IDB

UNIVERSAL ACCESS TO BROADBAND AND SERVICE PROGRAMS

A Comparative Study

Antonio García Zaballos
and Nathalia Foditsch

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Inter-American Development Bank

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About the Authors and Contributing Organizations

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The Asian Development Bank's (ADB) vision is an Asia and Pacific region that is free of poverty. Its mission is to help the member countries that are in the process of developing to reduce poverty and improve the livelihoods of the people. Despite the region's many successes, it represents two-thirds of the world's poor, with 1.8 billion people living on less than US$2 a day and 903 million struggling on less than US$1.25 a day. The ADB is committed to poverty reduction through inclusive and sustainable economic and environmental growth and regional integration. Based in Manila, the ADB has 67 shareholding

member countries, of which 48 are from the Asia and Pacific region. Its main instruments to assist developing members are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

The Inter-American Development Bank (IDB) supports efforts by Latin American and Caribbean countries to reduce poverty and inequality. It aims to bring about development in a sustainable and environmentally friendly way. The IDB is the largest source of development financing for the Latin American and Caribbean region, with a strong commitment to achieve measurable results, increased integrity, transparency, and accountability. It has an evolving reform agenda that seeks to increase its development impact in the region. The IDB provides loans, grants, and technical assistance, as well as develops research. Its member include 48 shareholding countries, 26 of which are from the Latin American and Caribbean region.

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Glossary of Terms

ADSL (Asymmetric Digital Subscriber Line): A form of Digital Subscriber Line technology, a data communications technology that enables faster data transmission over copper telephone lines than that of a conventional voice-band modem. It accomplishes this by utilizing frequencies that are not used by voice telephone calls.

Backbone: A local backbone refers to the main network lines that connect several local area networks. The result is a wide-area network linked by a backbone connection. Internet backbones are huge data pipes (routes) that connect networks, countries, and even continents.

Bandwidth: The range of frequencies available to be occupied by signals. In analogue systems, it is measured in terms of Hertz (Hz) and in digital systems, in bits per second (bit/s). The higher the bandwidth, the greater the amount of information that can be transmitted in a given time.

Digital dividend: The spectrum efficiency gain due to the switchover from analogue to digital in the frequency bands currently allocated to broadcasting.

Last mile: The final leg of delivering connectivity from a communications provider to a customer.

Spectrum: The radio-frequency spectrum waves used as a transmission medium for cellular radio, radio paging, satellite communication, over-the-air broadcasting, and other services.

VoIP: Any of a family of methodologies, communication protocols, and transmission technologies for delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet.

WiMAX: Fixed wireless standard IEEE 802.16 that allows for long-range wireless communication at 70 Mbps over 50 kms. It can be used as a backbone Internet connection to rural areas.

Source: United Nations (2011).

Foreword

We are currently experiencing one of the greatest transformations of our economy and social life—the Digital Economy Transformation—and broadband has emerged as the true backbone of this transformation. As governments all around the world become aware of this reality, they are introducing broadband in their economic development agenda as a flagship element to ensure that all of their citizens are included in the digital revolution, with the goal of bridging the existing social divide in regards to digital access.

However, in the Latin American and Caribbean (LAC) region, it is possible to identify different types of digital divides, such as (i) between the LAC countries and other regions of the world, (ii) within the LAC countries, and (iii) between the geographic areas and economic levels of households in any specific country. In addition, these divides take different dimensions depending on access, quality, price, use, and speed. In fact, the proactive policies that could be implemented on a public and/or private level may vary according to the combinations of the different factors mentioned above, and they should take into account the maturity of the broadband market as it relates to the these factors.

The telecom sector is no longer just a private sector; there is a need for an active role on the part of governments to reduce not only the digital divide but, in so doing, also reduce the social divide. It seems that the region is at a crossroads; failure to act effectively could result in even larger connectivity gaps with spillover effects that could increase the social divide, or effective action that increases connectivity could decrease the social divide.

The sum of the benefits that broadband can bring to the economy is leading many governments to announce significant broadband development programs to take advantage of the new and different technologies that are available. These programs include improvements in the delivery and accessibility of education and training; promotion of equality and inclusion of rural or disadvantaged communities; support to civil disaster relief; remote medical assistance (known as "telemedicine"); and increased competition, social cohesion, and interaction.

To achieve the goals of universality and affordability in broadband, it is essential for stakeholders in both the private and public sectors to cooperate; this is important because broadband is a highly capital intensive sector that is subject to public regulation. It is equally important to attract private and public capital, which will require innovative financing solutions. As we witness the Digital Economy Transformation, this publication arrives at an opportune time. We must address the issue of strategic regulation and finance of broadband collectively and promptly, as the universality of access to digital technologies is critical to the achievement of sustainable development goals.

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Executive Summary

Broadband is key to inclusive growth. It contributes substantially to social and economic development in areas such as job creation, business investment, online services (e.g., e-health and e-learning), among others. Many countries now recognize the need to ensure that the benefits of broadband are not only enjoyed by a fraction of the population; rather that everyone should enjoy them. For this reason, universal access and service (UAS) broadband programs have been specifically developed to meet the needs of people in urban and remote areas.

Several countries have initiated substantial reforms of their telecommunications framework in order to advance broadband towards universal usage. Broadband is now, for example, the centerpiece of the national information and communication technology (ICT) development plans of the United Kingdom and the United States, where considerable efforts are being made to transform the existing Universal Service Funds (USF) and to support the investments that are being made by the private sector (e.g., public–private partnerships (PPP) and stimulus packages). Similarly, in India, broadband is at the heart of a much broader economic development strategy and is one of the pillars of India's UAS program. South Korea is the most outstanding example of national policy driving higher levels of penetration and usage throughout the economy.

Countries in Asia and the Latin American and Caribbean (LAC) regions, which are subject to greater financial constraint and less favorable socioeconomic conditions, have been following different approaches. Most UAS policies are generally more nascent, reflecting the need for objectives, strategies, and capital investment. In particular, these countries are prone to the numerous barriers that prevent the supply of and demand for UAS broadband. These challenges will require greater political commitment to and a higher priority for broadband initiatives and relevant strategies that are well planned and comprehensive. Table 1 summarizes the challenges that are faced in the development of UAS broadband; it also provides examples of strategies that can be implemented to successfully overcome these challenges.

TABLE 1: Challenges to the Development of Universal Broadband Access and the Strategies to Overcome Them

	Challenges	Strategies
Demand side	• Low level of purchasing power and relatively high service prices • Low level of education, especially regarding ICT skills • Limited availability of (and high taxes on) consumer electronic equipment • Limited availability of relevant local content	• Subsidies for service fees or equipment purchases • Mandated discounts for certain classes of end users • Reduced taxation for broadband-related services and equipment • ICT training (in schools, institutes, etc.) • Public telecenters
Supply side	• Limited financial resources • Limited in-country infrastructure, especially national fiber optic networks, and limited or very expensive infrastructure for international connectivity • Limited amount of spectrum available for wireless broadband • Inadequate coverage of wireless broadband networks • Limited prospects for economic growth	• Levies on operators to finance USFs • Additional sources of funding (e.g., from international institutions) • Grants to build infrastructure, mandatory infrastructure sharing • Prioritization of development programs based on strict criteria • Roll out of public WiFi in public spaces • Spectrum refarming

Source: Authors' elaboration.

Analysis of these UAS strategies suggests that there are a number of best practices available, such as the following:

i. **Policy and regulation:** The full benefits of broadband should be recognized and its development should be holistic; the role of broadband USFs as an economic development tool and catalyst for social inclusion must be fully acknowledged; UAS policies should be designed in collaboration with relevant stakeholders; UAS policies should have a clear vision, as well as ambitious but achievable objectives; flexible or demand-based service provisions (as opposed to mandatory Universal Service Obligations [USOs]) should be used to obtain broadband UAS policy objectives.
ii. **Planning:** A thorough gap analysis is required to understand the focus of UAS; the governance structure of the USF should be adapted to the local context to ensure that there is full viability, integration, coordination, and that the checks and balances are in place; and the sustainability of UAS projects is critical.

iii. **Funding:** The source of funding should be adapted to the strategic vision of the UAS policy and the enabling environment; the level of spending should be significant in order to bring the best results; and the requirements for USF spending should be fair and transparent.
iv. **Implementation:** Cooperation between the public and private sectors is essential (e.g., PPPs); UAS programs must address the supply side, as well as the demand side, with some degree of flexibility; and implementation requires centralized control to monitor progress.

The Asian Development Bank (ADB) and the Inter-American Development Bank (IDB) are well placed to provide strategic and financial support to countries in Asia and the LAC region that are willing to embark on this path.

Box 1: Broadband and the IDB

In 2013, the IDB launched a Broadband Special Program. This is an initiative established to assist in accelerating broadband development in the LAC region. The program is based on three strategic areas that define the approach to be taken by the IDB in the LAC region with regard to broadband:

i. Develop public policy and governance models to ensure leadership in the design and implementation of broadband strategies.
ii. Develop strategic regulation conducive to effective and sustainable competition, while providing an enabling environment for investment.
iii. Strengthen the capacity of the various institutions involved to achieve the goals of universal access, adoption, and use of broadband services.

The expected impacts of the program are related to the access, adoption, and use of broadband. Various projects are already being implemented, such as those relating to national broadband plans, regulatory reform, broadband maps, and deployment of backbones. The IDB is fully equipped to provide technical and financial support to countries that are willing to develop their respective broadband market to achieve universality.

Introduction

As the world becomes increasingly dependent on information and communication technology (ICT), access to broadband services is becoming recognized as essential to economic growth. Access also contributes to social inclusion through a wide range of services that can be offered. There is a growing push by countries to ensure that the benefits that can be drawn from ICT can be made available to not only businesses, but also to unserved and underserved populations. This can be done by adopting universal access and service (UAS) policies, which are attracting growing attention in developing countries in their efforts to develop broadband access to promote growth and social inclusion.

There are, however, many challenges that developing countries face in their attempt to expand broadband programs on a national scale. These include, in particular, a lack of knowledge, skills, and political commitment to holistically develop the necessary policies and strategies and, often, a lack of resources. This book reflects the findings of a study, undertaken by Analysys Mason, on behalf of the IDB and ADB.[1] The aim of the study is to share international best practices with the countries of the LAC region so that they can apply this knowledge to their own specific needs in their aim to develop universal access to broadband services.

Definitions for several concepts used throughout this publication are included below. These are followed by a summary of the benefits offered by UAS programs and a description of the methodology used in the study. This introductory section will end with an overview of the book's structure.

[1] This study was commissioned in order to gather knowledge and best practices on UAS policies and programs and to propose a framework to address basic universal broadband policies and services. It compares what has been done in India, the Republic of Korea, the United Kingdom, and the United States with the progress of countries in Asia and Latin America. The observations that are included in this publication are intended to assist countries in understanding some of the key challenges and opportunities. These recommendations will assist in creating, improving, and better managing the policies that are necessary to achieve the goal of universal broadband service.

Key Definitions

The concept of UAS encompasses two distinct notions: universal access and universal service. As defined by the International Telecommunications Union (ITU), universal access is

> (…) when everyone can access the service somewhere, at a public place, [and is] thus also called public, community or shared access while universal service is the situation when every individual or household can have service, using it privately, either at home, or increasingly carried with the individual through wireless devices (ITU, 2012a).
>
> Previously, developing countries mainly focused on universal access; the development of mobile technologies, in particular, now enables them to set realistic universal service objectives. Many countries have plans to develop broadband. Their objectives not only include universal access; they also include universal services for telephony, (transmission of speech). This report will use the generic notion of UAS, which includes both.

In general, UAS policies are those that define the regulatory framework for access and services. They cover issues specifically related to UAS within a broader ICT regulatory framework context that might include a national broadband strategy. UAS policies, in general, cover the following key areas:

i. Services that are included within the scope of UAS and their definition (e.g., voice telephony, broadband).
ii. Vision of UAS, with a focus on the population groups that should be targeted (e.g., rural population, poor households, and disabled people).
iii. Entities that will oversee the implementation of the UAS policies (e.g., governance structure).
iv. Targets set for the services and the population groups that are included in the UAS scope, with a defined time frame for achievement.
v. Approach to be used and the strategies to be employed to achieve UAS targets (e.g., planning and implementation).
vi. Required funding, source of funding, and disbursement methods. Funds are typically transferred to a USF.

Universal access and service policies include investment plans, referred to as UAS programs, which include details for financing and implementation. Projects are designed under the umbrella of programs and typically include the following:

i. Amount of financial resources to be used.
ii. Type (or a comprehensive list) of projects and their costs (e.g., demand stimulation projects or supply projects).
iii. Entities responsible for implementing UAS projects or the method used to select those entities.
iv. Monitoring of activities.

Finally, policymakers use the definition of broadband service, in general, to define their vision and establish their UAS objectives. Broadband services can include various investment options for the communications industry and different levels of service for the end user. In developed countries, broadband Internet access is not defined by the transmission technology used (ADSL, cable, satellite, wireless, etc.). Instead, it is used as a general term and covers all the technical capabilities of broadband service, which include transmission speed (as well as the symmetric network of wave speeds), contention ratio, latency, jitter, and resilience. On the other hand, narrowband Internet access, in general, refers to a service that does not qualify as broadband. Examples include dial-up Internet and "general packet radio service" (GPRS). Each of these factors (especially speed, in addition to other measures of quality, such as symmetry and latency) are critical to broadband users and are based on their individual needs.

The most common network metric that is used to distinguish between narrowband and broadband services is the transmission download speed, which has a wide range of thresholds. The United Kingdom, for example, has set its universal availability target at 2 Mbit/s (megabits per second) in 2010, the United States at 4Mbit/s in 2010, and the Republic of Korea at 1Mbit/s in 2008, while Sri Lanka set it at only 128kbit/s (kilobits per second) in 2009. The Broadband Commission of the International Telecommunications Union (ITU) does not define broadband in terms of specific speeds in recognition of the diverse definitions in different countries. Rather, it "views broadband as a cluster of concepts: always-on; high capacity connectivity enabling combined provision of multiple services simultaneously" (ITU, 2013).[2] This shows that there is a lack of homogeneity between the reference countries and developing countries.

[2] See http://ict-industry-reports.com/wp-content/uploads/sites/4/2013/09/2013-Global-State-of-Broadband-ITU-Sept-2013.pdf

The Benefits of Broadband UAS

There are a number of reasons why governments and their broadband network agencies may consider supporting UAS in an effort to reduce the digital divide and improve access to the unserved and underserved in urban and rural areas. These relate, primarily, to the socioeconomic benefits that can result from UAS, such as economic growth and job creation; stronger community networks; regional development; and increased competition and investment.

Supporting Economic Development in Unserved and Underserved Areas

Broadband UAS can benefit consumers and businesses. A number of academic studies indicate the direct link between broadband penetration and economic growth. A recent study undertaken for the IDB reveals that in the LAC region, a 10 percent greater broadband penetration, on average, relates to a 3.19 percent increase in gross domestic product (GDP), a 2.61 percent increase in productivity, and 67,016 new jobs (García Zaballos and López-Rivas, 2012). The multiplier effect on GDP, productivity, and employment increases as the penetration rate increases. Generally, UAS policies can channel these economic benefits to particular areas (e.g., rural areas) or to specific populations (e.g., poor households) that would otherwise be deprived of the benefits of broadband due to the digital divide.

Minimizing the Digital Divide

One of the principal objectives of broadband UAS is to minimize the digital divide between urban and rural areas and between affluent and poor areas, referred to as the distributional objective. This will ensure that all regions within a country can enjoy similar levels of digital connectivity. Most UAS policies in emerging and developed markets should include this as one of the main goals, given that a digital divide can result in a poor economy that will discourage private investment from regional commercial operators. This includes the following:

i. Geographic characteristics that make for difficult access, such as mountainous terrain or sparse populations.
ii. Low-income levels that will likely reduce the demand for more expensive (and newer) services. In emerging markets, this factor may even inhibit the uptake of basic telecommunication services. Public investment in broadband networks in these areas, therefore, is likely to have the most impact.

Improving Social Inclusion

Policies that solely focus on the supply side will not create a sustainable broadband ecosystem. Demand for broadband is closely linked to socioeconomic benefits and access to it will reflect on (i) education; (ii) health; (iii) participation in policymaking; (iv) work environment; (v) consumption; (vi) family and community; and (vii) innovation (University of Siegen, 2010).

i. **Education:** Internet is becoming increasingly important for knowledge and learning. It is cost-effective, enables new forms of learning outside the school environment, and allows for an interactive learning process. Students from remote areas who can access learning online for their education can be considered as part of the policy objectives for social inclusion.
ii. **Health:** One of the key social benefits that the Internet offers is increased access to quality and affordable health services. Telemedicine is a well-known example and its benefits create opportunities for people to share information on their specific conditions. It also provides access to products and specialized services that were not previously accessible, making health decisions easier. The use of such broadband applications in rural areas has provided an incentive for new policies.
iii. **Participation in policymaking:** Universal access and service promotes an informed citizenship, leading to increased social engagement with regard to the challenges society faces. E-government services have improved the linkages between government and citizens and digital participation has the potential to promote cost-effective and rapid public engagement.
iv. **Work environment:** Reliance on ICT at work is so high that it blurs the concept of how the work environment functioned prior to ICT. In general, ICT has reduced the costs for business and government, as well as decreased asymmetric costs. It has promoted opportunities for peer and online collaboration, such as telecommuting, by overcoming geographic barriers.
v. **Consumption:** Broadband has spurred the increase in goods and services and allowed the development of new business models. Overall access to information allows for price comparisons, making markets more competitive. It has reduced information asymmetries, which has resulted in more conscious purchase decisions.
vi. **Family and community:** The use of the Internet goes hand in hand with the use of social networks, which have become a prominent medium through which to communicate with friends and family. In addition, online community spaces are now available to people seeking those with similar interests.

vii. **Innovation:** With people connecting in unprecedented ways, broadband has encouraged innovation. New concepts have been created, such as peer collaboration, crowd-funding, multiple applications, and new business models. Industries that depend on the generation and sharing of knowledge and information are known as creative economies and creative industries.[3]

Stimulating the Demand for Broadband

Governments have a role in promoting the benefits of UAS in order to stimulate demand, an important factor when formulating policies. This, however, is frequently underestimated. The examples below demonstrate how governments can effectively motivate the use of broadband by promoting its value and cost-effectiveness.

i. **Promotion and usage of e-governance**
E-governance refers to the use of ICT in government transparency. In their move to promote and improve transparency, governments are recognizing the need for broadband and are striving to encourage usage. The e-Sri Lanka initiative, for example, recommends the use of ICT within government through the introduction of e-government into its key processes. The Lanka Gate program that is integrated within the e-Sri Lanka platform provides a wide range of dynamic and accessible citizen-centric services.[4]

ii. **Stimulation for the creation of national digital content**
Digital content relates to digital data, which has been increasing profusely in parallel with the increase in Internet usage. As has been experienced in the Republic of Korea, digital content can bolster the demand for broadband and, thus, encourage the development of local content. The Korea Creative Content Agency (KOCCA)[5] was established in 2009 to support the creation of local content, such as games, cartoons, music, animation, and broadcasting. The agency mainly supports the following: production of local content; international expansion of projects; content production that

[3] See the website of John Howkins, The Creative Economy, at http://www.creativeeconomy.com.

[4] For more information on the Lanka Gate Initiative, see http://www.icta.lk/index.php/en/programmes/re-engineering-government/131-main-projects/556-the-lanka-gate-initiative.

[5] For information on the Korea Creative Content Agency, see http://eng.kocca.kr.

fits the convergence of the media environment; development of human resources; and creation and management of infrastructure. One example of KOCCA's successes is that it has contributed to the overseas momentum gained by the K-Pop musical genre.

Incentives to Stimulate the Use of Broadband Devices and Services

Various direct and indirect programs can spur broadband interest, one of which is a connection voucher, a program that has been implemented in the United Kingdom. This has helped small- and medium-size enterprises (SMEs) in 22 cities across the United Kingdom to be super-connected. SMEs will be able to use up to £3,000 toward the cost of equipment installation.[6]

Relative Status of Broadband in Developed and Developing Countries

A brief comparison of the overall experience regarding broadband in developed countries will be made against that in developing countries, based on the latest ITU data relating to 2011. Table 2 shows the significant differences.

The figures below are predictable, since developed countries have long understood the benefits of broadband and have acted accordingly. While the developing world more or less has caught up in terms of narrowband mobile subscriptions, it woefully lags behind with regard to broadband fixed-line and

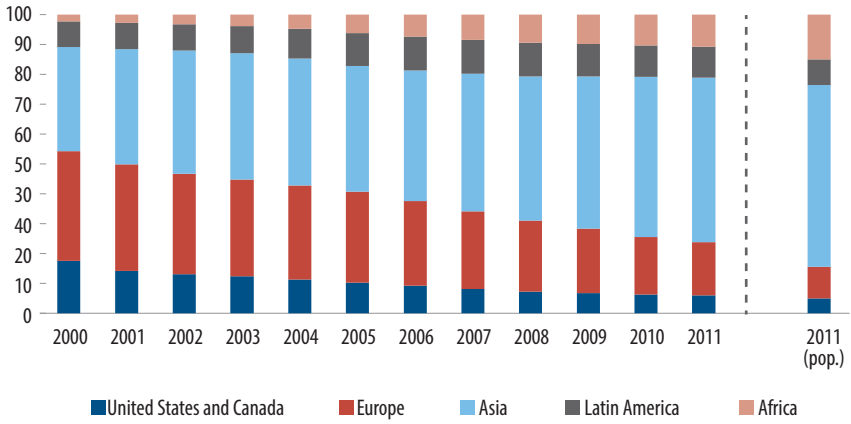
TABLE 2: Penetration Indicators for Telephony, Broadband, and PCs in Developing and Developed Countries

	Fixed telephone subscriptions per 100	Mobile subscriptions per 100	Fixed broadband subscriptions per 100	Mobile broadband subscriptions per 100	Households with a computer per 100
Developed countries	41.6	128.2	27.2	74.8	75.5
Developing countries	11.1	89.4	6.1	19.8	27.6

Source: ITU database.

[6] For more information on the SME voucher program in the United Kingdom, see https://www.gov.uk/government/news/100m-broadband-funding-boost-for-small-businesses-in-22-cities.

FIGURE 1: Geographical Distribution of Mobile Subscribers, 2000–11 (in percent)



Source: Databases of Wireless Intelligence and ITU.

mobile plans. This is due to various factors, the most important of which is that developing countries are, by definition, more resource constrained. Their poorly developed infrastructures—especially with regard to fixed telephony networks—have not been conducive to the development of broadband accessibility. Over the period of a decade, however, there has been a move by developing regions to catch up to those that are developed, particularly with regard to narrowband mobile penetration (see Figure 1).

The above figure indicates that in 2001, Canada, Europe, and the United States accounted for 52 percent of the world's mobile subscribers, while Africa, Asia (including developing and developed countries), and the LAC region (developing and emerging countries) represented 48 percent. While Canada, the EU, and the United States, however, represented approximately 15 percent of the world's population in 2000, combined they represented approximately three times the number of global mobile subscribers. In 2011, nevertheless, these three areas had only 1.5 times the number, with Africa, Asia, and the LAC region making up 85 percent of subscribers.

During the next decade, this evolution is expected to continue, although only in terms of broadband. The developed world currently has a significant lead in the number of broadband subscribers (Figure 1) and the developing world has begun efforts to catch up. This study reviews the role of UAS programs in order to establish what approaches will be the most effective in closing the gap.

Structure of this Publication

Chapter 1 analyzes the UAS policies that have been implemented in four countries: the United States, the United Kingdom, the Republic of Korea, and India. The first three countries represent developed countries with mature, state-of-the-art UAS policies in place; the last country, India, is a developing country that has made substantial progress in developing its UAS delivery framework. For each country, there is an overview of the previous and current UAS programs that have been implemented and how they fit together (e.g., ICT development and geographic constraints). This is followed by a two-fold analysis of the UAS policies (regulatory framework) and programs (investment, with a focus on planning and implementation issues). This will constitute the key lessons that will be relevant to developing countries in the Asian and LAC regions.

