affordability.

b. Effective spectrum management.[6]

- Ensure sufficient broadband-capable spectrum is made available and used efficiently.
- Open, transparent, and fair allocation and licensing mechanism.
- Harmonization of spectrum to global standards.
- Technology and service neutral licensing allowing flexible use.

c. **Enable innovative usage through unlicensed spectrum and opportunistic reuse within rules that avoid harmful interference (e.g. harmful interference with spectrum assigned to mobile operators). Established local and/or regional Internet exchange point (IXP).**[7]

- Transparent and fair rules for participation.
- Support for local data caching.

d. No luxury taxation or excessive customs/tariffs on telecom goods and services required for Internet access[8,9]

- Including handsets, set-top boxes, data/voice service, and infrastructure equipment.
- Tax rate at comparable level to basic goods and services rather than luxury goods.

e. Effective Universal Service Fund Administration (if one exists)[10]

- Non-discrimination (fair collection and distribution of funds, including non-carriers).
- Transparent and consultative processes, incorporating stakeholder inputs and priorities.
- Clear target goals and monitoring of effectiveness and impact of USF programmes and projects.
- Prioritize one-time infrastructure and other expenditures to enable access.
- Target any ongoing subsidies to individuals rather than providers.

f. Reasonable effort to systematize data collection of key indicators to measure effectiveness.

- Pricing, speed, adoption rates, spectrum utilization, peering.
- Encourage participation in the ITU Partnership on Measuring ICT for Development[11].
- Collection and disaggregation (such as by gender) of usage statistics to identify gaps and opportunities[12].

[1] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 2
[2] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 1.4
[3] Potentially in conjunction with the national body responsible for anti-trust regulation or competition policy, as appropriate.
[4] Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world, 2010 (Berkman Center) – Chapter 1.3 and 4
[5] A Concrete Build-out Plan to Bring High-Speed Fiber Connections to Every Community, 2009 (New America Foundation)
[6] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 4
[7] Assessment of the impact of Internet Exchange Points – empirical study of Kenya and Nigeria, 2012 (Analysys Mason, Internet Society)
[8] Global Mobile Tax Review 2011, 2011 (Deloitte, GSMA)
[9] Mobile telephony and taxation in Kenya, 2011 (Deloitte, GSMA)
[10] Telecommunications Regulatory Handbook 10th Anniversary Edition, 2011 (World Bank, infoDev, ITU) – Chapter 6.4
[11] http://www.itu.int/ITU-D/ict/partnership/index.html
[12] Policy Recommendations to Address the Mobile Phone Gender Gap, 2011 (GSMA mWomen Programme)

Annex C: Affordability Report Structure

Code	Indicator Name	Code	Indicator Name
ITU G	% of population covered by mobile cellular network	ITU B	Broadband subscribers per 100 populations
WI D	Base stations per capita	WI B	Number of mobile subscribers per 100 population
ITU A	International bandwidth (Mbps) per Internet user	WI C	Number of mobile broadband connections per 100 population
ITU O	Broadband speeds (peak Mbps, Average Mbps)	ITU R	Cost of fixed band per capita
ITU L	Investment per telecom subscriber	ITU S	Cost of mobile band per capita
WB A	Secure Internet servers per million population	ITU N	Cost of bandwidth per MB
IEAA	Electrification rate	WEF B	Internet access in schools
ITU K	Existence of national broadband plan	ITU Eye	Cluster of ITU indicators
PCH	Number of IXPs	WI	HHI
Q53	To what extent are ICT licensing frameworks flexible, simple, and technology and service neutral?	Q71	Have definitions and scope of the USF been expanded to include mobile and fixed line broadband?
Q55	To what extent does the regulator and/or the competition commission enforce the country's ICT licensing requirements and regulations?	Q72	To what extent have USF infrastructure investments prioritised infrastructure that will reduce costs and increase access for underserved communities and market segments?
Q59	To what extent are national-level policies or rules in place to facilitate efficient access to public rights of way and tower zoning permission?	Q73	To what extent have USF funds been used to subsidise broadband access for end users in underserved and underprivileged populations?
Q60	Does government require the installation of ducts and conduits for fiber cables wherever feasible during public works projects, such as roadworks or housing projects?	Q54	To what extent does the government ICT regulator perform its functions according to public and transparent rules and precedents?
Q61	To what extent are there proactive initiatives to encourage competition in the transmission part of the Internet network, for example through utilizing the communications networks of electric power utilities or railroads?	Q54	To what extent does the government ICT regulator perform its functions according to public and transparent rules and precedents?
Q62	To what extent does the government facilitate resource sharing across telecommunications operators, at least for passive infrastructure?	Q56	To what extent is ICT regulatory decision-making informed and influenced by adequate evidence?
Q63	To what extent are open and competitive tendering rules applied to subsidized infrastructure projects?	Q57	To what extent are ICT regulatory decisions influenced by public consultations?
Q64	To what extent has government defined specific, limited and well-justified guidelines for public infrastructure funding or subsidies in telecommunications?		
Q65	To what extent are decisions around public funding in or subsidies to telecommunications infrastructure determined through consultation with market players as well as consumers/end users?	Q70	To what extent are there transparent and fair rules promoting unlicensed spectrum usage?
Q66	To what extent has government established a time-bound target and plan for making sufficient spectrum available within a reasonable period of time to meet the growing demand for high-speed data services?		
Q67	To what extent has the government taken concrete steps to implement its plans for making more spectrum available for broadband?	Q70	To what extent are there transparent and fair rules promoting unlicensed spectrum usage?
Q68	To what extent is there a transparent, competitive process for obtaining spectrum via public auctions?		