Chapter 2 provides an analysis of the UAS policies that have been implemented in eight selected countries in Asia (Bangladesh, Pakistan, Sri Lanka, and Vietnam) and Latin America (Bolivia, Chile, Costa Rica, the Dominican Republic). This follows the same approach used for the four reference countries, but will include governance issues (e.g., integration, coordination, visibility, and checks and balances) in detail, as well as specific projects relating to UAS. From this analysis, key findings and lessons will be drawn. Finally, Chapter 3 summarizes the recommendations and provides a generic set of best practices to address issues relating to UAS.

CHAPTER 1

Analysis of Reference Countries

Overview

The following is an overview of the UAS programs that have been implemented in the four reference countries: the United States, United Kingdom, Republic of Korea, and India.

United States: Universal access and service (UAS) has been a key policy issue in the United States for the past few years. As such, the country has adopted comprehensive reforms of its USF to accelerate broadband distribution. The Federal Communications Commission (FCC) noted that providing UAS broadband is "the universal service challenge of our time."[1] The U.S. government has put in place a broadband stimulus package with significant funding from a combination of large one-off investments and yearly subsidies to operators. The United States has encouraged the private sector to play a leading role in extending broadband networks to areas that are unserved.

United Kingdom: Like the United States, the UK government views the development of broadband—especially superfast broadband—as a key priority. It acknowledges the considerable economic and social benefits that it can provide. While broadband access and usage are already well developed in the country, the UK government has unfolded a very comprehensive and bold national broadband plan with significant financial resources and a strong commitment from local authorities to implement well-designed programs.

[1] See http://www.fcc.gov/document/fcc-releases-connect-america-fund-order-reforms-usficc-broadband.

Broadband is not within the scope of USO that British Telecom (BT) is subject to as an incumbent operator; BT, however, has endorsed the nationwide broadband roll-out objectives and has committed large investments to complement public efforts. In general, Internet Service Providers (ISPs) are encouraged to make a universal service commitment, representing their obligations to citizens with regard to universal broadband access. There are, however, no legally binding broadband USOs.

Republic of Korea: The government of the Republic of Korea has had more influence on the telecom sector than have the UK and U.S. governments. In particular, it has developed inclusive master plans that affect the country's telecom industry at various levels, including research, infrastructure, competition, industry structure, user awareness, and ICT education. The government of the Republic of Korea has succeeded in stimulating supply and demand by implementing flexible policies, adapting well to rapidly evolving technologies and markets, addressing potential market failures, and ensuring fair competition. More importantly, while it has long held the view that information and technology (IT) and telecommunications are key to the economy, it has (with the exception of some direct investment, limited subsidies, and loans) depended on the private sector to fund network rollouts.

India: The drive to facilitate widespread broadband access is a high priority on India's national agenda. The National Telecom Policy (NTP, 2012)[2] recognizes the importance of broadband access as a basic need, on a par with education and healthcare. The cost of deploying fiber optic connectivity to the last mile and that of customer premises equipment remain a bottleneck in achieving the objective of providing access to households. In contrast to the other three reference countries, each of which has an extensive fixed broadband service network infrastructure and larger economies, India's mobile technology, which has boomed in the past decade, is a key to increasing the adoption of broadband. The rollout of its mobile infrastructure has been financed mainly by the private sector, although subsidies have been provided through the USF.

United States

The economic and social benefits of broadband connectivity and innovation are widely acknowledged by different stakeholders within the United States,

[2] Available at http://www.dot.gov.in/sites/default/files/NTP-06.06.2012-final.pdf.

TABLE 1.1: Macroeconomic and Broadband Indicators for the United States

Indicator	Year	Unit	Value
Population	2012	Million	316
Land area	—	Million hectares	915
Urbanization rate	2012	%	83
GDP per capita at purchasing power parity	2012	USD	51,749
Fixed broadband penetration per capita	2012	%	28.0
Mobile (active) broadband subscribers per capita	2012	%	74.7
Percent of individuals using the Internet	2012	%	81
ITU ICT development rank	2012	#	17 (/157)

Sources: Databases of the Central Intelligence Agency, ITU, FCC, and World Bank.

which is a pioneer with regard to the Internet and takes the lead in this area. The United States, through its large USF and the implementation of dedicated programs for UAS, has an extensive fixed telephone network, which has had strong public sector support, particularly in rural areas. In terms of broadband, the United States is the second largest fixed broadband market in the world, behind China. Table 1.1 summarizes the main macroeconomic and broadband indicators for the United States.

While major operators such as AT&T, Verizon, and Comcast dominate the Internet landscape, rural areas account for a multitude of small operators. It is seldom the case that more than two landline operators cover the same area; rather, it is usual to have a telephone and a cable television firm. There are, however, major gaps in uptake, as approximately 18.8 million households in rural areas remain without access to broadband.[3]

Overview of UAS Programs

The United States introduced universal service objectives in its telecom policy as early as the 1930s. Initially, the focus of universal policy was on voice services, but there was a partial shift to broadband with the enactment of the Telecommunications Act of 1996, which defined the structure and mechanisms of the current universal service. Table 1.2 provides an overview of the UAS programs in the United States, which are discussed in more detail.

Today, universal service is addressed through four distinct programs, which represented a total disbursement of US$8.10 billion in 2011:

[3] See http://www.connectednation.org/sites/default/files/bb_pp/connected_nation_usf_update_2012_04_27.pdf.

TABLE 1.2: Summary of Key Characteristics of UAS Programs in the United States

Characteristic	Description
Overview	• The USF covers four programs that include provision of broadband (High Cost, Lifeline, Schools and Libraries, and Rural Health Care programs). • The Connect America Fund (CAF) and the Mobility Fund are one-off investment programs, followed by yearly investments which will replace the High Cost component of the USF. • The Broadband Initiatives Program (BIP) and the Broadband Technology Opportunities Program (BTOP) are one-off investments in rural areas.
Broadband definition	• 4Mbit/s download and 1Mbit/s upload (in the 2010 National Broadband Plan) with acceptable quality of service for interactive applications.
Regulatory framework	• The Communications Act of1934 introduced a USF for voice transmission. • The Communications Act of 1996 restructured the USF and included broadband. • The American Recovery and Reinvestment Act, which was ratified in 2009, created ad hoc development funds (BIP and BTOP). • The 2010 National Broadband Plan set specific goals for broadband and initiated the transition of the USF to the CAF and Mobility Fund.
Planning	• The National Telecommunications Information Administration (NTIA) is the principal advisor on telecom policies. • The FCC oversees the use of the CAF. • The Universal Service Administrative Company (USAC) oversees the four universal service programs. • The Rural Utilities Service (RUS) is in charge of awarding projects under the BIP.
Funding	• The USF is financed via a levy on operators' revenues. • The CAF and Mobility Fund Phase I (one-off investments) are funded from the U.S. government budget. • The CAF and Mobility Fund Phase II will be financed via the USF. • The BIP and the BTOP are funded from the U.S. government budget.
Implementation	• Rural carriers are compensated for the cost of service provision by the High Cost component of the USF. • CAF Phase I projects are implemented via PPPs. • The Phase I Mobility Funds have been allocated via a reverse auction (where the bid that requests the lowest amount of subsidy wins the contract).

Source: Authors' elaboration.

i. **High Cost Program** (US$4.03 billion in 2011): ensures that rural and urban consumers pay comparable rates for telecom services. In 2011, over 1,900 carriers received subsidies through this program.

ii. **Low-Income Program** (US$1.75 billion in 2011): helps low-income consumers to have telephone service by offering them a discount on service costs. Over 13.7 million households benefited from the program in 2011.

iii. **Rural Health Care Program** (US$81.5 million in 2011): provides reduced rates to rural healthcare providers for telecom and Internet services. Over 3,000 healthcare providers received support from this program in 2011.
iv. **Schools and Libraries Program** (US$2.23 billion in 2011): offers discounts on telecom and Internet services to schools and libraries. Over 21,000 schools and libraries benefited from this program in 2011.

In 2010, the U.S. government unveiled its National Broadband Plan. The plan aims to improve broadband access across the United States and includes specific goals related to UAS. The Plan states that

> (…) every American should have affordable access to robust broadband service, and the means and skills to subscribe if they so choose, and that every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals, and government buildings.[4]

The National Broadband Plan initiated the creation of the Connect America Fund (CAF) and the Mobility Fund in order to shift resources from the High Cost Program component of the current USF. This allowed for these funds

Box 1.1: Benefits of Broadband Access

The FCC highlights the following benefits of broadband access to consumers:[a]

i. Americans living in unserved rural areas who will receive access to broadband over the next decade: 18 million.
ii. Consumers who will get mobile broadband coverage where they live, work, and travel: multiple millions.
iii. Jobs created related to new deployment in rural areas over five years: 500,000.
iv. Annual economic benefits in rural areas from new deployment: US$700 million.
v. Annual increase in economic growth, creating jobs: US$50 billion.
vi. Benefit to cost ratio for consumers: US$3 to US$1.
vii. Percentage of FORTUNE 500 companies that post job openings online only—and require online applications: over 80 percent.
viii. Graduation rates for students with broadband at home compared to similar students with no broadband access: 6 to 8 percent higher.

[a] See http://www.fcc.gov/encyclopedia/connecting-america.

[4] See http://www.broadband.gov/plan/goals-action-items.html.

to focus on broadband services. The CAF has a budget of up to US$4.5 billion per year to connect 7 million unserved rural residents to broadband within six years and, ultimately, 19 million by 2020. The Mobility Fund amounts to approximately US$500 million per year to finance the installation of 3G mobile wireless services in unserved areas. In Phase 1, these two programs take the form of one-off investments, which were allocated in 2012. Both of these programs will provide financing on a yearly basis in Phase 2 through mechanisms that have not yet been disclosed. These programs are described in more detail later in this section.

The American Recovery and Reinvestment Act of 2009 also provided a one-off stimulus package of US$7.2 billion to two separate agencies to expand broadband access and adoption in communities across the United States.

i. The Department of Commerce's National Telecommunications Information Administration (NTIA) was allocated US$4.7 billion to fund the Broadband Technology Opportunities Program (BTOP), which aims to: (a) promote broadband adoption, especially among vulnerable population groups (sustainable broadband adoption); (b) construct broadband networks and deploy public safety wireless broadband networks (comprehensive community infrastructure); and (c) provide access to broadband, computer equipment, computer training, job training, and educational resources to the public and vulnerable populations (public computer centers).
ii. The Department of Agriculture's Rural Utilities Service (RUS) was allocated US$3.5 billion to make loans and grants for broadband infrastructure projects specifically in rural areas via its Broadband Initiatives Program (BIP). The RUS used most of the US$3.5 billion to provide loans where the parties receiving the funds had to contribute some of their own money (typically 20 percent). Unlike grants, the loans have to be repaid; the repaid amounts can then be loaned again. Thus the total impact of the RUS program is likely to be far in excess of the US$3.5 billion of funding that was originally allocated.

It should be noted that the BTOP awarded grants to a range of projects, principally in rural areas. More importantly, it is interesting to note that neither of the two large national operators—AT&T and Verizon—has applied for any of these grants. Furthermore, while some regional carriers did apply for a grant, most of them did not, and most of the entities that secured a grant were start-ups or other organizations with community ties and not necessarily telecom operators.

Other programs include, for instance, the Connect to Compete program. This is a nationwide, private, and nonprofit partnership that was created to increase broadband adoption and digital literacy training in disadvantaged communities.

Lastly, Connected Nation is an organization that facilitates PPPs to

> (…) increase access to and use of broadband and related technology, creating dramatic results that translate into economic and community development, better education, higher quality healthcare, more efficient public service and improved quality of life.[5]

Connected Nation provides different broadband-related services to communities and states, including digital literacy (broadband awareness, technology training, and computer ownership) to targeted populations; research and analysis (in order to gather data on supply and demand conditions); and policy consultation (supporting broadband planning activities). The organization also identifies and maps areas unserved by broadband services in order to identify demand-stimulation programs designed to increase broadband adoption and encourage network deployment.

Regulatory Framework

The origin of the USF in the United States traces back to the Communications Act of 1934, which created the FCC. The act stated that the purpose of the new body was to regulate

> (…) interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the U.S. a rapid, efficient, nationwide, and worldwide wire and radio communication service with adequate facilities at reasonable charges.[6]

As a result, the FCC, at that time, was mainly concerned with developing rural telephony and reducing local call charges. To that end, a charging mechanism was put in place to transfer funds from interstate long-distance carriers to rural carriers (so-called rural local exchange companies or RLECs) through extra call charges.

By the end of the 1990s, the structure of the market had evolved to include the seven large Regional Bell Operating Companies, plus GTE, and

[5] See http://www.connectednation.org/who-we-are.

[6] See http://www.criminalgovernment.com/docs/61StatL101/ComAct34.html.

over 1,000 generally very small RLECs. The USF then overwhelmingly went to the RLECs. Over the next 15 years, the Regional Bell Operating Companies, plus GTE, merged and consolidated, leaving the current structure of two very large players (AT&T and Verizon) and one company of intermediate size (CenturyLink). The rural phone companies have also consolidated, but there are still over 500 of them. It is notable that the operations of AT&T and Verizon became more urban, as they transferred portions of their rural service territory to other rural specialist operators. Even more significantly, USF monies did not go to the large incumbents, but rather to these hundreds of smaller operators.

In this context, the Telecommunications Act of 1996[7] was the most significant regulation since the Communications Act of 1934. Beginning to take a close look at broadband services, this act expanded the existing USF into the four programs discussed earlier (High Cost, Low Income, Rural Health Care, and Schools and Libraries) and created the Universal Service Administrative Company (USAC), whose role is to collect universal service contributions from telecom carriers and administer support mechanisms.

The Telecommunications Act also addressed whether or not the federal government should intervene to prevent a digital divide in relation to broadband access. In particular, Section 706 of the act requires the FCC to determine whether "advanced telecom capability is being deployed to all Americans in a reasonable and timely fashion." If not, the act requires the FCC to "take immediate action to accelerate deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecom market."

Policymakers in the United States widely understood that urban households were a tougher challenge to target, as they included large blocks of two demographic groups that were not as easily motivated by telephony efforts: the elderly and the poor. During the policy debates of the mid-2000s, in explaining why the United States lagged behind other top-tier countries in terms of broadband penetration, the FCC regularly pointed out that the nation had a large elderly population that did not possess laptops. Urban low-income households comprised the second-largest group, and some of the stimulus programs were eventually aimed at this segment.

Rural households without broadband, however, became the main policy target. Numerous studies concluded that traditional telecom carriers (i.e., AT&T, Verizon, and the RLECs) were not going to reach these households—at least

[7] See http://transition.fcc.gov/telecom.html.

not at an affordable price. Furthermore, in poor, densely urban areas, there are community centers and a surprising number of households without coverage that are near others that do have coverage. In the rural areas, however, many households and even small communities were very distant from any alternative means of access to the Internet, so policymakers chose to concentrate on the rural areas.

In this context, the American Recovery and Reinvestment Act, which was ratified in 2009, included significant funding for broadband (US$7.2 billion), through both the BTOP and the BIP. More importantly, the policy debates led the FCC to develop the 2010 National Broadband Plan, which sets specific goals for broadband and initiated the beginning of the transition of the USF and the Intercarrier Compensation systems to the CAF. Policymakers in the United States have, in effect, now declared victory in the battle to spread voice-grade copper-based telephony and, as a result, have dramatically reduced the funding for such efforts. They now are putting nearly all of their funding efforts into a more widespread provision of broadband. The central theory of the new effort regarding broadband is to subsidize only in situations where private industry will not make the investment on its own.

The National Broadband Plan defines broadband in terms of speed (plus an additional mention of quality in relatively vague terms): it set an "initial universalization target of 4Mbit/s of actual download speed and 1Mbit/s of actual upload speed, with an acceptable quality of service for interactive applications."[8]

The plan notes that these targets are aggressive, but has set 2020 as the deadline for achieving them. The plan also mandates the FCC to review and reset this target every four years, to account for technology developments.

Overall, the FCC understands not only that new doctrines must be developed, but also that the validity of existing ones needs to be scrutinized with regard to the development of technology and society. The regulatory framework, therefore, is evolving to cater to the changing dynamics of the sector.

Investments

Planning: The following entities are involved in the management and control of the UAS program in the United States:

i. **Congress:** Sets universal service goals

[8] See http://www.broadband.gov/plan/8-availability/.

ii. **NTIA:** The principal advisor on telecom policies related to economic and technological advancement, as well as regulation of the telecom industry; also receives funds to finance the BTOP
iii. **FCC:** Oversees the use of the CAF to finance broadband development programs to be implemented by private companies
iv. **USAC:** An independent and nonprofit administration which oversees the four universal service programs
v. **RUS:** In charge of awarding projects under the BIP.

Other agencies also have a more minor role in relation to UAS. For instance, the National Exchange Carrier Association is responsible for administering interstate access charge revenue pools, and the state regulation commissions designate the eligibility status of most carriers to receive USF funds.

Funding: The USF includes a total of US$8.1 billion a year to use for grants, loans and other subsidy programs.[9] Originally, it was funded by fees on long-distance calls collected from telecom carriers. After the 1996 Telecommunication Act, the fees were transformed into a levy on operators' revenues, and other types of operators were included in the list of contributors in addition to long-distance carriers. Today, all telecom companies that provide service between states (such as long-distance carriers, local carriers, international carriers, wireless operators, payphone providers, voice over Internet Protocol (VoIP) service providers) are required to contribute to the USF. Each quarter, the FCC calculates the contribution factor used to determine the universal service contributions required from telecom carriers, based on information provided by USAC in terms of program needs and operators' reported revenues.[10]

In the first phase of the CAF, about US$115 million (out of the initial US$300 million offered) of public funding was awarded in July 2012. The companies that accepted the subsidies (US$775 per household) would be required to independently invest in network broadband infrastructure. Not all the potential resources were allocated, as some carriers refused the subsidy, which they estimated to be too small.[11] Similarly, US$300 million was

[9] See http://www.usac.org/_res/documents/about/pdf/annual-reports/usac-annual-report-2011.pdf.
[10] See http://www.fcc.gov/encyclopedia/contribution-methodology-administrative-filings.
[11] See http://content.usatoday.com/communities/technologylive/post/2012/07/fcc-to-spend-115-million-on-rural-broadband-subsidies/1#.UHg9jG-SaoQ.

awarded during the second phase of the Mobility Fund through a reverse auction, held in October 2012.

The funding for Phase 2 of these two programs will be taken from the actual High Cost component of the current USF. Finally, both the BIP and BTOP programs rely on direct funding from the U.S. government.

Implementation: Below are some details regarding implementation of the High Cost, Low Income, Rural Health Care, and Schools and Libraries programs, as disclosed by the USAC:[12]

High Cost Program	In 2011, the High Cost Program supported areas in all 50 states and U.S. territories, and over 1,850 eligible telecom carriers received support. In order to get support from this fund, rural and nonrural incumbent local exchange carriers and competitive carriers must be eligible telecom carriers (ETCs, as designated by state regulatory commissions). Then they must submit line count data, certain cost data (e.g., fixed asset property accounting records; general ledgers; invoice copies for the purchase and maintenance of equipment; maintenance contracts for the upgrade of equipment), and certifications to USAC to receive High Cost support. The program can be broken down into five components, with different eligibility criteria: The High Cost Loop provides intrastate support for the last mile of connectivity for rural companies in high-cost service areas, where the cost to provide service exceeds 115 percent of the national average cost per line. The High Cost Model provides intrastate support for nonrural carriers, where the cost to provide service in the state exceeds two standard deviations above the national average cost per line. Interstate Access Support helps offset interstate access charges and is available only for price-cap carriers (mostly nonrural and some rural carriers) and competitive ETCs. Interstate Common Line Support provides support to rate-of-return carriers (mostly rural and some nonrural carriers) to the extent that Subscriber Line Charge caps do not permit them to recover their common line revenue requirements. Local Switching Support provides intrastate assistance that helps cover the high fixed switching costs for companies that serve 50,000 or fewer access lines.

[12] See http://www.usac.org/about/about/universal-service/faqs.aspx.

Low-Income Program	Under the Low-Income Program, ETCs that provide consumers with Lifeline discounts file an FCC form with USAC to receive support that reimburses them for providing service at discounted rates. Eligibility requirements for the program vary from state to state. Lifeline eligibility is based upon participation in certain means-tested programs and, in most states, upon income. The federal default criteria for eligibility—which apply in eight states and two territories—require consumers either to have a household income at or below 135 percent of the Federal Poverty Guidelines or to participate in at least one of a number of federal assistance programs. The remaining states and territories have established their own eligibility criteria that are based solely on income or factors directly related to income, usually in line with the federal default criteria, but not always.[a]
Rural Health Care Program	Each year, over 3,000 rural healthcare providers (HCP) receive benefits from the Rural Health Care Program. The level of support depends on the location and the type of services chosen and is calculated individually for each HCP. For telecom services, the program provides support for monthly mileage-based charges (minus the Standard Urban Distance) or for the difference between the rural and urban rate for nonmileage-based charges. For Internet access, The Rural Health Care Program provides support for 25 percent of an HCP's Internet access charges.[b] The USAC requires that all healthcare providers (HCPs), or consortia of HCPs seeking to participate in the Rural Health Care Program, conduct a competitive bidding process for services to be used in providing healthcare. Once the service providers and services are selected, the healthcare provider completes and submits a funding request to USAC and, later, a notice that actual service has begun. The HCP then receives the benefit of the reduced rates from the Rural Health Care Program, which pays the selected service provider for the discounts it provides to the HCP.
Schools and Libraries Program	The Schools and Libraries Program provides discounts of between 20 percent and 90 percent on the service prices: the discount level depends on the level of poverty and the urban/rural status of the population served. Eligible beneficiaries include public and most nonprofit K-12 schools (primary and secondary schools) as well as all public and many private libraries. In terms of process, eligible applicants in this program open a competitive bidding process to receive bids on the products and services they seek. Service providers submit bids, which are reviewed by applicants under applicable program rules. Applicants select the service provider for the service or product and submit the appropriate forms to USAC to process support payment invoices.

[a] See http://www.universalservice.org/_res/documents/li/pdf/fcc/FCC-12-11.pdf.
[b] See http://www.fcc.gov/guides/universal-service-program-rural-health-care-providers

As part of the CAF and the Mobility Fund, carriers receive support to invest in broadband in two phases: one-off support (Phase 1) and ongoing support (Phase 2). In addition, the projects financed by the CAF are to be implemented by PPPs, and so carriers will be required to match the financial effort and commit to quantified objectives.

The first phase of the CAF was designed to award additional funding as a one-off capital injection across large carriers (price cap, incumbent local exchange carriers) willing to accept the subsidy in exchange for carrying out the necessary investments. This funding is meant to ensure that broadband is included in the UAS offers. Implementation of Phase 1 started in July 2012 with the aim of connecting nearly 400,000 residents and SMEs in 37 states to broadband within three years.[13]

Funding relating to Phase 1 of the Mobility Fund has been awarded to 38 companies through a nationwide reverse auction, held in October 2012. Recipients of the Mobility Fund will be required to upgrade 83,000 miles of road, nationwide, with mobile broadband capabilities over the next two to three years. They will also be subject to public interest obligations, including data roaming and co-location requirements.[14]

The FCC is still working on the details for implementation of Phase 2 of the CAF, which will eventually transfer all recurring subsidies accruing to large price-cap carriers to support expansion of broadband networks. Similarly, the FCC is also currently considering rules for awarding funds relating to Phase 2 of the Mobility Fund, also through competitive bidding.

United Kingdom

The United Kingdom has a relatively high population density. This factor has favored the development of an established fixed telephony infrastructure across the country, which is mostly owned by the incumbent operator, BT. The table below summarizes the main macroeconomic and broadband indicators for the United Kingdom.

The broadband market in the United Kingdom is well developed, and more than 70 percent of British households have access to broadband. Available connection speeds continue to rise: the regulator Ofcom reports that 86 percent of existing connections in the United Kingdom offer up to 2Mbit/s, and that superfast broadband (i.e., at least 50Mbit/s) is available to around 60 percent of premises across the country. There are significant geographic variations, however: for instance, 94 percent of premises in Northern Ireland have access to

[13] See http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0727/DOC-315436A1.pdf.

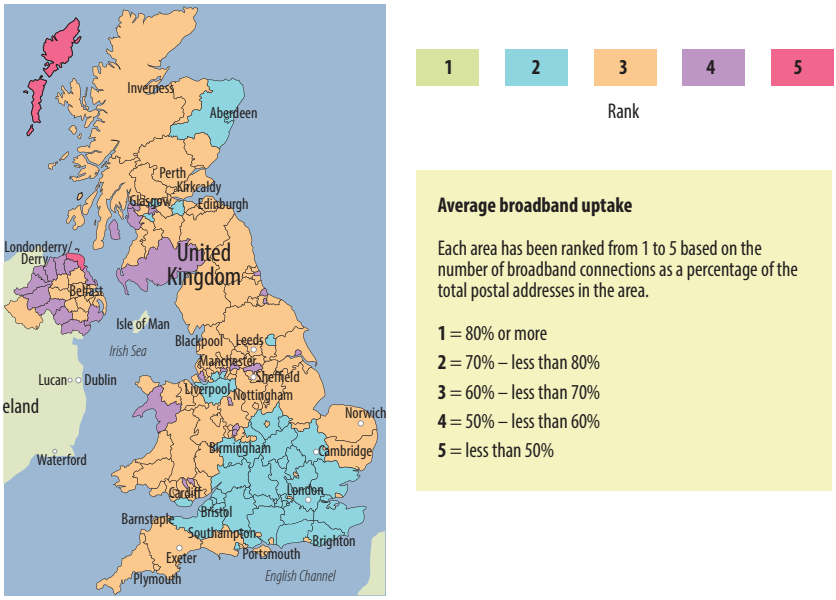
[14] See http://www.connectednation.org/sites/default/files/bb_pp/cn_policy_brief_-_mobility_fund_phase_i_final.pdf.

TABLE 1.3: Macroeconomic and Broadband Indicators for the United Kingdom

Indicator	Year	Unit	Value
Population	2012	Million	63
Land area	—	Million hectares	24
Urbanization rate	2012	%	80
GDP per capita at purchasing power parity	2012	USD	37,456
Fixed broadband penetration per capita	2012	%	34.0
Mobile (active) broadband subscribers per capita	2012	%	72.0
Percent of individuals using the Internet	2012	%	87
ITU ICT development rank	2012	#	8 (/157)

Sources: Databases of the Economist Intelligence Unit (EIU), Euromonitor, ITU, Ofcom, and World Bank.

MAP 1.1: Average Broadband Uptake in the United Kingdom (*as of September 2012*)



Source: Ofcom database.

superfast broadband but, for Wales and Scotland, this proportion goes down to 30–40 percent (Map 1.1).[15]

[15] See http://www.publications.parliament.uk/pa/ld201213/ldselect/ldcomuni/41/4105.htm.

Increasing broadband provision is a priority in the United Kingdom. As a result, there has been strong involvement by the central and local governments to increase broadband adoption, and British Telecom (BT) has made significant investments to expand and upgrade its broadband infrastructure.

Overview of UAS Programs

Table 1.4 provides an overview of UAS programs in the United Kingdom. These are discussed in further detail below.

The UK government, through the Department for Culture, Media, and Sport (DCMS), set the direction for a national broadband policy in December 2010. This policy aims to

> (…) provide everyone in the UK with access to broadband speeds of at least 2Mbit/s, and superfast (defined as 24Mbit/s) broadband should be available to 90 percent of people in each local authority by 2015.

To achieve this universal service objective, the commercial efforts of BT in its fixed network are being supplemented with a host of government, private, and European funding, while gaps in the fixed networks will be complemented by mobile broadband.

The DCMS has funded Broadband Delivery UK (BDUK) with £530 million (US$840 million) to bring superfast broadband to a third of UK homes and businesses in rural communities. In the period up to 2017, the DCMS may make a further £300 million (US$475 million) available for investment in broadband (DCMS, 2009).

The Rural Community Broadband Fund, which is jointly funded by BDUK and The Department for Environment, Food and Rural Affairs (DEFRA), was created to subsidize the provision of superfast broadband, not only to the final third of the population in the United Kingdom but also to local communities in the final 10 percent if they can demonstrate a need or demand for broadband, feasibility, and cost effectiveness. The Fund has around £20 million (US$32 million). The Mobile Infrastructure Project aims

> (…) to improve mobile voice coverage to outside of premises for the five to ten percent of consumers and businesses that live and work in areas of the UK where existing mobile coverage is poor or nonexistent" and "to enable the removal of 'complete' voice not-spots without converting them to 'partial' not-spots.[16]

[16] See http://www.culture.gov.uk/images/publications/Mobile_Infrastructure_engagement_Rel_1_0.pdf.

TABLE 1.4: Summary of the Key Characteristics of UAS Programs in the United Kingdom

Characteristic	Description
Overview	Broadband is not part of the USO. Broadband Delivery UK (BDUK) makes funds available for broadband development until 2017. The Rural Community Broadband Fund (RCBF) is a one-off fund for rural areas. The Super-Connected Cities program will provide superfast broadband to certain cities (one-off investment). The Mobile Infrastructure Project (MIP) aims to extend mobile coverage (one-off investment).
Broadband definition	2Mbit/s is the universal availability target (by 2015), while 90 percent of the population should enjoy superfast broadband at 24Mbit/s, and populations of Super-Connected Cities will have access to speeds of at least 80–100Mbit/s.
Regulatory framework	The Universal Service Order, dated July 25, 2003, transposed the 2002 European Commission's Universal Service Directives on USO policy. The 2010 National Broadband Policy set broadband development guidelines, legislated in the 2010 Digital Economy Act.
Planning	The UK Parliament defines the legal framework. The European Commission (EC) provides guidelines and directives. The Broadband Stakeholder Group (BSG) is the leading advisory group on broadband. The Department for Culture, Media and Sport (DCMS) is responsible for telecoms and broadband policy and delivery via Broadband Delivery UK. Ofcom is the national media and telecom regulator. The Department for Environment, Food, and Rural Affairs (DEFRA) is in charge of the Rural Community Broadband Fund.
Funding	BDUK funding comes from the BBC's license fee and from underspending of the country's digital TV switchover fund. Local authorities have to match national subsidies from the BDUK fund, and private operators are bearing part of the effort (there is competitive bidding for projects). The Rural Community Broadband Fund, the Super-Connected Cities program, and the Mobile Infrastructure Project are funded from the government budget. European funds can also be obtained at the local level.
Implementation	Private operators are bidding for public funds to support broadband development.

Source: Authors' elaboration.

The Mobile Infrastructure Project has around £150 million (US$240 million). The UK government has also established a separate fund (£150 million, or approximately US$240 million) to create Super-Connected Cities with access to speeds of at least 80–100Mbit/s.[17] Broadband is not included as part of

[17] See http://www.culture.gov.uk/news/media_releases/9331.aspx.

the USO, as the UK government considers the current nonregulatory approach to delivering universal broadband to be the most effective means to stimulate commercial investment. Finally, the UAS program for broadband in the United Kingdom relies on mobile broadband to fill in the gaps in fixed network coverage. To this end, Ofcom plans to auction spectrum in the 800MHz (megahertz) and 2.6GHz (gigahertz) bands in 2013 for Long-Term Evolution services and to refarm spectrum in the 900MHz band.

Regulatory Framework

As explained earlier, broadband is not included in the USO, but is part of a broader national broadband plan. The 2010 national broadband policy is based on the 2009 Digital Britain report (DCMS, 2009), [18] which was legislated for in the 2010 Digital Economy Act.[19] Originally, the report set the targets for 2012 (including speeds of at least 2Mbit/s to the entire population, and speeds of at least 24Mbit/s to at least 90 percent of the population), but these were later pushed back to 2015. It is important to note that the objectives set in the Digital Britain report are considered as targets; not as legal obligations.

The UK's Obligations as a Member of the European Union

As a member state of the EU, the United Kingdom must abide by EC Directives and translate them into its national legislation. The EU, via the EC's Universal Service Directive of 2002 (European Commission, 2002),[20] requires all member states to ensure that citizens are able to connect to the public phone network at a fixed location and access public phone services for voice and data communications with functional access to the Internet (no specific speed is mandated). This directive was implemented in the United Kingdom via the USO made by the secretary of state in July 2003. The services and facilities covered by the order included

> (…) the provision of access to the public telephone network and publicly available telephone services at data speeds sufficient to support functional internet access; the adequate provision of public pay telephones; the availability of comprehensive directories and directory enquiry services; and special measures for users with low incomes or disabilities.[21]

[18] See http://www.official-documents.gov.uk/document/cm76/7650/7650.pdf.
[19] See http://www.legislation.gov.uk/ukpga/2010/24/contents.
[20] See http://www.etsi.org/images/files/ECDirectives/Authorisation_Directive.pdf.
[21] See http://www.ofcom.org.uk/static/archive/oftel/ind_info/eu_directives/index.htm.

The scope of the order did not include broadband. Therefore, broadband Internet access in the United Kingdom does not currently fall within the scope of the EC's Universal Service Directive, but the debate on whether to include it has begun at the European level, as part of the regular review of the directive. Nevertheless, the EC has stated that "by 2020, all Europeans should have access to Internet of above 30 Mbit/s and 50 percent or more of European households have subscriptions above 100Mbit/s."[22]

The UK government has not put forward specific measures to reach these targets. While broadband is not included in the scope of USO as defined in the Universal Service Directive, the need for this potential requirement is reviewed regularly. To be included within the scope of a UAS policy, a service has to satisfy two questions: (a) In the light of social, economic, and technological developments, has the ability to use the service become essential for social inclusion? and (b) Are normal commercial forces unable to make the service available for all to use? The EC concluded from its 2006 review that broadband still should not be included, as fewer than half of European households subscribed to broadband Internet, and so it was not seen as essential for social inclusion. In its 2008 review, and for similar reasons, the EC concluded that broadband should still not be included, but the review noted that broadband was proving more and more of a necessity to access a range of services and, therefore, its impact on competitiveness and economic growth was gradually turning this infrastructure into an essential commodity. It was also thought unlikely that the market would provide access within a reasonable period of time to the most isolated regions of Europe.

Most recently, in 2011, the EC decided not to set a single broadband connection speed at the EU level under the universal service rules, given the very different stages of development of telecom networks in the member states and the potential costs involved. Member states, however, can retain the flexibility to include broadband connections in their national USO in justified cases, typically when broadband uptake is already sufficiently high. The EC also noted that making broadband availability obligatory would not automatically result in higher uptake. The EC, therefore, called on member states to reinforce measures to drive demand and stimulate uptake, rather than just ensure a connection. The EC also considers that USO might eventually—possibly as a medium-term target—become an additional incentive to the development of broadband, but that properly designed national programs should achieve universal broadband objectives. The EC also believes that other important instruments in increasing

[22] European Commission. Digital Agenda for Europe.

broadband coverage are an efficient radio spectrum policy, which will enable harmonized use of the digital dividend (spectrum freed up as the result of the switch-off of analogue TV networks), and investment-friendly regulations.

Investments

Planning: The following entities are involved in the management and control of the UAS program in the UK:

i. **Parliament:** Defines the legal framework, based on the political agenda, guidelines from the EC, and advice from the Broadband Stakeholder Group (see below).
ii. **EC:** Provides guidelines and directives for the deployment of broadband and ensures that no aid distorts or threatens to distort competition in the market.
iii. **BSG:** The UK government's leading advisory group on broadband was established in 2001 to tackle the strategic issues affecting the broadband value chain. It provides a forum for organizations across the value chain to discuss and resolve policy, regulatory, and commercial issues. The BSG's network includes telecom operators, manufacturers, investors, ISPs, broadcasters, news media companies, mobile operators, content producers, and rights holders, as well as government departments (including the DCMS and the Department for Business, Innovation, and Skills), Ofcom, and regional development agencies.
iv. **DCMS:** Responsible for the government's telecom and broadband policy and delivery via its BDUK unit. Individual projects remain the responsibility of local authorities and the devolved administrations (i.e., regional governments).
v. **Ofcom:** National media and telecom regulator, accountable to Parliament. Ofcom is funded by fees from industry for regulating broadcasting and communications networks and grants-in-aid from the government. Ofcom is in charge of controlling and reviewing the USO.
vi. **DEFRA:** In charge of the Rural Community Broadband Fund as part of its role to deliver policies addressing rural communities.

Funding: Funding of UAS programs comes from regulatory resources (sale of digital dividends and license fees) and ad hoc public funds. The £530 million (US$840 million) of BDUK funding comes from the BBC's license fee of £300 million (US$475 million) and from the underspending by the country's digital

TV switchover fund of £230 million (US$365 million). This funding is released to local authorities and the devolved administrations in stages, beginning with four pilot areas (Cumbria, the Highlands and Islands, Herefordshire, and North Yorkshire). Each area has been allocated between £5 million and £10 million (US$8–16 million); the government notes that the four regions selected are in some of the most remote and geographically challenging parts of the UK.[23]

To access funding for rollout, local authorities in the United Kingdom were asked by the government to prepare local broadband plans for approval. Moreover, local authorities in England and the devolved administrations have to put in place matching funding from their own resources and, possibly, access European funds: for example, the government has suggested that the European Regional Development Fund could provide up to £100 million (US$160 million) (Parliament of the United Kingdom, 2012).

As of July 10, 2012, a total of 44 out of 45 local broadband plans had been approved by the secretary of state, detailing exactly how local authorities in England will rollout superfast broadband in their areas. Operators obtain funding through competitive bidding processes administered by the UK government, using a dedicated gap-funded subsidy model (the investment gap being the public contribution required to the private sector's investment to make the project economically viable).

The other funds are directly financed from the government budget. For example, the Rural Community Broadband Fund received a £20 million fund (US$32 million) specifically for rural areas; £100 million (US$160 million) will be invested to create up to ten "Super-Connected Cities" across the United Kingdom (with potentially more funding to follow); and the Mobile Infrastructure Project will represent an investment of up to £150 million (US$240 million) by the UK government.

It is also worth mentioning that as an EU member, the United Kingdom is entitled to aid from the EC, which can be significant. In 2011, the EC proposed to spend almost EUR9.2 billion on pan-European projects related to high-speed broadband networks and services over the period from 2014 to 2020.[24] The funding would take the form of both equity and debt instruments and grants, and would complement private investment and public funds at the local, regional, and national levels, as well as existing EU structural or cohesion funds. The EC considers that these resources could leverage a total of EUR50–100 billion of public and private investments.

[23] See http://www.culture.gov.uk/news/news_stories/7509.aspx.

[24] See http://europa.eu/rapid/press-release_MEMO-11-709_en.htm?locale=en.

Implementation: BT and KCOM are the designated USPs for telephone services in the United Kingdom.[25] This designation is based on competition law principles, according to which market interventions are permissible, as these companies hold a position of significant market power in narrowly defined markets (according to a detailed market analysis). As USPs, the two operators are required to provide a connection upon reasonable request and at uniform prices, irrespective of geographic location. This obligation encompasses the provision of an Internet narrowband connection capable of functional Internet access.

British Telecom is bidding for public funding from the total amount of £530 million (US$840 million) that is available, and it is working with local authorities to extend rollout into areas where the commercial case for investment is more difficult—referred to as the final third. The company has also indicated that in order to support the government's policy objectives, it is willing to spend a further £1 billion (approximately US$1.6 billion) of BT's capital to match government funding, to roll it out into the final third, and to get as far as possibly into the final third.

If successful in most of these bids, BT claims that it can deliver superfast broadband to more than 90 percent of UK premises. In parallel, BT is undertaking a very significant upgrade of its network and has already committed £2.5 billion (US$4 billion) to rollout fiber optic connectivity, which will deliver speeds of up to 80Mbit/s to two-thirds of UK premises by the end of 2014.

The Republic of Korea

The Republic of Korea is one of the most advanced countries in the world in terms of broadband development, with approximately 18 million fixed broadband Internet subscribers as of the end of 2012 (ITU, 2012b). It holds first position in the ITU's ICT Development rankings. This is due to a combination of factors, including strong economic growth, a dense and restricted geography, as well as effective and extensive broadband policies that were put in place early by the government (Table 1.5). These policies have been implemented, in particular, through different master plans, funded by the government and the private sector.

The Republic of Korea was one of the first countries to develop an all-IP fiber optic network called the Broadband Convergence Network (BcN)—as early as 2004—gathering a consortium of industry players together with the Ministry of Information and Communications. This infrastructure offers seamless multimedia service with speeds ranging from 50Mbit/s to 100Mbit/s. The BcN offers

[25] KCOM is not a national telecom provider; its network is limited to the area of Hull in East Yorkshire.

TABLE 1.5: Macroeconomic and Broadband Indicators for the Republic of Korea

Indicator	Year	Unit	Value
Population	2012	Million	49
Land area	—	Million hectares	10
Urbanization rate	2012	%	83
GDP per capita at purchasing power parity	2012	USD	30,801
Fixed broadband subscribers per capita	2012	%	37.6
Mobile (active) broadband subscribers per capita	2012	%	106.0
Percent of individuals using the Internet	2012	%	84
ITU ICT development rank	2012	#	1 (/157)

Sources: Databases of the EIU, Euromonitor, ITU, FCC, and World Bank.

specific services for rural areas, such as monitoring of e-farming facilities, online direct trading of agricultural and marine products, and remote Internet Protocol television study rooms. The number of BcN subscriptions exceeded 52 million at the end of 2011 (comprising 16 million wired subscribers and 36 million mobile subscribers) (KCC, 2011).

In 2009, the national regulator, the Korea Communications Commission (KCC), announced further investment in next-generation broadcasting and communications services, with an investment of W34.1 trillion (US$31 billion) to build a so-called Ultra-Broadband Convergence Network (UBcN). This network will replace the public switched telephone network (PSTN) with a fully IP-based telephony network. By the end of 2013, KCC expects that download speeds achieved on this network will reach 1Gbit/s for fixed and 10Mbit/s for mobile connections.

In terms of targets, the original goal of the BcN was to provide 100Mbit/s fixed-line connections to 10 million households and at least 1Mbit/s wireless connections to 10 million mobile subscribers by 2010. Later, UBcN's new targets included 14.5 million households with at least 50Mbit/s and at least 46 million subscribers with 1–2Mbit/s wireless broadband by the end of 2013. Despite the exceptional broadband penetration rates already achieved, the Government continues to take measures to ensure solid broadband coverage in rural regions.

Overview of UAS Programs

Table 1.6 provides an overview of the UAS programs in the Republic of Korea, These are discussed in more detail below.

TABLE 1.6: Summary of Key Characteristics of UAS Programs in the Republic of Korea

Characteristic	Description
Overview	Operators must provide broadband services (as well as voice services) at a discount to eligible subscribers (poor households, etc.), but broadband is not included in the USO. Broadband deployment has been made a condition for privatization or takeovers. The Broadcasting and Telecommunications Development Fund provides selected support. Broadband development is typically included in holistic master plans, which are mostly financed by the private sector.
Broadband definition	The original goal of the Broadband Convergence Network (BcN) was to provide 100Mbit/s fixed-line connections to 10 million households and at least 1Mbit/s wireless connections to 10 million mobile subscribers by 2010. With the ultrafast broadband initiative (UBcN), the targets are to provide 14.5 million households with at least 50Mbit/s and at least 46 million subscribers with 1–2Mbit/s wireless broadband by the end of 2013.
Regulatory framework	The Framework Act of Informatization Promotion of 1995 introduced the USF. Several master plans (2001, 2006, 2007, etc.) have defined national ICT development plans. In 2009, the National Informatization Act established the National Information Society Agency (NIA). The 2007 Korea Disability Discrimination Act set guidelines for broadband availability.
Planning	The Korea Communications Commission (KCC) is the national regulator, and is in charge of overseeing the regulation of the broadcasting and telecom sectors. The Ministry of Knowledge Economy manages the Broadcasting and Telecommunications Development Fund. The NIA identifies and supports the development of national policies and technologies to close the digital divide.
Funding	Operators are not compensated for the discounts on broadband services given to eligible subscribers. The Broadcasting and Telecommunications Development Fund includes contributions from the government and private companies (spectrum licensing fees, and revenue-based contributions from operators). The allocation of national funds is leveraged by local authorities (matching the national funding) and the operators building the network (matching the overall public funding). Large-scale broadband deployment efforts are mostly supported by the private sector.
Implementation	Private operators have been forced to comply with broadband coverage targets as part of privatization or takeovers. Private operators receive matching support for UAS investments from public authorities.

Source: Authors' elaboration.

The Republic of Korea launched a Universal Service program in 2000. This covers local calls, emergency calls and discount-rate phone service; it does not, however, include an obligation to provide broadband access. Carriers are required to provide telecom services to disabled and low-income people at a discounted rate. These services include broadband, which should be offered at a 30 percent discount rate. To compensate for the lack of broadband obligations and to guarantee broadband access for all, the Republic of Korea has introduced additional regulatory requirements in rural areas in terms of privatization within the sector. For instance, in 2002, it privatized the incumbent Korea Telecom (KT) and made it subject to expand broadband infrastructure to rural areas. The government imposed a levy on KT to provide broadband access at a minimum of 1Mbit/s in all rural areas by 2005. Similarly, in 2008, the government approved the acquisition of Hanaro Telecom by SK Telecom on condition that SK Telecom meet specific rural broadband service targets.

The Republic of Korea, in fact, has taken a rather holistic approach to universal service, applying it to wider strategies since as early as the 1990s. The government's approach to develop ICT and, in particular, broadband, has been to create several national frameworks (master plans). The current master plan is the U-Korea Master Plan, and covers the period 2006–15 (Phase 1 for 2006–10; Phase 2 for 2011–15). The Plan is based on the principle of the so-called four Us—universal acceptance in society, services usable by all, unisonous (harmonious) use of technologies and services, and continual upgrading and creation of services. Through this plan and other older informatization master plans, the government has promoted broadband policies on the supply and demand sides. With regard to supply, it has developed policies relating to regulation, competition, infrastructure development, content promotion, as well as other sectoral policies. In terms of demand, it has sought to stimulate usage, creation of content, and promotion of services such as e-government, e-learning, and e-commerce.

These plans are mostly financed by the private sector with contributions from the state. For this purpose, the government created an Informatization Promotion Fund in 1996 (later known as the Information and Communications Fund) to finance specific projects relating to the development of ICT. In January 2011, this fund became the Broadcasting and Telecommunications Development Fund, following the enactment of the Framework Act on Broadcasting Communications Development in March 2010, which merged the existing Broadcasting Development Fund and the Information and Communications Fund into a single fund under the Ministry of Knowledge and Economy. The Republic of Korea also actively promotes interest in, and demand for, broadband service through dedicated training programs aimed at specific groups, such as elderly and disabled people, and public sector employees.

Regulatory Framework

The Republic of Korea has made informatization a key policy objective as early as the 1990s, by enacting the Framework Act of Informatization Promotion in 1995 (revised in 1999 and 2006). The Act on Informatization Promotion grants authority to the regulator to prepare informatization master plans (such as the current U-Korea Master Plan 2006–15) and authorizes the Informatization Promotion Committee to undertake ICT policymaking. The act also created the Informatization Promotion Fund, which was established as a special vehicle to overcome the budgetary restrictions to promote the informatization project; the promotion of informatization requires large-scale investment and lasts for several years.[26] Since the establishment of this framework, the government formulates new plans on a regular basis, such as the Master Plan for Closing the Digital Divide 2001, e-Korea Vision 2006 (2002–06) and Broadband IT Korea Vision 2007 (2003–07). For each plan, the government has revised its objectives, strategy, and implementation tools in line with evolving technology and market conditions.