Annex D: Emerging Countries*

Rank (Overall Composite Score)		Sub-index: Communications Infrastructure	Sub-index: Access and Affordability	Affordability Index: Overall Composite Score
1	Malaysia	71,6	72,2	68,6
2	Mauritius	61,7	76,9	65,5
3	Brazil	52,6	72,6	58,0
4	Peru	61,1	60,8	56,4
5	Colombia	55,9	63,6	55,0
6	Thailand	48,6	66,8	52,6
7	Ecuador	46,6	64,3	50,1
8	Costa Rica	38,7	71,5	49,5
9	Mexico	42,6	65,1	48,2
10	Jordan	48,7	58,3	47,9
11	South Africa	41,4	63,2	46,5
12	Hungary	48,5	53,6	45,2
13	China	50,4	48,1	43,3
14	Jamaica	29,3	69,6	43,2
15	Botswana	51,7	46,0	42,9
16	Namibia	31,5	57,9	38,0
17	Turkey	32,3	49,6	33,9
18	Venezuela	32,6	45,3	31,7
19	Tunisia	36,6	39,6	30,8
20	Argentina	28,9	37,9	25,5
21	Kazakhstan	17,5	49,4	25,4

** = Upper middle income countries as defined by World Bank.*

Annex D: Developing Countries*

Rank (Overall Composite Score)		Sub-index: Communications Infrastructure	Sub-index: Access and Affordability	Affordability Index: Overall Composite Score
1	Morocco	40,5	72,1	50,9
2	Indonesia	47,3	49,8	42,5
3	Kenya	34,2	60,1	40,7
4	Nigeria	30,7	61,2	39,3
5	Uganda	33,4	54,8	37,3
6	Tanzania	40,4	43,1	34,9
7	Senegal	34,3	47,3	33,7
8	Zambia	32,7	48,0	33,2
9	Egypt	31,1	48,5	32,5
10	India	27,3	45,6	28,8
11	Ghana	29,9	42,2	28,4
12	Philippines	24,0	46,6	27,5
13	Pakistan	27,9	42,2	27,2
14	Nepal	28,5	37,8	25,2
15	Bangladesh	28,2	36,9	24,6
16	Burkina Faso	20,2	41,3	22,4
17	Rwanda	38,0	21,5	21,6
18	Benin	21,0	37,0	20,5
19	Cameroon	21,4	30,4	17,1
20	Viet Nam	14,6	28,7	12,3
21	Mali	13,9	26,2	10,5
22	Ethiopia	0,0	28,2	3,7
23	Zimbabwe	4,7	23,1	3,6
24	Malawi	26,2	0,0	3,1
25	Yemen	11,3	9,7	0,0

*= Countries which are not high income or upper middle income as defined by World Bank.