In 2009, the National Informatization Act established the NIA, whose role is to support the development of national broadband policies. In addition, the act specifically covers ICT access and usage for the disabled and the elderly. The act mandates government agencies to conform to web accessibility standards, defines ICT access guidelines, supports technology, promotes the enabling environment, and provides training programs. This followed a 2007 Korea Disability Discrimination Act, which defined Web Access Obligations for 2009–15 for various entities (government agencies, universities, colleges, hospitals, private institutions, and cultural entities).

Investments

Planning: The following entities are involved in the management and control of the UAS program:

i. **KCC:** Established in 2008 as the Republic of Korea's national telecom regulator, it falls under the mandate of the Executive Office of the President in the Blue House. The KCC oversees the regulation of the entire broadcasting and telecom sector.
ii. **Ministry of Knowledge Economy:** Responsible for managing the Broadcasting and Telecommunications Development Fund. The Tele-

[26] See http://www.cepal.org/noticias/noticias/3/12743/kijoolee2.pdf.

communications Development Fund was previously managed by KCC and the Ministry of Information and Communications. A fund management council supervises the utilization of the resources of the fund.

iii. **NIA:** (formerly the National Computerization Agency): Identifies and supports the national policies and technologies to close the digital divide. As such, NIA monitors pilot projects for new technologies to the public sector and supervises ICT technologies and standards.

Funding: The Broadcasting and Telecommunications Development Fund includes contributions from the government and private companies through spectrum licensing fees and revenue-based contributions from operators (as well as earnings from the operation of the fund). The total budget in 2011 was W544 billion (US$500 million) (KCC, 2011). It should be noted, however, that the 30 percent discount provided by all carriers to eligible subscribers (mentioned above) is not funded as part of universal service (Government of India, 2011).[27]

In the past, especially at the end of the 1990s and at the start of the 2000s (during the KII Master Plan), the government applied several methods to stimulate private investment in broadband, such as tax incentives, low-rate loans, and loan underwriting. In its current support for rural broadband deployment, the KCC has adopted the matching fund method, under which the government provides 25 percent of the investment, the local authority provides another 25 percent, and the operator that wishes to build the network contributes the remaining 50 percent. Based on data-driven international telecommunications market research and analysis from TeleGeography, in April 2010, the KCC announced that for villages of fewer than 50 households, a total of W10.5 billion (US$9.6 million) would be made available to match investments made by local autonomous entities and service providers in bringing broadband to such villages.

The government can also invest directly when it considers it to be necessary. For example, in April 2010, it announced an investment of around W150 billion (US$138 million) to rollout 100Mbit/s-capable services in rural areas. This initiative is being supervised by a newly created Rural Village Smart Infrastructure Implementation Council together with representatives from government ministries, local authorities, operators, and equipment manufacturers (TeleGeography).

[27] See http://www.censusindia.gov.in/2011-prov-results/data_files/india/Final_PPT_2011_chapter3.pdf.

Nevertheless, in spite of public funding, the bulk of the financial effort to support broadband deployment is expected to come from the private sector. This will particularly be the case for the recent UBcN deployment. The contributions of public and private funding for this initiative have been estimated at W1.3 trillion (US$1.1 billion) and W32.8 trillion (US$27.8 billion), respectively (World Bank database).

Implementation: Korea Telecom has been designated as the sole universal service provider with the obligation to provide local call service and public phone service at the same price for all users. As mentioned earlier, however, this obligation excludes broadband. In addition, all carriers must provide broadband service (as well as voice service) at a discount to eligible subscribers (e.g., poor households and the disabled).

Broadband expansion is one of the objectives covered by the master plans. The Framework Act on Informatization Promotion specifies that an implementation plan should be formulated for each master plan and should be executed by the heads of the relevant administrative agencies. Each agency must submit a performance report to the Informatization Promotion Committee at the end of each year, along with an implementation plan for the following year. The implementation plans include the overall mission and goals; a review of existing policies; a performance assessment; and project and investment plans for the following year. As explained earlier, the KCC has also ensured development of rural broadband by applying specific conditions to acquisitions in the telecom sector.

In 2002, the final privatization of KT was subject to obligations to expand broadband infrastructure to rural areas. The company was to provide broadband access at a minimum of 1Mbit/s in all rural areas by 2005. As a result, KT upgraded the broadband service of towns with more than 50 households between 2002 and 2006. It received additional funding from the Ministry of Information and Communications and the local governments to do likewise in towns with fewer than 50 households. As of the end of 2008, 99 percent of Korea's 3.77 million households in rural areas had access to broadband service of at least 1Mbit/s through KT's networks (Calvo, 2012).

When the KCC approved SK Telecom's US$1.15 billion acquisition of Hanaro Telecom in February, it required SK Telecom to provide BcN service to approximately 41 percent of towns of 50–240 households before 2013. The rationale for this condition was that the acquisition might reduce broadband competition in rural areas.

India

India is the second most populous country in the world, with over 1.2 billion inhabitants as of March 2011 (Table 1.7). Providing Internet access to such a large population is a challenging task, especially when close to 69 percent of this population resides in rural areas. This is further complicated by the fact that in 2010, more than 32 percent of the population lived below the international poverty line (US$1.25 per day at purchasing price parity).[28] This means that a very large section of the population within reach of broadband access cannot make use of it due to the high cost. Apart from the digital divide caused by urban/rural and rich/poor polarities, India's geographic diversity poses constraints in some regions (e.g., mountainous areas) and, hence, requires intervention.

Unlike the rapid uptake that has been seen with mobile services in the past decade, access to broadband is lagging far behind. After a boom in broadband uptake in the first half of the 2000s, with subscribers increasing by around 50 percent per quarter in 2004/2005, expansion then slowed, dipping to around 12 percent growth in 2008 before falling to 6.7 percent in Q1 2010 and 3.3 percent in Q1 2012. At the end of March 2012, India had about 13.8 million fixed broadband subscribers, representing a household penetration of approximately 6 percent and a population penetration of just 1.1 percent (TeleGeography).

The Indian USF was established in April 2002. It was originally used to set up village community phones, but was expanded in 2006 to fund mobile services and broadband connectivity in rural and remote areas. Since then,

TABLE 1.7: Macroeconomic and Broadband Indicators for India

Indicator	Year	Unit	Value
Population	2012	Billion	1.2
Land area	—	Million hectares	297
Urbanization rate	2012	%	32
GDP per capita at purchasing power parity	2012	USD	3,813
Fixed broadband penetration per capita	2012	%	1.1
Mobile (active) broadband subscribers per capita	2012	%	4.9
Percent of individuals using the Internet	2012	%	13
ITU ICT development rank	2012	#	121 (/157)

Sources: Databases of the EIU, Euromonitor, ITU, and World Bank.

[28] See http://povertydata.worldbank.org/poverty/country/IND.

several broadband schemes have been subsidized through the USF, including the most recent national fiber optic network at an investment of INR200 billion (US$3.72 billion).

Overview of UAS Programs

Table 1.8 below provides an overview of the UAS programs in India. These are discussed in further detail below.

The USF is financed through a Universal Service Levy, which is collected from operators in the form of a specific percentage of their revenues. These funds are used to subsidize services across six service areas, ranging from basic voice services to pilot projects to establish new technology developments in rural and remote areas:[29]

Stream I:	Provision of public telecom and information services
Stream II:	Provision of household telephones in rural and remote areas
Stream III:	Creation of infrastructure for provision of mobile services in rural and remote areas
Stream IV:	Provision of broadband connectivity to villages by stages
Stream V:	Creation of general infrastructure in rural and remote areas for development of telecom facilities
Stream VI:	Introduction of new technolog developments in the telecom sector in rural and remote areas.

As part of the broadband-related Streams IV and V, a number of programs have already been initiated:

iv. **National Optical Fibre Network:** In October 2011, the Cabinet approved a plan for this network to provide broadband connectivity to 250,000 village *Panchayats* (councils) with a budget of INR200 billion (US$3.72 billion), funded in full by the government of India, initially through the USF and subsequently by private companies.[30] The project will add new links to existing core networks of public operators that already have fiber optic cable infrastructure in place (including Bharat Sanchar Nigam Ltd. [BSNL], RailTel, and Power Grid).

[29] Indian Telegraph (Amendment) Rules 2004, 2006.

[30] See http://www.odisha.gov.in/portal/ESDM%20Strategic%20Roadmap.pdf.

TABLE 1.8: Summary of Key Characteristics of UAS Programs in India

Characteristic	Description
Overview	• The USF includes dedicated streams of action for broadband, including national backbone deployment, rural Internet access development, and the launch of targeted services (e.g., women's self-help groups). • Specific initiatives run in parallel (e.g., the Bharat Nirman, which aims to improve rural infrastructure).
Broadband definition	• The goal of the 2012 National Telecom Policy is to reach 600 million broadband connections by 2020, with a minimum download speed of 2Mbit/s. • The definition of broadband will thus be progressively increased from the current 256kbit/s to 512kbit/s, and then to 2Mbit/s by 2015, with higher speeds thereafter.
Regulatory framework	• The 1999 New Telecom Policy introduced USO. • The 2003 Indian Telegraph (Amendment) Act gave status to the USF. • The 2004 Indian Telegraph (Amendment) Rules defines the USF rules (amended in 2006 and in 2012). • The 2004 National Broadband Policy, revised in 2012, sets broadband development objectives. • The Department of Telecommunications (DoT) strategic plan for 2011–15 includes broadband development.
Planning	• DoT is the governing body for all telecom services, including policy formulation. • The Telecom Regulatory Authority of India (TRAI) is the national regulator; it provides recommendations to DoT on various issues relating to the USF. • The Ministry of Communication and Information Technology oversees the working of the DoT and its various subunits. • The Office of the Administrator USOF formulates and implements USF projects. • An Inter-Ministerial Advisory Committee provides advice and recommendations relating to the USF. • The Controller of Communication Accounts oversees subsidy disbursement. • The Comptroller and Auditor General of India is responsible for auditing the accounts of the USF.
Funding	• The USF is financed via a levy on operators' revenues.
Implementation	• The incumbent, Bharat Sanchar Nigam Ltd. (BSNL), has been selected to implement most of the USF schemes (following competitive bids) • Projects are typically awarded via competitive bidding.

Source: Authors' elaboration.

v. **Wire-Line Broadband Plan:** This is an agreement that was signed with the incumbent BSNL in January 2009 to provide rural, fixed broadband from about 28,000 rural wire-line exchanges spread across the country. Apart from subsidized broadband connectivity for individuals and government

institutions and preferential connectivity for women's self-help groups, one broadband kiosk for public access is to be provided from each eligible rural wire-line exchange.[31]

vi. **Rural Public Service Terminal (RPST) pilot for financial inclusion and value-added services:** A Memorandum of Understanding has been signed with BSNL for subsidy support from the USF for the provision of broadband-enabled RPSTs to eligible women's self-help groups on a pilot basis. It is envisaged that the subsidized RPSTs will enable these groups to provide banking services and other value-added services to the rural public.

In addition, the BSNL initiative has been developed to improve all rural infrastructures in India. As a part of its larger plan, the Department of Telecommunications (DoT) sought to achieve broadband coverage to all 247,864 village *Panchayats* by the end of 2012.[32] Of these, 110,695 village *Panchayats* were covered by the end of the financial year 2010–11.[33] It is notable that support for mobile broadband deployment is currently excluded from the USO fund, in view of the mandatory rural rollout obligation imposed on broadband wireless access and 3G operators, which were allotted spectrum following an auction in 2010.[34]

Regulatory Framework

The 1999 New Telecom Policy introduced the USO and sought to achieve the following objectives: (i) voice and narrowband data service acces to the remaining 0.3 million uncovered villages by 2002; (ii) Internet access to all district headquarters by 2000; and (iii) telephone on demand in urban and rural areas by 2002. Since then, there have been a number of changes in the legislation regarding UAS. The 2003 Indian Telegraph (Amendment) Act gave statutory status to the USF. The 2004 Indian Telegraph (Amendment) Rules define the regulations for USF administration and include Streams I and II as the areas

[31] See http://usof.gov.in/usof-cms/USFO-2-Folder.pdf.

[32] See http://articles.economictimes.indiatimes.com/2012-12-14/news/35820022_1_broadband-policy-broadband-connectivity-bharat-broadband-network.

[33] See http://www.isrj.net/UploadedData/3017.pdf.

[34] See USOF Results Framework Document at http://usof.gov.in/usof-cms/GagendaPdf/bb/USOFs_VisionMissionObject_and_Functions.pdf.

to be funded by the USF. In 2006, an ordinance was passed to enable support for mobile services and broadband connectivity in rural and remote areas; this was put into place by the 2006 Indian Telegraph (Amendment) Act. In parallel to this act, the central government amended the administration regulations of the USF so that Streams II to VI would be included.

With regard to the national broadband plans, DoT formulated a National Broadband Policy in 2004.[35] Since broadband was not part of the USF at the time, the 2004 Broadband Policy did not include a mechanism for funding broadband through the USF. To incentivize service providers, however, the policy reduced the license fee for certain types of infrastructure providers.[36]

DoT's strategic plan for 2011–15, formulated in 2010,[37] restated the need for broadband development. Moreover, the plan acknowledged that the 2004 Broadband Plan had failed to achieve its goals and a new set of objectives were identified:

i. **Broadband penetration:** Broadband for all by increasing access to high-speed broadband in *Gram Panchayat*.[38]
ii. **Allocation of resources for broadband:** Ensure a sufficient allocation of resources such as spectrum, rights-of-way management, and infrastructure sharing for broadband.
iii. **Cross-sectoral use of broadband:** Provide incentives to encourage the uptake of broadband in sectors such as education, healthcare, public safety, and government operations, by subsidizing equipment for customers.
iv. **Expansion of broadband in rural areas:** Provide funding and support to encourage the speedy rollout of mobile broadband on 3G and broadband wireless access spectrum in rural and remote areas.

Of the above four areas, the second (allocation) was an action item to be the responsibility of the various government entities, while the other three areas were clearly identified as programs to be financed through the USF. The

[35] See http://pib.nic.in/archieve/image/broadband_policy04.pdf.
[36] See Broadband Plan, article 4.1.
[37] See http://www.dot.gov.in/sites/default/files/Final_Strategic_Plan-uploaded.pdf.
[38] The Village Panchayat is the main institution that runs the administration of local affairs of the village. The Gram Panchayat consists of one or more villages. For the purpose of this publication, the terms are used interchangeably.

objectives for broadband development were then revised in the 2012 National Telecom Policy as follows (Government of India, 2012):[39]

i. Access to broadband by 2015.
ii. 175 million broadband connections by 2017.
iii. 600 million broadband connections by 2020, with a minimum download speed of 2Mbit/s (and speeds of at least 100Mbit/s to be available on demand).
iv. High-speed and high-quality broadband access to all village *Panchayats through a combination of technologies by 2014, and progressively to all villages and habitations by 2020.*
v. Significant transition to Internet Protocol version 6 in a phased manner by 2020.

The strategic activities under the 2012 National Telecom Policy include the following:

i. Develop an ecosystem for broadband in close coordination with all stakeholders, including ministries and other government departments and agencies to ensure access to media at all levels (last-mile access, aggregation, core network, and user devices) and a favorable environment for development of relevant applications.
ii. Work toward the right to broadband, recognizing that it is basic need for citizens, especially in terms of education and healthcare.
iii. Specifically provide reliable and affordable broadband access for rural and remote areas through a combination of fiber optic, wireless, satellite and other technologies. In particular, the fiber optic network will extend to the village *Panchayat* level with USF funding, and access to the network will be open, nondiscriminatory, and technologically neutral. The extension of fiber optic connectivity for village *Panchayats* will be made progressively.
iv. Provide appropriate incentives for rural rollout of telephony and broadband.
v. Increase the existing download speed of 256kbit/s to 512kbit/s, and then to 2Mbit/s by 2015, with higher speeds of at least 100Mbit/s thereafter.
vi. Encourage the uptake of fiber optic communications in the home to transform cities and towns into a connected society.

[39] See http://www.trai.gov.in/WriteReadData/userfiles/file/NTP%202012.pdf.

vii. Continue support by the USF of telecom services, including combined communications services in commercially unviable rural and remote areas.

In March 2012, DoT formulated the 2012 Indian Telegraph (Amendment) Rules. These ensure that the forthcoming National Optical Fibre Network project will receive funding from the USF for a period of five years from the date the rules came into force.[40]

Investments

Planning: The following entities are involved in the management and control of the USF in India:

i. **Department of Telecommunications (DoT):** The governing body for all telecom services. Its duties include policy formulation, licensing, international cooperation, and dispute resolution.
ii. **Telecom Regulatory Authority of India (TRAI):** The independent telecom regulator, established in 1997, which is part of the DoT. One of the TRAI's main objectives is to provide a fair and transparent policy environment to promote fair competition. In terms of USF management, the TRAI provides recommendations to DoT on various issues relating to the USF.
iii. **Ministry of Communication and Information Technology:** Responsible for supervising the work of the DoT and its various subunits, such as Telecom Regulatory Authority of India (TRAI), Office of the Administrator (USOF), and the state-owned telecommunications companies Bharat Sanchar Nigam (BSNL) and Mahanagar Telephone Nigam Limited (MTNL).
iv. **Office of the Administrator, USOF:** An office of DoT with responsibilities that include formulating USF projects within the various streams; designing the bidding process and carrying out tenders; entering into implementation agreements with operators; monitoring the implementation of USF projects; funding subsidies; budgeting; and auditing the USF activities.
v. **Inter-Ministerial Advisory Committee:** Provides advice and recommendations on important issues relating to the USF. It is constituted under the chairmanship of the Administrator of the USOF and includes representatives from the Indian Institute of Technology (Chennai), Indian Institute of Management (Ahmedabad), Ministry of Finance, Ministry of Law and Justice, Planning Commission, TRAI, and DoT.

[40] See http://www.ijlt.in/pdffiles/Telegraph-Rules-2012.pdf.

vi. **Controller of Communications Accounts:** Twenty-three offices assist the USOF Administrator. These field units of DoT have been delegated the duties of disbursing subsidies and verifying claims. They assist the USOF Administrator to monitor implementation, at the field level, of USF agreements.

vii. **Comptroller and Auditor General of India:** An independent authority that audits all government accounts; as part of this, it is responsible for auditing the accounts of the USF.

Funding: The USF has accumulated considerable resources over the past few years and, according to DoT accounts, INR440 billion (US$8.5 billion) has been collected in the form of the Universal Service Levy to date. The USF had INR218 billion (US$4.05 billion) available at the end of the financial year 2011–12 and, in three years, this sum has risen to INR360 billion (US$6.7 billion).[41]

The USF is financed through a Universal Service Levy collected from certain telecom operators at a specific percentage of their adjusted gross revenue. The levy is currently fixed at 5 percent of adjusted gross revenue for all telecom service providers, except pure value-added service providers such as Internet, voice-mail, and email.[42] The levy is first credited to the Consolidated Fund of India and allocated to the USF through parliamentary approval. The balance of credit does not lapse at the end of the year.[43] Furthermore, additional grants and loans may be provided by the central government, if required.

Implementation: BSNL, the incumbent fixed operator, has been selected to implement most of the projects under Stream IV (broadband connectivity to villages) and Stream V (general infrastructure in rural and remote areas). Under Stream IV, an agreement has been signed with BSNL to provide wireline broadband connectivity to rural areas through the 28,000 wireline exchanges that it owns (as discussed above). The agreement requires BSNL to provide 861,459 wireline broadband connections by 2014. By the end of April 2012, BSNL had provided 360,966 broadband connections under this plan.[44] Under Stream V, following a request for Expressions of Interest, BSNL was selected to lay the network and an agreement was signed in February 2010. As of the end of 2011, 174 nodes (out of 354) had been installed.

[41] See http://usof.gov.in/usof-cms/usof_fundstatus.htm.
[42] See http://usof.gov.in/usof-cms/usof_home_contd.htm.
[43] See http://www.itu.int/ITU-D/treg/related-links/links-docs/USOF-India.pdf.
[44] See http://usof.gov.in/usof-cms/GagendaPdf/bb/BB7A_16-05-2012.xls.

Another agreement was signed with RailTel Corporation in January 2012, whereby it will receive subsidies from the USF for the deployment and management of an intradistrict fiber optic network in rural and remote areas.[45]

The tendering process for the rollout of the National Optical Fibre Network started at the end of 2012. A total of 500,000 kilometers of fibre will be needed to achieve the objective to connect all 250,000 village *Panchayats* by the end of 2013.[46] This infrastructure will complete an already large backbone of fiber optic network (close to 670,000 kilometers.) that is available from BSNL, Railtel, and Power Grid, most of which is located in urban and semi-urban areas. This network will be rolled out and operated by Bharat Broadband Network Ltd., under the legal status of a business that establishes, manages, and operates the national fiber optic network. The company's objective is to provide high-speed broadband connectivity to all *Gram panchayats* and act as an independent wholesaler of network capacity to service providers.

Lessons Learned

The reference countries have clearly understood the need to adapt to UAS. Some have done so sooner (e.g., the Republic of Korea) than others (e.g., the United States). All four countries have carried out significant reforms of their legacy policy and regulatory frameworks and have followed different approaches to develop UAS that have been tailored to their respective macroeconomic and sectoral settings and political objectives. There are many approaches, one of which is to implement a specific UAS broadband policy. This option will generally rely on an existing UAS telephony policy that can be extended and adapted to include broadband as an additional supported service. Other options include direct public investments and direct subsidies, among others. The following table summarizes how the four reference countries have handled these issues.

The four countries share some similarities in increasing broadband access to the population, but the specific measures differ due to the uniqueness of each country. The key lessons learned from their experiences are summarized below:

i. **Target segments:** UAS initiatives usually target the poor population and the rural and remote areas. The government can also include other

[45] See http://usof.gov.in/usof-cms/usof_Implementation_status.htm.
[46] See http://www.lightreading.in/document.asp?doc_id=222414.

segments, such as healthcare providers, schools, and women's groups, according to the priorities of the social inclusion programs in that country.

ii. **USO imposition:** USO imposed on the incumbent operator alone is not considered an optimal way to achieve the objectives of broadband UAS policies in these four countries. A deregulated market moves toward a market where the cost of UAS is shared proportionally among industry stakeholders.

iii. **Funding sources:** Well-funded UAS programs rely on multiple sources. Other than the conventional USF, there are other ways to fund programs, such as in the case of operators' discounts to eligible poor and disabled subscribers in the Republic of Korea and the EU funds to the United Kingdom.

iv. **Budget allocation mechanism:** It is possible to optimize the impact of a government budget by allocating a fund via reverse auction (United States) or a gap-funded subsidy model (United Kingdom). The different competitive bidding methods have the same principle: the bid requiring a minimum subsidy/investment gap will win.

v. **Private sector participation:** Active private sector participation is essential to the success of UAS policies. In the Republic of Korea, the private sector mostly finances broadband deployment, and the local authorities (matching national funding) and operators building the network (matching overall public funding) leverage the allocation of national funds. Similar arrangements exist in the United Kingdom.

vi. **Alternative technology:** Mobile broadband can be deployed to bridge the gaps in fixed broadband networks; this especially applies to extreme remote areas with low population density where fixed broadband deployment does not make economic sense. India, the United Kingdom, and the United States complement fixed broadband with wireless options.

vii. **Demand-side focus:** Stimulating broadband uptake cannot be ignored to increase broadband access. The European Commission called on member states to reinforce measures to drive demand. The Republic of Korea also has actively promoted interest in and demand for broadband services through dedicated training programs. India launched the RPST pilot for financial inclusion and value-added services to encourage uptake.

viii. **Holistic plan:** A country is mostly likely to achieve its objectives when a broadband deployment plan is part of a holistic ICT master plan and when challenging—yet feasible—goals are clearly defined. The Republic of Korea is a good example.

TABLE 1.9: UAS Comparisons Across Four Countries

	United States	United Kingdom	Republic of Korea	India
GDP per capita (USD PPP) 2012	51,749	37,456	30,801	3, 813
Population geography	High urbanization but low density in the large rural areas	Relatively high population density	Dense and restricted geography	Populous and ~70% resides in rural areas
UAS target segment	• Poor • Rural and remote • Healthcare • School and library	• Poor • Rural and remote	• Poor • Disabled	• Poor • Rural and remote • Women
Imposition of Broadband USO	No	No	No	No
Funding	• USF (a levy on operators' revenues) • Government budget • Private sector contribution	• BBC's license fee and digital TV switchover fund • Government budget • Private sector contribution • European funds	• Discounts to eligible poor and disabled subscribers by operators • Government budget • Private sector contribution	• USF (a levy on operators' revenues) • Government budget • Private sector contribution
Stimulus approach	Mainly supply side	Supply side and demand side	Supply side and demand side	Mainly supply side
Mobile broadband to complement?	Yes	Yes	—	Yes (considered very important)
Uniqueness	• Public-led funding • A combination of major one-off investments and yearly subsidies to operators from the government • PPP to implement some projects • Fund allocation via reverse auction	• Multiple funding sources • Operators bid for public funds to support deployment • EC provides guidelines and aid for UAS • The incumbent BT matches government's capital and works with local authorities for difficult rollout	• Mostly financed by private sector • Holistic master plans for ICT development • Broadband deployment as a condition for privatization or take-overs • A clear vision to encourage broadband uptake	• USF plays an important role • The Rural Public Service Terminal (RPST) pilot for financial inclusion and value-added services • Mobile broadband is an important alternative to fill the gaps

Source: Authors' elaboration.

United States

In the United States, broadband is now centered in UAS policy and, more generally, the U.S. government has made broadband the core of its ICT development plans. The benefits of broadband and UAS are well understood: the United States was the first country to implement a UAS policy to address the fact that it has a large number of low-density areas where it would not be economically viable to establish and maintain telecom services without subsidies. The USF is relatively mature and has significant resources and has a well-defined structure.

The national regulator, the FCC, has recently made substantial effort to transform the existing USF in order to put broadband at the heart of UAS policies. In particular, a large part of the funds that were previously used to support traditional voice services are currently being earmarked exclusively for broadband initiatives by shifting resources from the High Cost Program into the Connect America Fund.

In addition to the USF, the U.S. government has put in place specific stimulus packages with significant resources (e.g., the Mobility Fund and the Broadband Technology Opportunities Program). These initiatives use a combination of large one-off investments and grants, plus annual subsidies to operators. The government has also encouraged the private sector to invest in unserved areas to the largest possible extent.

United Kingdom

The United Kingdom, similar to the United States, is a wealthy country that is technologically advanced. London is a major financial hub in Europe, and the government is fully aware of the strategic importance of broadband for economic development. Unlike the United States, however, the United Kingdom has a traditional decentralized approach to promote UAS, with a strong focus on partnerships between local authorities and the private sector in the form of PPPs.

Universal access and service in the United Kingdom does not include broadband; it only covers basic fixed services (i.e., a fixed connection to the PSTN for individual users, public payphones, telephone bill monitoring capabilities, and discounted tariffs for certain types of subscribers). As a memberof the EU, the United Kingdom's UAS policy is a transposition of its legislation. The framework for EU legislation is particularly sensitive to the potential impact that UAS might

have on competition, and market interventions are not permitted if they could disrupt competition.

In relation to broadband, the UK government is following a multifold approach to ensure broadband UAS. In particular, it is relying heavily on PPPs and providing relevant subsidies or grants to leverage local broadband development plans for remote areas. The government is also funding several stimulus packages that are of strategic importance to the economy. Lastly, ISPs are encouraged to make a Universal Service Commitment, stating their ambitions regarding broadband UAS; however, there are no legally binding broadband USOs. It is notable that the government's broadband policies include a number of speed targets: by 2015, the target is to have UAS broadband at 2Mbit/s, while 90 percent of the population will enjoy superfast broadband at 24Mbit/s, and residents of Super-Connected Cities will have access to speeds of at least 80–100Mbit/s.

Republic of Korea

The Republic of Korea is also a relatively wealthy country and is one of the most advanced countries in the world in terms of broadband development. This is due to a combination of factors, including strong economic growth, a densely populated and relatively small nation, and effective and extensive broadband policies that were put into place at an early stage. These policies have been implemented through various master plans, funded by the government and the private sector. The master plans are the crystallization of a very centralized, detailed, and well-designed approach to ICT development in general and especially, to broadband development. For example, the Republic of Korea was one of the first countries to develop an all-IP fiber optic network—as early as 2004—as a result of extensive government involvement.

Broadband UAS is less of an issue in the Republic of Korea than in the United Kingdom and the United States, given the tremendous development that has been achieved so far and its demographic (a small proportion of the population lives in rural areas), economic enabling environments, and market conditions. As a result, UAS also includes local telephone calls, public telephone service, emergency call services, as well as discounted tariffs for eligible households; it excludes, however, broadband. To support broadband service in the few remaining unserved or underserved areas, the Republic of Korea has had to rely, instead, on ad hoc regulatory requirements, particularly when the country's telecom industry was in the process of being privatized.

India

In comparison to the previous three reference countries, India faces many more economic and demographic challenges. It is much less developed and in 2011 had a GDP per capita at purchasing power parity of only US$3,825. It is also the second most populous country in the world, and 70 percent of the population reside in rural areas. To provide Internet access to such a large population is a challenge. Apart from the digital divide that exists between urban and rural areas and between the wealthy and the poor, India's topography also poses a challenge in some areas (e.g., mountainous regions); thus government intervention will be needed to support broadband UAS.

India recognized at a relatively early stage that ICT represents a tremendous opportunity for economic development and could contribute toward reducing poverty in remote areas. In particular, there is strong emphasis on low-cost software and the outsourcing of services that rely heavily on broadband. Thus, broadband is central to a much broader economic development strategy. In view of this, India established a USF for village community phones as early as 2006. The USF has expanded since to include broadband and mobile services, and considerably significant financial resources have been invested in the development of ICT. Broadband is thus one of the pillars of the UAS programs that are financed by the USF.

CHAPTER 2

Analysis of Asian and Latin American Countries

This chapter analyzes the universal access and service (UAS) programs that have been implemented in eight Asian and Latin American countries: Costa Rica; Dominican Republic; Chile; Bolivia; Sri Lanka; Pakistan; Vietnam; and Bangladesh. The chapter concludes with a summary of the key lessons derived from the analysis.

LATIN AMERICA

Costa Rica

Table 2.1 summarizes the main macroeconomic and broadband indicators for Costa Rica. Costa Rica's telecom market had been under the monopoly of the state-owned incumbent operator, ICE (Instituto Costarricense de Electricidad) and its subsidiary RACSA (Radiográfica Costarricense S.A.) until 2008. Since

TABLE 2.1: Macroeconomic and Broadband Indicators for Costa Rica

Indicator	Unit	Year	Value
Population	Million	2012	5
Land area	Million hectares	—	5
Urbanization rate	%	2012	65
GDP per capita at PPP	USD	2012	12,733
Fixed broadband penetration per capita	%	2012	9.3
Mobile (active) broadband subscribers per capita	%	2012	14.5
Percent of individuals using the Internet	%	2012	48
ITU ICT development rank	#	2012	60 (/157)

Sources: Databases of the ITU and World Bank.

then, the telecom sector has undergone extensive change, primarily due to deregulation of the market and the creation of SUTEL (Superintendencia de Telecomunicaciones de Costa Rica), the new telecom regulator, in 2009.

In terms of broadband, the main obstacle to growth is the high price of telecom services, since almost a quarter of Costa Rica's population lives below the poverty line. As a result, the adoption of broadband services is often limited to urban areas.

In 2009, the Costa Rican government published its National Plan for the Development of Telecommunications (Plan Nacional de Desarrollo de las Telecomunicaciones, or PNDT) (MINAET, 2009), defining its UAS program for 2009–14. Implementation of the program, however, is still in its early stage and the results of the initiatives are yet to materialize.

Overview of UAS Programs

In 2008, General Telecommunications Law No. 8642 (Ley General de Telecomunicaciones) created a USF, the National Telecommunications Fund (Fondo Nacional de Telecomunicaciones, or FONATEL), which falls under the responsibility of SUTEL. In 2011, the government of Costa Rica published its national broadband plan as part of its PNDT. Overall, the plan aims to improve the country's economy by rolling out broadband to rural areas and by fostering ICT innovation. The principal objectives are the following:

i. To provide broadband access through wireless technology when installation and maintenance costs of fixed infrastructure are too high.
ii. To install dedicated centers offering broadband access to rural and urban communities.
iii. To provide broadband access to public education institutions (pre school, elementary, and high school).
iv. To provide broadband access in hospitals, clinics, and public health centers, as well as in Ministry of Health buildings.

The first phase of the plan began in June 2011, leading to the identification of priority areas. In August 2012, the First FONATEL Program (Primer Programa FONATEL) was published, which is a comprehensive, five-year program that integrates the various objectives of the PNDT. The First FONATEL Program is based on the following pillars: the provision of (i) fixed telephone services; (ii) Internet services to unserved or underserved communities; and (iii) access to ICT access by public service centers in communities.

Governance

FONATEL was established in March 2012 and is currently recruiting its key staff. As of November 2012, the fund had a director and a few managerial officers. FONATEL ultimately will oversee the management of funds, which is currently the responsibility of SUTEL. The National Bank of Costa Rica currently manages the trust fund.

The role of SUTEL, as regulator, is to ensure efficiency, equality, continuity, quality, and coverage with regard to telecom services in Costa Rica. Besides managing the USF, SUTEL's primary functions include mandating open access to networks and services by operators; encouraging investments in ICT; providing licenses and authorizations to service providers; managing the radio spectrum; and resolving disputes between service providers.[1]

The Ministry of the Environment, Energy, and Telecommunications is in charge of defining telecommunications laws and implementing the national telecommunications strategy, in particular, the national broadband plan. In August 2012, the government announced that management of the telecom sector would migrate into the Ministry of Science and Technology.

Regulatory Framework

The legal framework for UAS in Costa Rica was established by General Telecommunications Law No. 8642 and the Law No. 8660 to Strengthen and Modernize Public Entities in the Telecommunications Sector (Fortalecimiento y Modernización de las Entidades Públicas del Sector), both of which were published in 2008. In particular, FONATEL was created under Article 34 of the General Telecommunications Law, which sets out its objectives as follows:

i. **Accessibility:** Promote access to high-quality telecom services in a timely, efficient, affordable, and competitive manner to areas of the country where the installation and maintenance of infrastructure for the supply of these services is not commercially viable.
ii. **Affordability:** Promote access to high-quality telecom services in rural areas—where people do not have sufficient resources to access them—in a timely, efficient, affordable, and competitive manner.

[1] See http://www.sutel.go.cr/.

iii. **Education and health:** Provide high-quality telecom services in a timely, efficient, affordable, and competitive manner to institutions and people with special needs, such as children's shelters, the elderly, persons with disabilities, indigenous people, schools and colleges, as well as public and private health centers.
iv. **Social inclusion:** Narrow the digital divide and ensure that there is equal opportunity for access and greater enjoyment of the benefits of information and knowledge through connectivity, infrastructure development, and available ICT devices and broadband.

FONATEL programs are implemented by SUTEL, following an assessment of the applications for subsidies. The programs are designed in accordance with the goals and priorities defined in the PNTD and in line with the UAS principles listed above. In addition, the management of FONATEL's financial resources includes ensuring that (i) resources are effectively and efficiently utilized; (ii) solutions are sustainable; and (iii) the award of funding is transparent.

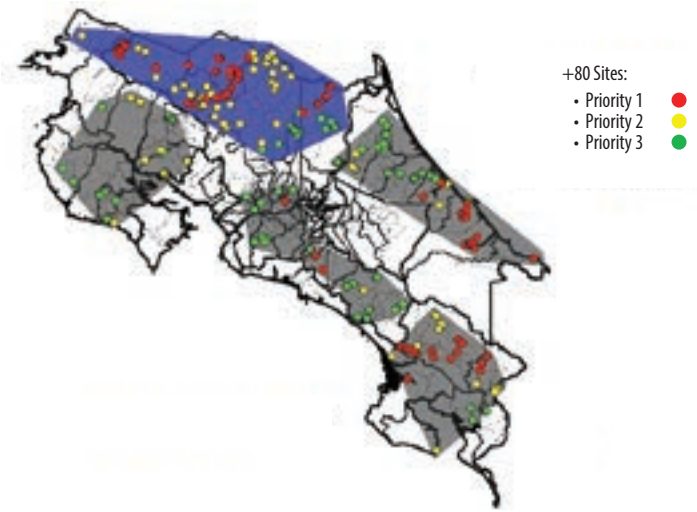
Investments

Planning: The first phase of the PNDT started in June 2011 and set out to identify the areas with the most urgent needs. The First FONATEL Program determined approximately 190 locations in 5 regions and classified them into three levels of priority (1 to 3), based on a measure called the Human Development Index at the Community Level (Índice de Desarrollo Humano Cantonal) and the density of population. The first trials were conducted in Siquirres in 2012. In 2013, it was anticipated that the program would focus on the northern region, where more than 80 priority locations have been identified (Map 2.1).

In Siquirres, the program involves connecting six villages of approximately 750 households and 7 educational centers. In addition to access to residential fixed telephony, the program intends to provide download speeds of up to 2Mbit/s for households and up to 8Mbit/s for public centers.

Funding: As defined in Article 38 of the General Telecommunications Law, FONATEL's resources originate from a special contribution from telecom operators. This contribution is set annually at between 1.5 percent and 3 percent of their gross revenues; for 2012, it was set at 1.5 percent of gross revenues. FONATEL receives additional funding from other revenue streams, including

MAP 2.1: Location of Sites in the Northern Region to Benefit from FONATEL



Source: FONATEL and SUTEL.

from those such as telecom licenses, penalties from operators, late-payment interest on transfers, and revenues from FONATEL's investments. At the end of July 2012, FONATEL had CRC96.5 billion (US$193 million) in resources. Most of this originated from mobile spectrum concessions that had been awarded (US$170 million), while the rest came from the contributions of operators (US$23 million between March 2012 and July 2012).

FONATEL's resources are invested in government bonds, which are placed by the Ministry of Finance through a dedicated trust fund that was created in October 2011, in line with Article 35 of the General Telecommunications Law. As the money is invested in UAS projects, the trust fund, ultimately, will monitor and manage the use of FONATEL's resources. It is believed that FONATEL considers that its resources are sufficient to cover the implementation cost of potential projects that have been identified so far, although the tendering process was not yet complete at the time of writing. Nevertheless, it should be noted that FONATEL has considerable financial resources to cover the cost of Internet access for a relatively small population.

Implementation: As defined in Article 36 of the General Telecommunications Law, FONATEL's resources can be allocated toward (i) network operators and

telecom service providers to finance UAS-related projects, (ii) the shortfall in services relating to the USO imposed on operators, or (iii) possible competitive disadvantages. As described earlier, SUTEL published its First FONATEL Program only recently, and the tendering process to award the work contract is in its final stage of completion.

Projects: Other than FONATEL, there is currently no major program in place that directly relates to broadband UAS in Costa Rica.

Dominican Republic

Table 2.2 summarizes the main macroeconomic and broadband indicators for the Dominican Republic, where broadband penetration is relatively high (17 percent of households, as of June 2012) (TeleGeography) and where 45.9 percent of the population were Internet users by the end of 2013 (ITU database). Wireline infrastructure is relatively well developed compared to other LAC countries, with broadband access across the country.

The main factors that hinder further installation, especially in rural areas, include the following:

i. Low purchasing power of the local population in some rural and suburban areas, combined with low levels of education
ii. Low affordability of broadband services—a main barrier to the adoption of broadband by a high proportion of the population, since many households do not yet have access to basic commodities, such as drinking water and electricity

TABLE 2.2: Macroeconomic and Broadband Indicators for the Dominican Republic

Indicator	Unit	Year	Value
Population	Million	2012	10
Land area	Million hectares	—	5
Urbanization rate	%	2012	70
GDP per capita at PPP	USD	2012	10,038
Fixed broadband penetration per capita	%	2012	4.3
Mobile (active) broadband subscribers per capita	%	2012	15.4
Percent of individuals using Internet	%	2012	45
ITU ICT development rank	#	2012	94 (/157)

Sources: Databases of the ITU and World Bank.

iii. Relatively high tax rate applicable to telecom services (28 percent in 2012 and 30 percent planned for 2013), which indicates that broadband is not a priority within the government's development agenda, nor is it considered a basic service for citizens and businesses
iv. High cost of installing broadband infrastructure in rural areas, combined with a lack of critical infrastructure, such as a national fiber optic backbone, the implementation of which has been delayed for several years
v. High cost of national connectivity—internal connectivity costs are high and can significantly affect the economic viability of broadband in rural areas

As a result, according to the Dominican Telecommunications Institute (Instituto Dominicano de las Telecomunicaciones, or INDOTEL), broadband penetration rates can vary across provinces—75 percent of Internet users are concentrated in just 4 of the 31 provinces.

Overview of UAS Programs

The Dominican Republic has established a USF, the Fund for the Development of Telecommunications (Fondo de Desarrollo de las Telecomunicaciones) to expand broadband coverage and ensure that people who live in remote rural areas have access to broadband. The USF is administered by the national regulator, INDOTEL, and funded from the revenue that originates from telecoms operators. The primary objectives of the Fund are the following:[2]

i. Contribute to the economic and social welfare of the country
ii. Promote technological innovation in the telecom sector
iii. Foster competition in the telecom market
iv. Render self-sustainable and market-oriented services, as well as operations and businesses to promote access to communications services

Many of the projects that are eligible for funding are development projects, which form part of INDOTEL's biannual plans to extend UAS to rural areas of the country. These projects are led by INDOTEL and implemented by the private sector. Ultimately, the goal is to achieve the highest rate of social return on investment while, at the same time, ensuring that the projects are self-sustainable and profitable for the private sector in the long term.

[2] See http://www.indotel.gob.do/index.php/indotel/fondo-de-desarrollo-de-las-telecomunicaciones.

INDOTEL has identified 21 projects for 2012–13.[3] These will be awarded to private companies through open tender. The projects, totaling RD$1,063 billion (US$26.7 million), fall into three categories:

i. **UAS to advanced telecom services:** These projects aim to improve access to telecom services. Initiatives include providing WiFi Internet access and terminals to Santo Domingo's metro stations, public spaces, and educational institutions; installing fiber optic backbone; bringing broadband Internet service to underserved areas; and promoting the development and use of e-government applications.
ii. **ICT training:** Training projects include e-education services and applications to improve ICT literacy among students, such as Virtual Technology Higher Education (virtual classrooms); Computers for Outstanding Young (computer labs); Digital Salas; Fund for Academic Excellence; and Community Technology.
iii. **Increase of broadband uptake and usage by specific groups and communities:** These projects aim to increase the adoption and usage of broadband by specific groups and communities. Initiatives include the development of a web portal to empower the agricultural industry; an integrated platform for the Ministry of Labor; and a virtual management system that enables hospitals and healthcare organizations to remotely manage the allocation and use of resources.

The USF also funds some ad hoc projects of a strategic and social nature. These are outside the scope of INDOTEL's biannual plans.

Governance

INDOTEL, as the telecom regulator, is in charge of managing the USF. More generally, its mission is to promote the development of telecommunications by implementing UAS; to ensure fair competition for the provision of public telecom services; and to enforce the rights of customers and the providers of these services. INDOTEL regulates the entire telecom sector, grants licenses, prevents anticompetitive behavior, manages spectrum resources, monitors the fulfillment of operator obligations, and regulates interconnectivity, among others.

[3] "Resolución" No. 015-12 and Biannual Plan2012–2013. Available at http://www.indotel.gob.do/index.php/indotel/proyectos-indotel/planes-bienales.

At a more global level, the National Commission for Information Society and Knowledge (Comisión Nacional de la Sociedad de la Información y el Conocimiento, or CNSIC) defines the national policies and strategies related to ICT.

INDOTEL coordinates the work of CNSIC with other stakeholders, including the Presidential Office of Information Technology and Communication (Oficina Presidencial de las Tecnologías de la Información y Comunicación); National Statistics Office (Oficina Nacional de Estadística); Ministry of Education, Ministry of Higher Education, Science, and Technology; representatives of operators; and other government agencies and nongovernmental organizations.

Regulatory Framework

The USF (Fondo de Desarrollo de las Telecomunicaciones) of the Dominican Republic originated in 1998 under General Telecommunications Law No. 153–98 (Ley General de Telecomunicaciones). INDOTEL's 2010 policy guideline, the Universal Service Social Policy for the Telecom Development Fund, sets the guidelines for implementation.

In 2007, the government published its national ICT plan, the e-Dominicana Strategy (CNSIC, 2007).[4] The plan has eight priorities: access to infrastructure; digital inclusion; promotion of e-education; computer and Internet training; promotion of public awareness of the benefits of broadband services; development of digital content; e-government; and e-services by the private sector. With regard to broadband, the government set the following access targets:

i. Broadband access for households within 5 kilometers at speeds of at least 128kbit/s.
ii. Internet access for 40 percent of the population, with at least 30 percent of connectivity supporting speeds of at least 128kbit/s.
iii. Personal computer ownership by at least 50 percent of the population.

To achieve these objectives, INDOTEL established specific goals to include the following:

i. Create incentives for broadband usage by making services affordable to all citizens.

[4] See http://www.cnsic.org.do/documentos/task,doc_view/gid,104/.

ii. Stimulate the ICT market and contribute to its growth through the joint effort of the government and the private sector.
iii. Reduce the costs of broadband access by encouraging competition.
iv. Promote the use of the Internet in small companies and throughout the public sector.

The Rural Broadband Connectivity Project, which was launched in 2007 as part of the eDominicana Strategy, was the first and most important project to promote broadband and the use of computers across the country. The project provided 508 unserved municipalities with access to residential and public telephones; broadband services; broadband Internet access through Internet cafés; and telephony through public call centers.

In March 2010, INDOTEL adopted Resolution No 024.10, which includes broadband as part of UAS. This underlines the need to include broadband in future development projects. The government of the Dominican Republic has also implemented a number of spectrum management policies to foster broadband usage. For instance, Decree No. 520-11 of August 2011 modified the national frequency allocation plan, providing additional spectrum to wireless broadband services. INDOTEL also intends to compel operators to share their infrastructure, in order to increase broadband penetration and reduce the cost of rolling out infrastructure.

Investments

Planning: The following criteria, along with cost-effectiveness, are considered when selecting UAS projects:

i. Average income level of the population and the level of poverty.
ii. Integration of the population into economically developing areas, according to economic development opportunities and existing commercial activities.
iii. Density and distribution of the population.
iv. Infrastructure availability and accessibility.

Funding: The development projects that form part of INDOTEL's biannual plans to extend UAS to rural areas are led by INDOTEL and implemented by the private sector. These projects are partly or wholly funded by the USF, which has invested US$63 million since 1998. To date, the only broadband initiative funded by the USF has been the Rural Broadband Connectivity project. There

has been a recent policy shift, however, toward broadband development, especially since INDOTEL has included broadband within the scope of UAS. INDOTEL plans to use 20 percent of the funding to support broadband-related projects in 2013 and to invest US$60 million over the next five years on the installation of a fiber optic infrastructure.

Each telecom operator contributes 2 percent of its gross income through the Telecom Development Contribution (Contribución al Desarrollo de las Telecomunicaciones), of which 40 percent is used to finance INDOTEL's regulatory activities. The remaining 60 percent is used to finance the USF. It should be noted that there have been objections relating to the fact that a large part of the funds has not been utilized.

Implementation: INDOTEL's development projects include inputs received from local organizations and authorities. Relevant details are published explaining the purpose, objectives, and characteristics of each project, including the technical specifications and the terms of reference relating to the bidding process. Following publication, INDOTEL launches the tender process, either nationally or internationally, depending on the project. Public and private entities are encouraged to submit a proposal, and those whose bids meet the criteria participate in a reverse auction to be selected. Companies that receive subsidies, but fail to fulfill their obligations, are excluded from further contributions.

The implementation of the project is generally made either through a direct subsidy to public telecom service providers or through direct contracts. It should be noted that INDOTEL plans to put in place a PPP for the development of fiber optic networks, representing a significant investment. The State will invest in network infrastructure and the private sector will operate the network.

The USF gives preference to projects with high social returns that benefit groups residing in rural and low-income urban areas, where incentives for private sector investment are inadequate and where secure access to telecom services is required. Projects are prioritized according to a comprehensive assessment of the socio-economics of these areas, including household income and poverty levels, demographics, existing infrastructure, and the cost-effectiveness of projects.

According to INDOTEL, there have been difficulties in obtaining environmental and local permits at the municipal level to allow for the installation of infrastructure and facilities. Additionally, in the case of PPPs, there have been issues relating to management changes within the relevant private entities, which have affected the continuation and sustainability of projects. Difficulties

have also been experienced in relation to the promotion of ICT in educational, health, and public safety institutions. In some cases, the institutions have neglected to sustain the projects, resulting in their ultimate failure.

Finally, in terms of assigning spectrum, discount rates for access and service have been made available to incentivize usage. There has been, however, a lack of communication of these incentives to the public.

Projects: Broadband projects relating to UAS are implemented within the framework established by INDOTEL. The government of the Dominican Republic is currently developing a National Development Strategy (Estrategia Nacional de Desarrollo) which will set targets for 2030. These will include broadband as one of its priorities: to achieve UAS and encourage the use of ICT. The focus will be on increasing the level of connectivity and access to broadband at an affordable price. The strategy also aims to raise the capacity and quality of the country's international telecommunications access by expanding and upgrading the physical infrastructure and installing an open-access fiber optic backbone. This strategy will ensure that 60 percent of the population is connected to the Internet by 2020 and 80 percent by 2030 (INDOTEL). Details relating to the implementation of this project have not yet been released.

Chile

Chile is one of the most advanced countries in Latin America in terms of broadband uptake and, according to the ITU, it is the leading country with regard to Internet penetration (53.9 users per 100 inhabitants at the end of 2011). This is principally due to a highly competitive broadband market, which has led private operators to invest in the expansion and upgrade of their infrastructure, coupled with a well adapted regulatory environment (including competition regulation, net neutrality, and affordable pricing). In terms of Chile's main macroeconomic and broadband indicators, a summary is included in Table 2.3.

The Chilean government subsidizes the roll out of broadband infrastructure in rural areas through a USF, which is directly funded by the Treasury. There has been some success, with the telecom regulator—Subtel—reporting that over 90 percent of the country's population had access to the Internet by the end of 2011. Nevertheless, according to Subtel, there are several barriers to broadband penetration, which include the following:

i. Large investments are required to make broadband available in remote rural areas, given the country's geography
ii. High cost of operations and maintenance of broadband networks in remote rural areas
iii. High cost of international connectivity
iv. Relatively limited digital literacy
v. Cost of IT equipment

The Chilean government has taken the approach of not imposing a USO, but rather to finance a USF, as explained below.

Overview of UAS Programs

Chile's UAS policy encompasses broadband, with its USF—the Development Fund for Telecommunications (Fondo de Desarrollo de las Telecomunicaciones)—as its key component. This fund was created in 1994 by the government to increase telecom service coverage in rural and low-income urban areas through subsidies to private companies.

The initial objective of the USF was to improve access to payphones in areas with low teledensity. Subsequently, it has supported telecenter projects, Internet access for schools, broadband access, and broadband backbone infrastructure. Unlike in many countries, the financing of the USF derives from the national budget rather than from levies on telecom operators. The USF, itself, does not implement telecom projects; rather, implementation is carried out by public tender, awarded to companies and institutions willing to invest within specific conditions and obligations.

TABLE 2.3: Macroeconomic and Broadband Indicators for Chile

Indicator	Unit	Year	Value
Population	Million	2012	17
Land area	Million hectares	—	74
Urbanization rate	%	2012	89
GDP per capita at PPP	USD	2012	22,363
Fixed broadband subscriber per capita	%	2012	12.4
Mobile (active) broadband subscribers per capita	%	2012	28.0
Percent of individuals using the Internet	%	2012	61
ITU ICT development rank	#	2012	51 (/157)

Sources: Databases of the FCC, ITU, and World Bank.

Governance

Subtel, the telecom regulator, is responsible for managing the USF to coordinate, promote, encourage and develop Chile's telecom sector, and make it an instrument for economic and social development. Subtel focuses on four areas, specifically to reduce the digital divide, increase market competition, award grants to development programs, and reform institutions.

The Executive Secretary of Digital Development is responsible for the national Digital Development Strategy. Implementation of the strategy is a collaborative process that involves public and private entities, as well as academics and citizens. The State Modernization Unit and Electronic Government (Unidad de Modernización del Estado y Gobierno Electrónico) of the General Secretariat of the Presidency is dedicated to e-government services. Its key objective is to promote the development of e-government policies, in order to provide more efficient service to citizens and to increase transparency and participation. The Ministry of Education is responsible for enhancing the digital literacy of children and young people.

Regulatory Framework

In February 2007, a Committee of Ministers for Digital Development was established by Chile's administration. It is responsible for the design and implementation of Chile's Digital Development Strategy for 2007–12 (Government of Chile, 2007). This is the first national broadband strategy in Latin America. It was developed through public participation that included the input of citizens, professionals, consultants, activists, and civil society organizations. The process included a blog on which people could post comments, proposals, and suggestions over a one-month period. The overall aim of the digital strategy was to contribute to Chile's economic and social development by means of the potential offered by the use of information and communication technologies to improve the quality of education, increase transparency, productivity and competitiveness, and provide better governance through greater citizen participation and commitment. One of the objectives was to increase the intensity and sophistication of ICT utilization by students and civil society. To achieve this objective, the strategy sets a number of specific goals, as follows:

i. Double the number of broadband connections to cover the entire country.
ii. Double the current ICT investment rate of businesses and institutions.

iii. Strengthen the institutional digital framework through the participation of the public and private sectors and civil society.

With regard to universal service for unserved and underserved areas, Chile's policy envisages that mechanisms have to be studied to provide high quality Internet access at affordable prices. Extending coverage to areas that still do not have access is also an issue. In addition, the policy for the development of "infocenters" would be strengthened and redirected, converting them into not only places in which the population has access to the Internet, but also into relevant service centers for communities.

In 2012, the President of Chile launched a Program for Change, Future and Hope (Programa de Gobierno para el Cambio, el Futuro y la Esperanza, Chile 2012–2014) to include broadband as one of its objectives. This program sets the stage to reduce the digital divide by recommending that the USF be redefined to provide broadband services to educational institutions and households in isolated and vulnerable areas. In line with this, projects are now providing telecom connectivity to these areas. The program's objectives by 2014 are as follows:

i. 70 percent of households to have access to broadband access.
ii. 99 percent of the country to be covered.
iii. 98 percent of schools to have Internet connectivity.

Following Subtel's success in increasing access to the Internet by 98 percent of the population through wireless or fixed technology, the government is now developing its Digital Agenda for 2013–20. This is divided into five components, each with its own initiatives. One of them—Connectivity and Digital Inclusion—is designed to ensure that all citizens have access to the Internet and ICT, with a focus to shift from supply to demand. In particular, broadband usage will be increased, the quality of services will be improved, and support will be given to the generation of content.

Investments

Planning: Subtel is responsible for administering and managing the USF. Projects are not initiated in response to the requests of telecom carriers, municipalities, neighborhood associations, and other community and social organizations. These are aggregated into a portfolio for evaluation by Subtel from a technical and economic standpoint only and later transformed into formal

proposals by the Development Council of Telecommunications. If approved, the proposals are integrated into projects that are eligible for subsidies, in which case a tender is called the following year. The Development Council of Telecommunications decides on the annual program, selects the projects that are eligible for subsidy, awards the subsidies through competitive tender, and publishes an annual report.

Funding: The USF receives resources directly from the state budget on an annual basis, as established by the Budget Law. It also receives additional funding from regional governments. Funds can be fully utilized annually.

The Rural Internet Network program will invest approximately US$100 million, which includes a US$43 million subsidy financed, equally, by the Telecommunications Development Fund and regional governments. The balance will be provided by the incumbent fixed operator, Entel (Empresa Nacional de Telecomunicaciones), which was awarded the project in December 2009.

Subtel has carried out a cost–benefit analysis to ensure the viability of the project. Estimates were made, using an engineering model based on a combination of fiber and wireless technologies and including investment, operations, and maintenance expenses. The potential benefits covered forecast revenues, business productivity gains, and the advantages of e-government. The analysis demonstrated that, among other benefits, a small but positive financial net present value would result and the impact on education and employment would be positive. The maximum amount of subsidies to be awarded was set at US$63 million, triggering a net present value of zero. The actual funding required would then be determined through open competitive bidding and the successful bidder would receive US$43 million.

Implementation: Subtel finances projects through subsidies to the private sector. According to the legislation governing the USF (Law 18.168 and Supreme Decree No. 353, 2001), those operators that wish to participate in a particular project, financed by the fund, must follow a public tender process. According to Subtel, a PPP approach allows for greater transparency in the allocation of resources, ensures technological neutrality, and has proved to be an efficient mechanism for attracting foreign capital. Periodic reports are published relating to the assessment of achievements in terms of coverage, access (e.g., population penetration), and usage. These reports are subject to audits.

In 2010, the Chilean government initiated the Rural Internet Network,[5] program to provide Internet connectivity to households, businesses, schools, health centers, and government buildings in 1,474 localities (representing approximately 3 million people) across the country. The program provides download speeds of up to 1Mbit/s and upload speeds of up to 512kbit/s, as well as service quality and prices in rural areas similar to those offered in larger towns (Ministerio de Transportes y Telecomunicaciones, 2010). The selection of locations was provided by local and regional authorities and civil organizations. The program also reflects the development priorities relating to agriculture, SMEs, and tourism.

Projects: Chile has been particularly successful in providing and subsidizing broadband access for schools, funded by the USF. Broadband access for schools reached 92 percent in 2012 (a significant increase of 49 percent in 2009). This level compares with the 93 percent average in developed countries. In addition, the 4G licenses that were recently introduced in Chile are compelled to provide coverage to 554 isolated locations.

Bolivia

The Bolivian telecom market is still in the early stage of development, although broadband usage and Internet connectivity, in general, have increased in recent years. Between 40–50 percent of the population has Internet access,[6] but the level of penetration is negligible, since only 3 percent of households had broadband connections as of June 2012 (TeleGeography). Moreover, connection speeds are usually quite low: 1.1 Mbits/s as of the third quarter of 2013.[7]

Reasons for the low level of Internet penetration are deemed to include the lack of infrastructure; the landlocked position of the country (preventing international telecommunications access via submarine cables, which results in expensive communications traffic); the limited level of competition in the broadband market; and the focus of operators on the roll out of ADSL services at the expense of dial-up Internet. Furthermore, the relatively high cost of ADSL makes this service out of the reach of the majority of Bolivians. Table 2.4 summarizes the main macroeconomic and broadband indicators for Bolivia.

[5] Red de Internet Rural: Todo Chile Comunicado (Rural Internet Network: Chile Connected).

[6] See http://www.bolpress.com/art.php?Cod=2012051804.

[7] See http://www.akamai.com/dl/akamai/akamai-soti-q313-infographic.pdf.

TABLE 2.4: Macroeconomic and Broadband Indicators for Bolivia

Indicator	Unit	Year	Value
Population	Million	2012	10
Land area	Million hectares	—	108
Urbanization rate	%	2012	67
GDP per capita at PPP	USD	2012	5,196
Fixed broadband penetration per capita	%	2012	1.1
Mobile (active) broadband subscribers per capita	%	2012	6.7
Percent of individuals using Internet	%	2012	34
ITU ICT development rank	#	2012	99 (/157)

Sources: Databases of the ITU and World Bank.

Overview of UAS Programs

There was no telecom-specific USF until 2011. Prior to this, a nonsector-specific national fund, the National Fund for Regional Development (Fondo Nacional de Desarrollo Regional) provided finance for nonprofit social projects in the rural areas of Bolivia. Resources originated from the telecom sector (e.g., through frequency assignments and penalties to operators).

Once the national development policy, Bolivia Dignified, Sovereign, Productive and Democratic by Living Well (Bolivia Digna, Soberana, Productiva y Democrática para Vivir Bien) came into place, telecommunications gained more attention. Covering the period 2006–11, it was approved by a Supreme Decree in September 2007, establishing that UAS in relation to information, knowledge, and communications was the responsibility of the State. This policy led to the creation, in 2011, of a USF—the National Telecom Program for Social Inclusion (Programa Nacional de Telecomunicaciones de Inclusión Social), which replaced the National Fund for Regional Development. It is managed by the General Directorate of Telecommunications (Dirección General de Servicios de Telecomunicaciones) within the Vice-Ministry of Telecommunications (Viceministerio de Telecomunicaciones). The USF will finance programs and projects in the ICT sector to achieve UAS in rural areas and for the benefit of social interest.

The government of Bolivia has also established the National Committee on ICT (Comité Plurinacional de Tecnologías de Información y Comunicación). This committee will promote policies and development plans for the ICT sector; coordinate projects with relevant stakeholders; define mechanisms to implement projects; and monitor activities.

Governance

The Telecom and Transport Authority (Autoridad Telecomunicaciones y Transportes, or ATT) is the Bolivian telecom regulator. Its role is to supervise, monitor, and regulate the telecom sector and to promote UAS quality and efficient services. It is also responsible for the USF. The ATT role in UAS programs is complemented by the Agency for the Development of the Information Society in Bolivia (Agencia para el Desarrollo de la Sociedad de la Informacion en Bolivia). It was established in 2002 and proposes policies, implements strategies, and coordinates actions to reduce the digital divide in the country through the promotion of ICT in all areas. The following entities are also involved indirectly in the management and control of the UAS programs:

i. **The Vice-Ministry of Telecommunications:** This falls under the Ministry of Works, Services and Housing, whose mission it is to design, implement, and evaluate policies, legislation, and strategies for the development, monitoring, regulation, and control of the telecom and postal sectors. It also promotes equitable UAS to public telecom services and prioritizes the poorest sectors. The Vice-Ministry leads the development of the telecom sector through the Directorate-General of Telecom Services.
ii. **The Council:** The advisory agency that oversees the executive director of the ATT and recommends measures and actions relating to the telecom sector. The Council consists of the Minister of Works, Services and Housing; Deputy Minister of Telecommunications; Deputy Minister of Transport; and two representatives of private organizations and/or users.

Regulatory Framework

The 1995 Telecommunications Law originally oversaw the expansion of rural coverage and quality of service through USOs that were licensed to four main operators (ENTEL, COMTECO, COTEL, and COTAS). These USOs referred to local telephone networks and included the expansion and installation of fixed lines. Subsequent to 2000, new targets have been set, including the installation of telephones for free local calls in schools and social assistance centers.

In June 2007, the government published Decree No. 29174 to offer incentives and funding to operators to expand telecom access in rural areas. The incentives included direct award of concessions for rural services; licenses for frequency use; exemption from spectrum usage fees in rural projects; the

possibility to interconnect rural networks with other operators' networks; and special interconnection rates for operators involved in rural projects. The UAS was addressed by the constitution and enacted in February 2009, establishing the right of all to UAS through ICT and postal services. It also states that the provision of ICT services is the responsibility of the State through public, mixed, cooperative, or community-based entities (telecom services may be provided through contracts with private companies).

Bolivia's national development policy (Bolivia Digna, Soberana, Productiva y Democrática para Vivir Bien) was approved by Supreme Decree in September 2007. Its objectives are the following:

i. Universal access to information, knowledge, and communications through significant expansion of service coverage.
ii. Management and control of the telecom sector and creation of a new regulatory framework.
iii. Improvement in the quality, continuity, and affordability of public telecom services through mechanisms that will ensure the sustainability of services and contribute to better livelihoods.

The means to achieve these outcomes was the enactment, in August 2011, of the General Telecommunications, Information, and Communications Technologies Law No. 164. This law ensures that people have a right to UAS and ICT, stipulated by Article 5, which includes the right to communications, education, knowledge, science, technology, and culture. Article 66 states that the government will expand the telecom infrastructure for broadband Internet services by 2015 (defined for the first time as a basic service). Furthermore, Article 71 declares it a national priority to promote the use of ICT for the well-being of Bolivians. To support these objectives, Article 65 established a USF, the National Telecom Program for Social Inclusion (Programa Nacional de Telecomunicaciones de Inclusión Social).

Investments

Planning: The coordination of plans and projects is carried out by the Ministry of Public Works, Services, and Housing; the USF; and the National Committee on ICT. Since the creation of these last two entities is fairly recent, the project has not yet been defined, given that broadband is new to Bolivia—the Internet, until 2011, was considered a value-added rather than a basic service. The Ministry of Public Works, Services, and Housing sets the guidelines, which

are published in its Social Economic Development Plan (Plan de Desarrollo Económico Social) and outlines the objectives and milestones of projects to achieve the state's goals. To date, no information on broadband projects has been published, although there is speculation that they will address three challenges, identified by ATT: the (i) lack of infrastructure in rural areas where a large percentage of Bolivians live; (ii) high cost of services due, in part, to expensive national and international capacity building; and (iii) low affordability of Internet services.

Funding: Since January 2012, UAS projects have been financed by the regulator from the contributions, licenses, and fines it has collected. The funding is administered by the Ministry Public Works, Services, and Housing.

Implementation: The Project Execution Unit (Unidad de Ejecución de Proyectos) of the National Committee on ICT carries out UAS projects. According to Article 67 of the General Telecommunications and ICT Law, the unit requests public companies (i.e., majority-owned by the State) to undertake the development of telecom services for social inclusion. In cases where this is not possible, private operators are encouraged to bid competitively through public tender. The monitoring of project activities falls to the Vice-Ministry of Telecommunications.

Projects: The Agency for the Development of an Information Society (Agencia para el Desarrollo de la Sociedad de la Información) currently manages several UAS programs, one of which relates to e-government, which differs from the traditional approach where ICT is used to support existing public administration systems. Instead, ICT will transform and improve existing institutional structures for greater transparency and accessibility. Other programs include the following:

i. Promotion of ICT through communication campaigns and promotional events for multiple segments of the population.
ii. Bolivian Observatory on the Information Society (Observatorio Boliviano de la Sociedad de la Información), which is the point of contact for various international public, private, academic, and scientific entities relating to ICT issues.
iii. Creation of an advanced telecom network, Latin American Cooperation for Advanced Networks (Cooperación Latino Americana de Redes Avanzadas), for academic research in the region.

ASIA

Sri Lanka

The broadband market remains at a nascent stage in Sri Lanka and, as of June 2012, broadband household penetration was only 7.7 percent. Sri Lanka, therefore, remains relatively behind in terms of broadband development within the Asia region (TeleGeography). This is due to what has been its comparatively limited economic growth and, more importantly, to the impact—until recently—of a civil war on its economy. Sri Lanka's economy, nevertheless, is now growing rapidly. Like many other developing countries, it has a poor fixed telecom infrastructure, although there are recent signs of a very significant increase in broadband accessibility and usage, due primarily to widespread development of mobile broadband. Table 2.5 reflects the country's main macroeconomic and broadband indicators.

A USF was formed in 2003. Previously managed by the regulatory agency, it is now managed—since 2010—by the ICT Agency and is financed by a compulsory contribution from operators. Partial contributions can be reclaimed by operators when they invest in UAS projects. More generally, the telecom regulator and the ICT Agency have focused on ICT development in the country within a 10-year initiative, e-Sri Lanka, which was initiated in 2006.

Since 2012, the regulator has been involved in policies, standardization, and installation plans to boost broadband penetration, especially in underserved areas. At the same time, it encourages investments in the roll out of the broadband infrastructure[8]—in particular, the installation of next-generation broadband services. In its forthcoming National Broadband Policy, the regulator expects to provide guidance and encouragement to operators to install fiber optic networks (which included households as of 2012). The draft version of the policy has several initiatives to encourage stakeholders to install high-speed broadband services in underserved areas, including special subsidies and tax incentives. It also provides for the promotion of broadband in schools and other educational facilities, while supporting distance learning programs. Alternative technologies to take broadband to rural communities have also been considered (Jayasekera, 2012).

[8] See http://www.dailynews.lk/2012/04/26/bus35.asp.

TABLE 2.5: Macroeconomic and Broadband Indicators for Sri Lanka

Indicator	Unit	Year	Value
Population	Million	2012	20
Land area	Million hectares	—	6
Urbanization rate	%	2012	15
GDP per capita at PPP	USD	2012	6,146
Fixed broadband penetration per capita	%	2012	1.7
Mobile (active) broadband subscribers per capita	%	2012	4.4
Percent of individuals using Internet	%	2012	18
ITU ICT development rank	#	2012	107 (/157)

Sources: Databases of the FCC, ITU, and World Bank.

Overview of UAS Programs

As part of the deregulation process in 2003, the government of Sri Lanka imposed a levy on international calls relating to UAS. Two-thirds of contributions can be reimbursed to operators within three years to finance the development of networks in unserved and vulnerable areas. The areas, which meet USO criteria, are determined by the regulator.

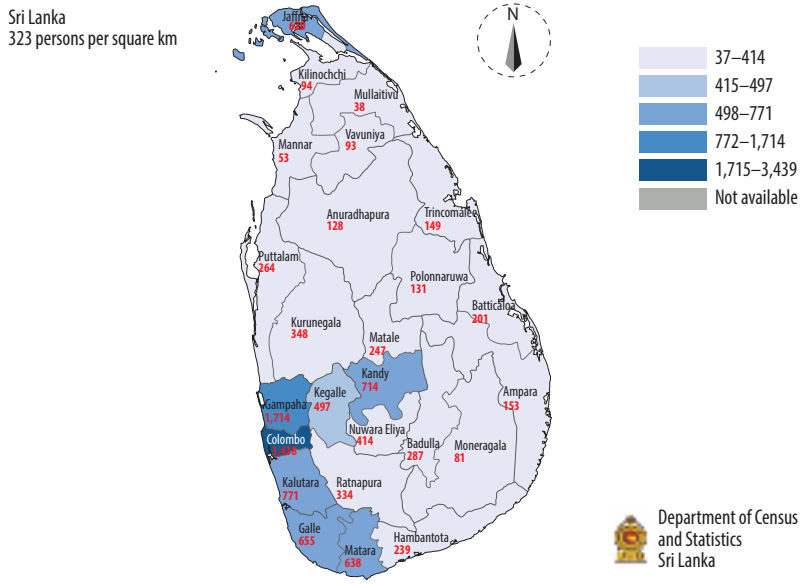
In addition to these investments, the e-Sri Lanka initiative is defined as a holistic approach to support ICT development in the country, including broadband. The major components of the e-Sri Lanka initiative include the following:

i. Infrastructure for Internet or broadband connectivity by way of backbone networks, roll out of a government-wide broadband network, and installation of a network of telecenters to enable access in rural areas
ii. Promotion of ICT within government and application of e-government into key government processes
iii. Introduction of ICT into all levels of education and sectors to increase human capacity
iv. Development of an IT and IT-enabled service industry
v. ICT access (and promotion of usage) in rural areas and by disadvantaged groups

Governance

The Information and Communication Technology Agency (ICTA) was established in 2003 to lead the country's ICT policy. The ICTA manages the USF

MAP 2.2: Population Density in Sri Lanka as of 2012



Source: Department of Census and Statistics, Sri Lanka (2012).

through the e-Sri Lanka initiative (until 2010, it was administered by the regulating agency, the Telecom Regulatory Commission of Sri Lanka, or TRCSL). The ICTA functions under the Ministry of Telecommunication and Information Technology and is required to take all necessary measures to implement the government's Policy and Action Plan in relation to ICT. The e-Sri Lanka initiative is thus implemented by the ICTA, but is administered by the Presidential Secretariat.

The ICTA works closely with other entities on UAS issues. The Ministry of Telecommunication and Information Technology formulates general policy guidelines relating to the telecom sector and TRCSL (created by The Telecom Act of 1991) acts as the national regulator. It is responsible for fair and sustainable competition, price regulation, spectrum management, numbering, overall quality of telecom services, and consumer protection.

Regulatory Framework

The e-Sri Lanka roadmap called for the implementation of the Information and Communication Technology Act, No. 27 of 2003, which established the

Information and Communication Technology Agency (ICTA) as the main ICT policymaking entity in Sri Lanka. The act defined the ICTA's duties as primarily those related to UAS—to bridge the digital divide and promote ICT to rural regions. The Policy and Procedures for ICT Usage in Government (e-Government Policy) was approved on December 2009. Lastly, the TRCSL is due to submit its advice to the government regarding a next-generation network policy and regulatory framework. The policy, planned for the last quarter of 2012, includes considerations relating to USO programs (Jayasekera, 2012).

Investments

Planning: The e-Sri Lanka initiative was designed as a national cross-sectoral ICT development program. It includes an extensive list of supply and demand stimulus projects and ICT knowledge development initiatives that cover multiple sectors (private, public, and education) in urban and rural areas. The projects are categorized into six interdependent programs: ICT policy, leadership and institutional development; information infrastructure; re-engineering of government; capacity building of ICT human resources; ICT investment and development of the private sector; and e-society.

Funding: According to the ITU, the TRCSL disbursed LKR3.46 billion (US$31 million) between March 2003 and March 2008 (Jayasekera, 2012). The funding for the USF originates from various sources, including from a levy on operator revenues, direct contributions from the government, international institutions (e.g., World Bank), and other organizations (e.g., Export-Import Bank of Korea). The levy collected from operators comes from a charge imposed on incoming international calls to Sri Lanka. A portion of this levy is then set aside as a Telecom Development Charge to fund the USF. Operators can then claim back up to two-thirds of these funds within three years to finance network development in unserved and underserved areas, as determined by the regulator. International institutions also participate in the effort, an example of which is Nenasala, a knowledge center, described below.

Implementation: Several projects have been established as part of the e-Sri Lanka initiative. The Nenasala Center has implemented a project to establish 1,000 knowledge centers in Sri Lanka. These facilities include rural knowledge centers, e-libraries, distance and e-learning centers, and computer kiosks, of which 600 will be funded jointly by the World Bank and the government of

India and the remainder by other sources, including the government of Sri Lanka (ICTA, 2010). At the time of writing, 698 centers have been set up around the country.[9]

The Lanka government Network Project is related to e-government initiatives, and provides the necessary infrastructure to connect government organizations and local bodies. A total of 325 locations are to be connected to a backbone network in a cost-effective and secure way. The Lanka Gate Project is another e-government project, which intends to ensure the interoperability of the different e-services to citizens.

The USF has also provided subsidy support to operators. A recent ITU study reports that the USF has assisted in the construction of 909 telecom towers in 23 districts, spread over 9 provinces, to provide mobile and fixed wireless services in rural and remote areas (Jayasekera, 2012).

In 2010, an InfoDev study[10] reported the results of the e-Sri Lanka initiative, which included (in addition to the knowledge centers, themselves) an estimated 33,000 users at these facilities, 112 on-line e-government services for the private sector, approximately 35,000 people trained in ICT, and the creation of chief information officers in almost 600 government agencies.

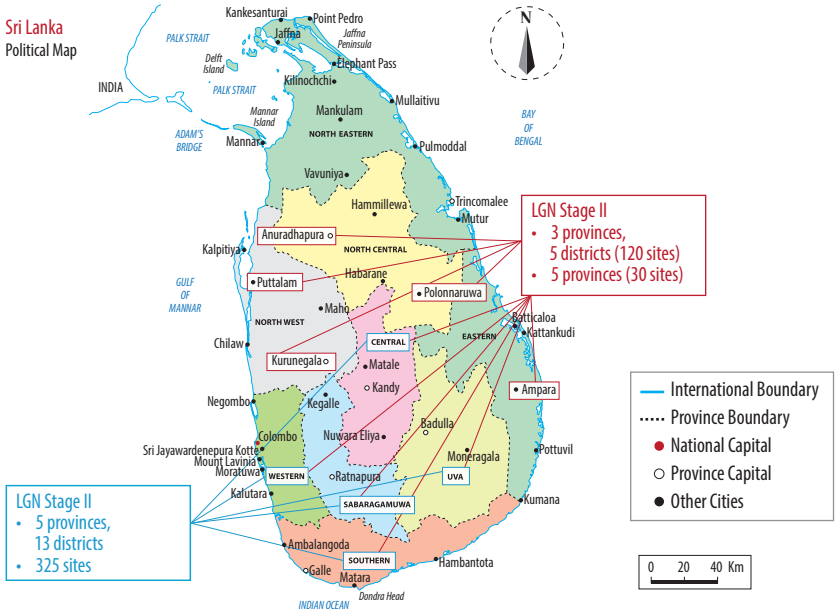
The progress of the projects is disclosed within detailed annual reports of the ICTA, which undertakes evaluation surveys and field visits. The ICTA also makes a comparison analysis of national statistics with international indices and participates in exhibitions to present its results and best practices.

Projects: Other programs relating to the development of broadband are initiated on an ad hoc basis. For instance, the TRCSL implemented the eNable project in 2005 to provide ICT facilities for the empowerment and development of disabled and marginalized groups in Sri Lanka. Most of the funding came from the TRCSL and the telecom operators, and consisted of free packages for a limited time period, which included dongles and connectivity. The offers came under the license conditions of operators and their commitment toward social responsibility. The eNable project has also received considerable support from the ITU in the form of equipment. In addition, through this project, the TRCSL has introduced or developed ICT in 98 schools, 38 vocational

[9] See http://www.nenasala.lk/.

[10] See http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/SAR/2010/12/25/0D9887F3F94C315385257804003D75E0/1_0/Rendered/PDF/P0817710ISR0Di022520101293275514930.pdf.

MAP 2.3: Coverage Plans for the Lanka Government Network Project



Source: http://www.icta.lk/en/programmes/i-infrastructure/75-projects/programmes/re-engineeringgovernment/131-mainprojects/240-lanka-government-network-project-lgn.html.

training institutes and universities for disabled persons, and 40 *Ranaviru* villages (communities for disabled soldiers) (Jayasekera, 2012).

In May 2011, the TRCSL and the ITU inaugurated a project, "Connect a School, Connect a Community." The objective is to connect 25 schools in the Southern Province of Sri Lanka.[11]

Pakistan

Internet broadband in Pakistan is still in the early stages of development. Based on data from TeleGeography, Pakistan is one of the last countries in the world to adopt broadband since it introduced DSL services on the fixed incumbent's network through its partner ISPs in 2002. Internet penetration has increased significantly since 2008, mostly through the enthusiastic uptake of WiMAX by subscribers. Pakistan has one of the largest WiMAX networks in

[11] See https://itunews.itu.int/En/1979-Connect-a-School-Connect-a-Community.note.aspx.

the world, accounting for an estimated 50 percent of urban broadband connection as of April 2012. Overall, DSL represents around 50 percent of connections, WiMAX approximately 25 percent, and the rest are provided using other broadband access technologies. In total, at the end of April 2012, there were nearly 2 million broadband subscribers, representing nearly 1.1 percent of the population (Table 2.6).[12]

Pakistan faces several challenges to development of its broadband network. These include low income levels, limited literacy and ICT knowledge, and a lack of local content. The government, nevertheless, has taken actions to promote development, in particular, the Ministry of Information Technology, which adopted a Broadband Policy in 2004 (TeleGeography). A USF was established in 2006.

Overview of UAS Programs

The USF is operated by an independent company, Universal Service Fund. It is managed by a board that includes public and private stakeholders. Since its formation in 2006, the USF has run several programs.[13]

i. Rural Telecom Program: Provide telecom services in unserved areas through contracts with major telecom service providers.

TABLE 2.6: Macroeconomic and Broadband Indicators for Pakistan

Indicator	Unit	Year	Value
Population	Million	2012	179
Land area	Million hectares	—	77
Urbanization rate	%	2012	37
GDP per capita at PPP	USD	2012	2,741
Fixed broadband penetration per capita	%	2012	0.5
Mobile (active) broadband subscribers per capita	%	2012	0.3
Percent of individuals using Internet	%	2012	10
ITU ICT development rank	#	2012	129 (/ 157)

Sources: Databases of the ITU, Pakistan Telecommunication Authority (PTA), and World Bank.

[12] Pakistan Telecommunication Authority's Telecom Indicators. See http://www.pta.gov.pk/index.php?option=com_content&view=article&id=269&Itemid=599.

[13] See http://www.usf.org.pk/Company.aspx.

ii. Broadband Program: Improve broadband penetration, especially in small towns where there is a large proportion of unserved citizens.
iii. Optical Fiber Program**:** Introduce fiber optic networks to districts that do not have fiber optic connectivity (approximately 30 percent of a total of 400 districts).

The USF has also launched four special projects, which aim to enable people with disabilities to use telecom services; convert computer centers into multipurpose community telecenters; build telemedicine networks and services; and build telecenters.

Governance

The Universal Service Fund is an independent, but wholly state-owned, company that is responsible for the USF. It prepares project plans to identify the districts that are to be funded and establishes the telecom systems and services to be introduced. The entity also determines the reserve price (i.e., the maximum subsidy value), which is calculated based on expected revenues, capital, and operating costs incurred in fulfilling the project. The USF entity is also responsible for the management of the auction process, as well as overseeing the projects.

The USF is directed by a board of directors that includes equal representation from public sector organizations (i.e., the Ministry of Information Technology and the Pakistan Telecommunication Authority [PTA]) and from the private sector (i.e., representatives of consumer groups and telecom operators), plus an independent chief executive officer. The board sets goals for the USF, allocates budgets and reviews projects, and proposes changes in the USF policy to the Ministry of Information Technology. Other entities involved in UAS include the following:

i. **Ministry for Information Technology:** Responsible for the enactment of USF-related laws and policies. It is also responsible for the constitution of the USF board and monitors the activities of the company
ii. **Pakistan Telecommunication Authority:** The national regulator for the telecom sector, responsible for the establishment, operations, and maintenance of telecom infrastructures and systems, as well as for the provision of telecom services. It also ensures that licensees meet their USF obligations and utilize the funds appropriately.
iii. **Auditor General of Pakistan:** Responsible for the annual audit of USF accounts.

Regulatory Framework

In 2004, the Ministry for Information Technology drafted the Broadband Policy,[14] which was designed to encourage the following:

i. Affordable and constant high-speed broadband Internet services to business and residential areas.
ii. Entry and growth of new service providers, at the same time motivating the growth of existing ones.
iii. Private sector investment in local content generation and broadband services.

The Broadband Policy identifies the following three challenges to broadband growth in Pakistan:

i. Content: There is a significant lack of local content in local languages (e.g., online stock market, online education, e-government, e-commerce, and home shopping).
ii. Last-mile access: The low quality and small scale of fixed networks is a major concern. There are quality issues with copper beyond 1.5 kilometers from the exchange and very limited availability of spectrum for wireless broadband access.
iii. Price: The price for broadband in Pakistan is significant. At the time that the Broadband Policy was drafted, the price was 60 times higher than in the Republic of Korea, (in comparison to the lowest priced, unlimited plans available).

To overcome these barriers, the policy included an action plan to address four components of the broadband value chain:

i. Content facilitation: Increase local content and translate it into local languages.
ii. Backhaul facilitation: Facilitate international and domestic backhaul links to enable service providers to offer affordable broadband services.

[14] See http://www.usf.org.pk/FCKeditor/editor/filemanager/connectors/aspx/UserFiles/Broad%20Band%20Policy.pdf.

iii. Broadband delivery facilitation: Encourage the roll out of various broadband delivery technologies to ensure cost-effective broadband delivery to different areas in Pakistan.
iv. User terminal equipment facilitation: Increase the availability and uptake of low-cost devices.

The Broadband Policy, in late 2005, achieved its target of 100,000 DSLs. It remains unclear whether there were any other targets to be met.

The Ministry for Information Technology established the USF Policy[15] through the Pakistan Telecommunication (Amendment) Act of 2006.[16] The policy is supported by the USF Rules of 2006,[17] which specify how the USF is to be managed and administered. The USF Policy covers the objectives of broadband, as well as fixed and mobile telecommunications. The USF's main objectives are to: (i) make available affordable voice telephony and data services to 85 percent of the population by 2010 and up to 95 percent by 2015; (ii) provide attractive subscriptions to achieve 5 percent teledensity in rural areas by 2010; and (iii) kick-start the broadband and ICT markets to achieve a 1 percent nationwide broadband penetration by 2010, with at least one telecenter for every 10,000 people in USF contract areas.

The USF Policy is technology-neutral in order to encourage the use of the most cost-effective technologies, depending on particular local conditions and contract requirements. Additionally, infrastructure sharing is mandatory, in order to support multiple operators in the same area and thus promote competition.

Investments

Planning: All USF projects are approved by the board of directors and are advertised subsequently for open reverse auction. The auction amount is capped, based on the project's estimated capital costs and market conditions. Priority is given to rural, remote, and small towns with the highest number of unserved or underserved inhabitants. Only companies with valid licenses to provide telecom services for relevant regions are eligible to participate in the

[15] See http://www.usf.org.pk/FCKeditor/editor/filemanager/connectors/aspx/UserFiles/USF-Policy.pdf.
[16] See http://www.pta.gov.pk/media/telecom_act_170510.pdf.
[17] See http://www.usf.org.pk/fckeditor/editor/filemanager/connectors/aspx/UserFiles/2006.pdf.

auction.[18] The USF company also performs regular monitoring of projects and imposes penalties for nonperformance.

Funding: Since its establishment, the USF has collected PKR58 billion (US$600 million).[19] According to the USF website, only PKR22 billion (US$227 million) had been awarded in subsidies as of October 2012. The USF is mainly funded by revenues collected from telecom licensees, but also from a levy on international calls and through dedicated grants. The USF contribution from operators is set at 1.5 percent of annual gross revenue, minus interoperator payments and other regulatory costs. It is usual for the Ministry for Information Technology to require licensees to deposit their USF contribution on a quarterly basis, based on estimated annual gross revenues and subject to adjustments at the end of the financial year.

Fees on international calls—Access Promotion Contribution—are also used to finance the USF. Long-distance and international operators are allowed to retain a fixed share of the termination charge (up to a limit of US$0.06 per minute) paid by international carriers for international incoming calls. The remaining amount of the termination charge is the Access Promotion Contribution, which has to be paid to the USF.[20] Lastly, the USF receives financing through (i) grants made by the Ministry for Information Technology and the provincial governments; (ii) proceeds from the auction of spectrum; (iii) loans obtained from the Ministry for Information Technology; and (iv) grants received from international or bilateral development agencies.

In terms of subsidy awards, the incumbent (Pakistan Telecommunication Company Ltd.), has been the successful bidder for 56 percent of the total subsidy amount, followed by Wateen with 23 percent.[21] Recently, however, there have been a few issues with funding that were highlighted by the media.

i. **Nonpayment by operators:** In November 2012, the USF Company announced that telecom operators owed PKR26 billion (US$268 million) related to the Access Promotion Contribution. A number of operators (e.g.,

[18] See USF Rules 2006 Chapter V, http://www.usf.org.pk/fckeditor/editor/filemanager/connectors/aspx/UserFiles/2006.pdf.

[19] See http://tribune.com.pk/story/446607/universal-service-fund-cellular-operators-contribute-rs58b/.

[20] See http://www.usf.org.pk/FCKeditor/editor/filemanager/connectors/aspx/UserFiles/USF-Policy.pdf.

[21] See http://www.usf.org.pk/projectpicture.aspx?pname=updatestate12.jpg.

Pakistan Telecommunication Company Limited [PTCL], WorldCall, Wateen, and Telenor) have gone to court regarding these contributions against the regulator, which is responsible for the enforcement of the payments.[22]

ii. **Misuse of funds:** In June 2012, the Ministry for Information Technology allegedly bypassed the USF Executive Board and used PKR120 million (US$1.2 million) from the fund to hire an advertising agency to run a media campaign to highlight the achievements of the ruling political party.[23]

iii. **Delay of projects:** In 2011, six projects (three of which are under the Broadband Program), worth PKR5 billion (US$52 million), were suspended due to the nonapproval of their USF budget. This was reportedly due to the removal of the Minister for Information Technology in 2010.[24]

Implementation: As explained earlier, the USF Company has launched four main types of programs: the Rural Telecom Program, the Broadband Program, the Optical Fiber Program, and various special projects. The first three programs are detailed below, while the special projects are discussed in the next section.

The Rural Telecom Program: This program aims to provide basic telephony and data services to 12,000 remote rural areas. Up to October 2012, 3,500 areas have been provided with the services, and a total of PKR7.4 billion (US$76 million) has been awarded. The incumbent fixed-line operator, PTCL, has won the majority of the projects, worth a total of PKR4.1 billion (US$42 million). Telenor, one of the mobile operators, follows in second place with a subsidy of PKR1.5 billion (US$15 million). The rest of the projects have been undertaken by other telecom service providers (e.g., China Mobile Pakistan, Mobilink, and Warid).[25] Interestingly, under this program, operators are required to power their infrastructure through renewable energy sources.

The Broadband Program: With regard to enhancing broadband access, there have been projects worth PKR7.6 billion (US$79 million) in subsidies that have been awarded up to June 2012. Pakistan Telecommunication Company Limited

[22] See http://propakistani.pk/2012/11/02/telecom-operators-owe-rs-26-billion-to-usf-ceo/.
[23] See http://tribune.com.pk/story/394307/misuse-of-usf-disgruntled-board-members-seek-nab-investigation/.
[24] See http://www.pakistantoday.com.pk/2011/08/30/news/profit/non-approval-of-funds-delaying-usf-projects/.
[25] See http://www.usf.org.pk/Rural-Telecom-Programme.aspx.

won the majority, worth PKR5.2 billion (US$55 million), while the rest of the projects haved been split almost equally between WorldCall, a telecom and multimedia service provider, and Wateen, Pakistan's leading wireless broadband service provider.[26]

This program especially addresses the unserved urban areas of Punjab, Sindh, Balochistan, and Khyber Pakhtunkhwa. Special emphasis is given to educational institutions, where those awarded subsidies are required to set up broadband labs in schools and community centers.

Due to the significant efforts made, the number of broadband subscribers in the country grew from 9,000 at the end of 2004 to approximately 1.1 million by the end of 2010 (PTA, 2010). These figures indicate a population penetration of 0.006 percent and 0.66 percent, respectively. Comparing this with the target of 1 percent by the end of 2010, set in USF Policy, broadband penetration was a little behind target. By April 2012, however, the number of broadband subscribers had increased to approximately 2 million,[27] indicating a broadband penetration of 1.1 percent.[28]

The Optical Fiber Program: This project aims to lay approximately 8,300 kilometers of fiber optic cable to extend connectivity to underserved districts in Pakistan. To date, contracts worth PKR6.5 billion (US$68 million) have been awarded for approximately 6,700 kilometers of cable; as of October 2012, approximately 4,200 kilometers had been completed. Wateen won the majority of these contracts, worth PKR3.8 billion (US$40 million), while PTCL won the remaining projects.[29]

Projects: In addition to the programs described above, several special projects relating to UAS objectives have been developed on an ad hoc basic; these include the following:

i. **Enabling people with disabilities to use telecom services:** Two programs have been completed under this special project. In collaboration with the Pakistan Foundation Fighting Blindness, a digitalized library and an Internet

[26] See http://www.usf.org.pk/projectpicture.aspx?pname=updatestate12.jpg.

[27] PTA Telecom Indicators: see http://www.pta.gov.pk/index.php?option=com_content&view=article&id=269&Itemid=599.

[28] Based on population estimate by Euromonitor.

[29] See http://www.usf.org.pk/project.aspx?pid=6.

café—accessible by visually impaired people—were built in Islamabad.[30] In addition, in collaboration with the Al-Shifa Eye Trust, modern computerized low-vision centers and equipment were provided in several districts.[31]

ii. **Converting computer centers into multipurpose community telecenters:** In 2009, 11 sites were identified for this purpose. PTCL won most of the contracts, worth PKR34.9 million (US$360,000). As of January 2012, most of the telecenters had been completed.[32]

iii. **Building telemedicine network and services:** In collaboration with the Ministry of Health, telemedicine networks were set up at three hospitals, with each hospital being connected to four remote health centers. Oratier Technologies, a Pakistan-based IT service provider, won a contract worth PRK59 million (US$61,000).[33]

iv. **Building universal telecenters.** This project aims to build 24 universal telecenters, each equipped with 2Mbit/s broadband Internet, in four provinces in Pakistan. The project, however, appears to have been suspended and soon will be re-advertised for auction.[34]

Vietnam

The table below summarizes the main macroeconomic and broadband indicators for Vietnam. The figure that follows illustrates that most areas in Vietnam have less than 300 people per square kilometer, and around 70 percent of Vietnamese live in rural areas.[35]

As of June 2012, broadband penetration in Vietnam stood at around 17 percent of households, according to TeleGeography. The number of broadband subscriptions has been growing rapidly, principally due to the reduction in some tariffs and improvements in the country's infrastructure by the state-owned national operator, VNPT, and other operators. Despite the rapid

[30] See http://www.usf.org.pk/Publicphase.aspx?phaseid=51&pgid=12&phasename=Project percent20with percent20 percent20Pakistan percent20Foundation percent-20Fighting percent20Blindness.

[31] See http://www.usf.org.pk/Publicphase.aspx?phaseid=50&pgid=12&phasename=Project percent20with percent20Al-Shifa percent20Eye percent20Trust.

[32] See http://www.usf.org.pk/project.aspx?pid=13.

[33] See http://www.usf.org.pk/project.aspx?pid=14.

[34] See http://www.usf.org.pk/project.aspx?pid=16.

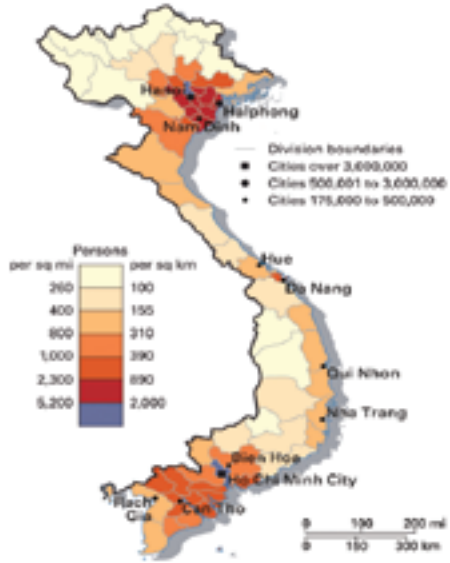
[35] See www.infodev.org/en/Document.1127.pdf.

TABLE 2.7: Macroeconomic and Broadband Indicators for Vietnam

Indicator	Unit	Year	Value
Population	Million	2012	89
Land area	Million hectares	—	31
Urbanization rate	%	2012	32
GDP per capita at PPP	USD	2012	3,787
Fixed broadband penetration per capita	%	2012	4.9
Mobile (active) broadband subscribers per capita	%	2012	19.0
Percent of individuals using Internet	%	2012	39
ITU ICT development rank	#	2012	88 (/157)

Sources: Databases of the FCC, ITU, and World Bank.

MAP 2.4: Population Density in Vietnam



Source: Bangladesh Population and Housing Census (2011); see http://bangladeshcensus.blogspot.com.

growth in broadband subscriptions, however, broadband coverage is only reliable in the major cities (e.g., Ho Chi Minh, Da Nang, and Hanoi). In 2008, less than 1 percent of households in rural areas had Internet access.

There have been significant efforts by the government of Vietnam to modernize and expand the country's telecom system and to stimulate the adoption and usage of broadband. While there is no specific policy for broadband development, the ICT development directives, published by the Government

since 2001, define a set of objectives in the context of broadband; for example, Decision No. 1755/QD-TTg of September 2010. This sets specific objectives for broadband telecom infrastructure by 2020, as discussed later in this section.[36] To achieve these objectives, the Vietnamese government has implemented several investment and financial schemes, such as the incentives to operators to install telecom infrastructure in rural or remote areas.

Overview of UAS Programs

The Vietnam Public-Utility Telecommunication Service Fund (VTF), the USF, was established in 2004. It aims to expand UAS to rural areas across Vietnam[37] and reduce the digital divide. This is expected to boost Vietnam's socioeconomic development and strengthen the country's national security and defense. Between 2005 and 2010, the USF enjoyed only relative success. Although it exceeded its targets for basic ICT services in rural areas with favorable socio-economic conditions, this was not the case for areas with unfavorable conditions. In such areas, infrastructure development has been slow and the provision of services generally has been of low quality. Moreover, while the targets related to basic services (i.e., voice and narrowband Internet) generally have been met, there has been limited effort to develop broadband Internet. As a result, only 55 percent of communes (there are approximately 12,000 communes in Vietnam) had public Internet access service in 2010, which is below the 70 percent target set for that year. The government of Vietnam is setting new goals for the next five years, taking into consideration the lessons learned during the first five years of the USF's operation.

Governance

The VTF is managed by a nonprofit financial institution that is owned by the government of Vietnam under the Ministry of Information and Communications. It is responsible for mobilizing financial resources for projects, as well as selecting and reviewing UAS-funded projects. The fund's organizational structure consists of a Management Board, Control Board, and Executive Board:

[36] See http://www.moj.gov.vn/vbpq/en/Lists/Vn%20bn%20php%20lut/View_Detail.aspx?ItemID=10749.

[37] Decision No. 191/2004/QD-TTg, dated November 8, 2004, of Prime Minister on Establishment, Organization and Operation of Vietnam Public-Utility Telecommunication Service Fund.

i. **Management Board:** Composed of five members, appointed by the Ministry of Information and Communications. The Chairperson of the Management Board is also Chairperson of the Ministry, and one member of the Management Board acts as the Director of the VTF.
ii. **Control Board:** Composed of three to five members, appointed by the Ministry of Information and Communications. The Control Board monitors the activities of the Management and Executive Boards.
iii. **Executive Board:** Composed of the Director of the VTF, the deputy directors, and the heads of department.

The following entities are also involved in the management and control of the UAS program:[38]

i. **Ministry of Information and Communications:** Sets the areas to be provided with public telecom utility services on an annual basis and over a five-year period. It is also responsible for coordinating the provision of services and directing the VTF in its funding activities.
ii. **Ministry of Finance:** Coordinates with the Ministry of Information and Communications regarding the financial management of the VTF. It provides guidance in relation to the financial assistance given to operators (e.g., preferential loans and VAT exemptions), as well as the charges for public-utility telecom services.
iii. **Ministry of Planning and Investment:** Supports the Ministry of Information and Communications in managing the provision of public utility telecom services, as well as monitors and reports progress, especially with regard to socio-economic objectives.

The approach to governance is extensively collaborative, and the same principle is applied to the implementation of the National Broadband Plan:

iv. **Ministry of Information and Communications:** Draws up the implementation plans; annually reviews achievements and reports to the prime minister; proposes adjustment measures; and formulates mechanisms and policies.

[38] Decision No. 191/2004/QD-TTg, dated November 8, 2004, of Prime Minister on Establishment, Organization and Operation of Vietnam Public-Utility Telecommunication Service Fund.

v. **Ministry of Planning and Investment:** Coordinates with the Ministry of Finance and the Ministry of Information and Communications to budget the plans.
vi. **Ministry of Finance:** Manages expenditures from the state budget for ICT.
vii. **Ministry of Education and Training:** Coordinates with the Ministry of Information and Communications and other ministries and sectors in performing ICT training projects.
viii. **Ministry of Science and Technology:** Coordinates with the Ministry of Information and Communications in performing ICT usage development projects.
ix. **Ministry of Industry and Trade:** Coordinates with the Ministry of Information and Communications in performing ICT industry development projects.
x. **Ministry of Defense and the Ministry of Public Security:** In charge of security-related projects.

In addition, other ministries, ministerial-level agencies, government agencies, province-level People's Committees, ICT enterprises and ICT associations, together formulate plans for the ICT sector. The advantage of this approach is that all stakeholders are implicated in the definition and the implementation of the projects. The obvious drawback is the difficulty in adhering to implementation timelines and the administrative burden of the process.

Regulatory Framework

The Vietnam Public-Utility Telecommunication Service Fund was established in 2004[39] by Decision 191/2004/QD-TTg. This decision set the following specific targets to be met by 2010:

i. The telephone density in areas provided with public telecom services shall be over 5 telephone sets per 100 people.
ii. 100 percent of communes nationwide shall have public telephone service access points.

[39] Decision No. 191/2004/QD-TTg, dated November 8, 2004, of Prime Minister on Establishment, Organization and Operation of Vietnam Public-Utility Telecommunication Service Fund.

iii. 70 percent of communes nationwide shall have public Internet access points.
iv. Every person shall have free access to telecom services.

Decision No. 74/2006/QD-TTg of April 2006, also known as Project 74, set a roadmap for the provision of public-utility telecom services (PUT services) up to 2010, including the following:

i. Universal telecom services (standard telephone and Internet access services).
ii. Compulsory telecom services (emergency communication service; for example, first aid, firefighting, and public security; plus Internet and telecom services to facilitate communication needs during natural disasters or other emergencies).

The government is in the process of finalizing its strategic objectives for broadband up to 2015, but provisional targets include:[40]

i. 100 percent of communes shall have access to telecom services over broadband infrastructure.
ii. The number of Internet subscribers (in terms of households) in communes within districts with less than 2 percent of Internet subscribers shall increase to at least 5 percent.
iii. 50 percent of communes in poor districts shall have public Internet service access points.
iv. Citizens shall have free access to compulsory telecom services.

In parallel, Decision No. 1755/QD-TTg of September 2010 set the government's national broadband goals for (a) 2015 and (b) 2020:[41]

i. By 2015:
   - Broadband network to be completed in all communes.
   - Mobile broadband signal to cover 85 percent of population.
   - 20–30 percent of households to have computer and broadband Internet access.

[40] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.
[41] See http://www.moj.gov.vn/vbpq/en/Lists/Vn%20bn%20php%20lut/View_Detail.aspx?ItemID=10749.

- Basic online public services to be provided to citizens and enterprises (e.g., downloading forms, exchanging information, and sending/receiving files using an online network).

ii. By 2020:
- Broadband network to be completed in most villages.
- Mobile broadband signal to cover 95 percent of population.
- 50–60 percent of households to have computer and broadband Internet access (25–30 percent using fiber optic cable).
- Most online public services to be provided to citizens and enterprises (e.g., service fee payment, announcement of service results).

To achieve these goals, the National Broadband Plan encompasses six inputs, as follows:

i. Develop IT human resources.
ii. Develop the IT industry.
iii. Further develop and improve telecom and IT infrastructure.
iv. Develop and apply appropriate support for UAS to households.
v. Apply IT in state agencies, enterprises, and society.
vi. Enhance research in ICT for innovative technologies.[42]

Investment

Planning: The Ministry of Information and Communications applies two criteria to identify the regions in which public-utility telecom services must be established: a comparison of a region's fixed teledensity with that of the nation; and a region's socio-economic status (assessed in terms of its GDP per capita). The Ministry announces the selected regions annually.[43] The objective is also to include the communes that surround these regions, which lack public Internet and telephone access points, but for which the USF can support investment to develop the public access points. Responsibility for project planning lies with various entities, including the Ministry of Finance, the Ministry of Planning and Investment, and the Ministry of Posts and Telematics, as well as sector and local authorities (e.g., People's Committee of provinces and cities and ICT companies).

[42] See http://www.digitaldivide.org/wp-content/uploads/2011/08/Vietnam-Broadband-Policy.pdf.

[43] Decision No. 191/2004/QD-TTg dated November 8, 2004 of the Prime Minister on the establishment, organization and operation of the Vietnam Public-utility Telecommunication service Fund.

Funding: The VTF has three main sources of funding: charter capital, contribution from telecom service providers, and other aids, such as financial support and voluntary contribution. At the time it was created, the fund's charter capital was estimated at VND500 billion (US$34 million). The government of Vietnam contributed VND200 billion (US$13 million), while the rest was made up of the contributions of telecom service providers for the first three years after the creation of the USF.

Telecom service providers must contribute a proportion of their revenue to the USF. For mobile telecom operators, this is 3–5 percent of their revenue; for international long-distance operators, it is 24 percent; and for domestic long-distance operators it is 1–3 percent. Service providers also must pay connection surcharges (if applicable), as set by the Ministry of Information and Communications.

It is estimated that the USF collects approximately US$55 million annually and the capital accumulated over the period 2005–10 is estimated to total approximately US$325 million,[44] although no details are publicly available. Data from Intelecon Research shows that the USF collected US$101 million in 2007 and that it disbursed US$69 million in subsidies and US$20 million in soft loans.[45]

The UAS programs are currently being evaluated and summarized, although indicators are not yet available. The difficulty in obtaining accurate financial indicators appears to be a concern in terms of adequate administration of the fund.

Implementation: The USF provides funding for the following public telecom service components (Intelecon Research, 2009):[46]

i. Investment in new access points, especially in locations where basic telecom services are not yet available.
ii. Maintenance costs of telecom services.
iii. Promotion of services to potential subscribers (e.g., subsidies for terminal equipment or monthly access charges).

[44] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.
[45] See http://www.inteleconresearch.com/pages/documents/UASFFunds2009update-Oct2009.pdf.
[46] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.

The USF provides various types of financial assistance. Direct funding is provided for operators to support the development of infrastructure and maintenance of services in the selected regions. In some cases, however, operators—instead—are offered soft financing (i.e., preferential loans). Operators are obliged to comply with the requirements defined by the Ministry of Information and Communications, and they receive finance that covers most, if not all, of the associated costs. The USF also provides financial support to encourage the uptake of telecom services (e.g., offers of terminal equipment).[47] From 2005 to 2010, the USF achieved some success:[48]

i. Approximately 21 million people in the poorest districts of Vietnam now have access to telecom services.
ii. Fixed teledensity in the selected areas reached an average of 16 sets per 100 inhabitants, surpassing by far the goal of 5 sets per 100 inhabitants.
iii. 97 percent of communes had public telephone access points, 3 percent short of the target.
iv. 55 percent of communes had a public Internet access point, 15 percent short of the goal.
v. Internet subscribers rose by over 75,000 in the selected regions, increasing from 1.8 per 10,000 inhabitants in 2004 to 32 in 2009.

There were some shortcomings, nevertheless. There was an imbalance in infrastructure development: the target was exceeded in communes in the regions with more favorable socio-economic conditions, while targets often were not met in those with limited economic development. For instance, despite achieving a high fixed teledensity in selected areas, 32 communes remained without fixed lines and communes in four districts had a teledensity of less than 5 telephones per 100 inhabitants.[49]

With regard to broadband, only 55 percent of communes had access to the Internet in 2010, which is low compared to the objective of 70 percent. In addition, while the number of Internet subscribers increased by ten-fold to 0.32 per 100 inhabitants, it pales in comparison with Hanoi's 13.9 per 100 and

[47] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.
[48] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.
[49] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.

Ho Chi Minh's 10.5 per 100.[50] The difference could be attributed to the large investment required to develop network infrastructure, coupled with the fact that in rural areas—especially in the wealthier ones—the demand for telecom services often is too low for operators to recover their investment. In response, the Ministry of Information and Communications increased the amount of funding to develop ICT skills in certain areas.[51] It also ensured the commercial sustainability of telephone/Internet access points. Currently, the USF provides funding for the maintenance of access points, but this will cease when they become sustainable. Sustainability of services will be an issue once the programs reach completion, and this has yet to be resolved. The Ministry of Information and Communications intends to collaborate further with key stakeholders to identify ways in which to address this.[52]

The key challenges that have been identified in terms of increasing uptake of ICT in rural regions and the sustainability of programs include:

i. Limited economic development in these regions, making ICT services unaffordable to many households in the absence of subsidies.
ii. Lack of ICT skills.
iii. Lack of awareness concerning available UAS programs.
iv. Slow uptake that makes it difficult to recover investment.

Projects: There is no indication that there are specific projects that fall outside the scope of the National Broadband Plan. This also applies to the USF.

Bangladesh

Table 2.8 summarizes the main macroeconomic and broadband indicators for Bangladesh, which has a population of 167 million people. It is one of the world's most densely populated countries and almost half of the population lives below the poverty line.

Internet access has been available in Bangladesh since 1996 from the state-owned wire-line network operator, Bangladesh Telecommunications Company Ltd. As of May 2014, Bangladesh had approximately 38.9 million

[50] See www.infodev.org/en/Document.1127.pdf.
[51] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.
[52] See http://aseanruralconnectivityconference2011.files.wordpress.com/2011/09/5-nguyen-thi-lan-anh-mic-vietnam.pdf.

TABLE 2.8: Macroeconomic and Broadband Indicators for Bangladesh

Indicator	Unit	Year	Value
Population	Million	2012	155
Land area	Million hectares	—	13
Urbanization rate	%	2012	29
GDP per capita at PPP	USD	2012	1,851
Fixed broadband penetration per capita	%	2012	0.4
Mobile (active) broadband subscribers per capita	%	2012	0.2
Percent of individuals using the Internet	%	2012	6
ITU ICT development rank	#	2012	135(/157)

Sources: Databases of the ITU and World Bank.

Internet subscribers,[53] of which 96 percent used a mobile phone to access Internet. Accessibility to broadband services in Bangladesh is extremely low, which hinders growth in multiple sectors such as education, governance, and healthcare. As of June 2012, there were only 470,000 broadband subscriptions, which represent a household penetration of 1.5 percent and a population penetration of only 0.3 percent (TeleGeogrpahy).

Overview of UAS Programs

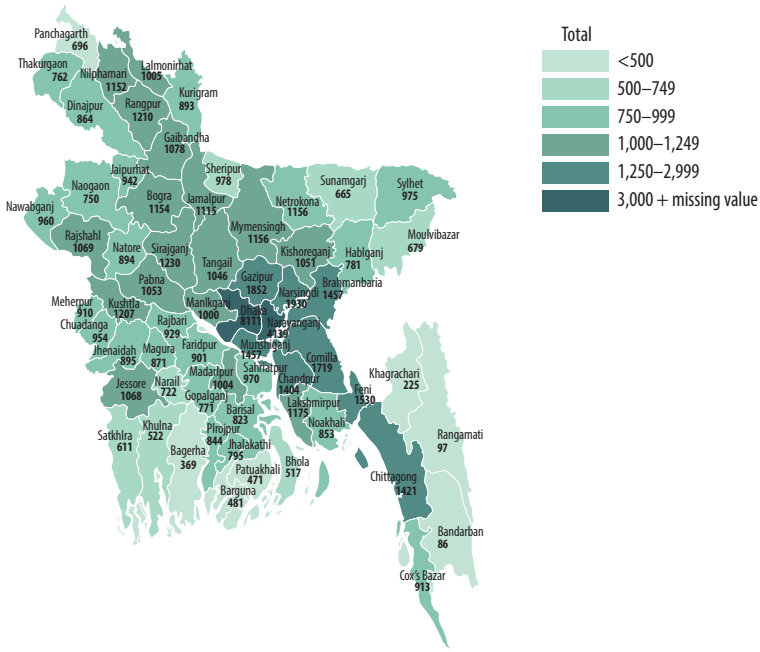
Instead of establishing a dedicated UAS program for broadband, the Bangladeshi government decided to develop a comprehensive National Broadband Plan. In 2009, the government published its National Broadband Policy,[54] followed—in 2010—by its Perspective Plan for 2010–21(Government of the People's Republic of Bangladesh, 2010). These policy documents set the following broadband goals:

i. Ensure the availability of affordable, advanced, and secure broadband services to consumers.
ii. Facilitate the development of access infrastructure and interconnection between networks.
iii. Introduce technology—and service-neutral broadband technologies to encourage private sector investment and the development of PPPs.

[53] Bangladesh Telecommunication Regulatory Commission. See http://www.btrc.gov.bd/content/internet-subscribers-bangladesh-may-2014.

[54] See http://www.btrc.gov.bd/sites/default/files/national_broadband_policy_2009_0.pdf.

MAP 2.5: Population Density in Bangladesh



Source: Bangladesh Population and Housing Census (2011); see http://bangladeshcensus.blogspot.com.

iv. Encourage investment in local content and value-added services.
v. Increase the penetration rate of broadband to 30 percent by 2015 and to 40 percent by 2021.
vi. Provide WiMAX across the country by 2015.

This strategy has been defined. There is no indication, however, that it has yet been implemented.

Governance

With regard to the National Broadband Policy, the Ministry of Posts and Telecommunications has been designated as the coordinating ministry, directing the efforts of the regulator and relevant ministries, including the Ministry of Science and Information and Communication Technology, the Ministry of Education, and the Ministry of Commerce.

The Bangladesh Telecommunication Regulatory Commission, the national regulator, was established in 2002 by the Bangladesh Telecommunication Act,

2001. The commission is in charge of implementing UAS-related projects, with the following goals:

i. Support the development of a telecom system to enhance and strengthen social and economic development in Bangladesh.
ii. Provide access to reliable, reasonably priced, and modern telecom and Internet services as much as possible for all, taking into account the prevalent social and economic conditions.
iii. Establish an efficient national telecom system with the ability to compete locally and internationally.
iv. Abolish discrimination in providing telecom services to enable a competitive telecom market under the control of the commission.
v. Incentivize new services and create an enabling environment for local and foreign investment in the telecom sector.[55]

Regulatory Framework

The National Telecommunications Policy of 1998 established the government's policies for promoting UAS to basic voice services in Bangladesh. Other services, such as data services and access to the Internet, are to be provided only in areas where there is demand.[56]

The Telecommunication Act of 2001 provides the telecom regulator with the discretion to compel licensed operators to provide UAS to rural and sparsely populated areas without exceeding 10 percent of their network capacity.[57] Until 2010, there had been no USF in Bangladesh, nor was there any funding mechanism. In 2010, amendments to the Telecommunication Act included a social obligation fund, although how the fund was to operate is unclear. For instance, while the act specifies the funding arrangements for UAS, information on how the regulator is to disburse resources is not available. In addition, the regulator has yet to identify the rural and urban areas that need to be provided with UAS.

[55] See http://www.btrc.gov.bd/history-and-vision.
[56] See http://www.itu.int/ITU-D/projects/ITU_EC_ACP/hipcar/in-country_assistance/Saint_Lucia/S-Maddens-Toscano_HIPCAR-St-Lucia_UAS_Training_July-2011.pdf.
[57] See http://www.btrc.gov.bd/jdownloads/Acts/telecommunication_act_english_2001.pdf.

In Bangladesh, broadband is defined as a data connection with a bandwidth of 128kbit/s—lower than the standard defined by the ITU. This definition, however, is subject to revision on a regular basis.

Investments

Planning: The Telecommunication Act of 2001 only stipulates an upper limit for the extent of UAS obligations—licensed operators must provide UAS to rural and sparsely populated areas, without exceeding 10 percent of their network capacity. Most operators (fixed and mobile) generally fulfill their UAS obligations by providing only around 5 percent.[58] As a result, the government does not provide telecom services to most rural areas; rather, they are distributed primarily through the Grameenphone's Village Phone Program (described later in this report).[59] As for the newly established USF, it appears that funds have not been dispersed yet.

Funding: The amendments in 2010 to the Telecommunication Act of 2001 established that all mobile operators must contribute 1 percent of their revenue to the social obligation fund.[60] There is no further documentation available regarding UAS funding in Bangladesh.

Implementation: While there are no details on specific UAS broadband implementation plans, adoption of the following initiatives is expected:

i. Ensure fair access to broadband networks.
ii. Develop a number of government initiatives to promote broadband (e.g., promote broadband usage; create an enabling environment for private investment; improve coordination among the relevant stakeholders).
iii. Ensure that existing facilities are fully utilized (e.g., share infrastructure).
iv. Improve ICT skills through training by universities and research institutes.
v. Save international bandwidth (e.g., establish Internet Exchange Points to avoid "tromboning" of local traffic via other countries).
vi. Develop local content.

[58] See http://www.itu.int/ITU-D/projects/ITU_EC_ACP/hipcar/in-country_assistance/Saint_Lucia/S-Maddens-Toscano_HIPCAR-St-Lucia_UAS_Training_July-2011.pdf.
[59] See www.grade.org.pe/infraestructura/doc4BestPractice.pdf.
[60] See http://www.mopt.gov.bd/all percent20backup/Draft_3G_4G_LTE_Guideline.pdf.

vii. Manage IP addresses.
viii. Review spectrum allocations.
ix. Provide fiscal incentives for the private sector to extend broadband installation.
x. Raise awareness of the benefits of broadband (e.g., through media campaigns).

Projects: In 1997, Grameen Bank, a nonprofit organization with an extensive rural banking network in Bangladesh, created a subsidiary, Grameen Telecom Company (GTC). In partnership with Gonofone and Telenor, GTC established a private company, Grameenphone to fund the Village Phone Program in Bangladesh with the profits it earns as a nationwide cellular telephone provider. The Village Phone Program, launched in 1997, aimed to install 40,000 village phones by 2004. The program provides loans to Grameen Bank members (often women) in selected villages to purchase a mobile phone; these individuals then become village phone (VP) operators. Grameen Telecom Company purchases a mobile phone subscription and the necessary hardware from Grameenphone, on behalf of the VP operator, which it then provides to the individual under a lease-finance program (a loan of approximately US$350). Unit officers from GTC provide training to VP operators on how to operate their mobile phones.

Village phone operators are responsible for providing telephone services to other people in the village (each operator, on average, covers around 2,500 people), collecting call charges, remitting payments to Grameen Bank according to the rates set by GTC, and ensuring the mobile phones are properly maintained. The income earned by VP operators is the difference between the charges paid by customers and the airtime charges billed by GTC to Grameenphone.

VP operators repay the initial loan of US$350 in weekly installments of approximately US$4.5 over two or three years. In addition, the operators pay a monthly fee of approximately US$3.20. Grameen Telecom Company buys airtime in bulk at a discounted rate from Grameenphone, and so GTC's head office receives the total monthly charges for airtime used by all VP operators. The bill is then split among individual VP operators and sent to the corresponding Grameen Bank branches. Branch managers are then responsible for the collection of these monthly fees.

By the end of 2011, there were over 670,000 VP operators providing telecom services in more than 83,000 villages in Bangladesh.[61] The sustainability of

[61] See http://investor-relations.grameenphone.com/IRPortal/annualreport/2011/Directors%E2%80%99%20Report.pdf.

the program, however, has been often questioned. Global System for Mobile Communications technology is a relatively costly solution to provide UAS in rural areas, especially if, in the future, it will be used to provide UAS. Going forward, it is likely that GSM will need to be replaced by a more cost-effective technology to ensure the sustainability of the program.

Lessons Learned

Regional Trends: The approaches of the Asian and Latin American countries under evaluation differ in various ways, although much relates to their overall socio-economic and demographic characteristics. To compare, the three Asian countries with the lowest GDP per capita (Bangladesh, Pakistan, and Vietnam) have only 14–30 percent of GDP against the third lowest of the four Latin American countries (Costa Rica), and only 9–19 percent of GDP against the country with the highest GDP (Chile). For Latin America, Bolivia's GDP per capital (US$5,100), the lowest in the region, compares to Sri Lanka's (US$5,660), the Asian country with the highest GDP per capita. These two latter countries are very different in terms of population, population density, terrain, geographic position in terms of access to the sea, among other factors. The following includes a discussion on the approaches of these two groups of countries.

UAS programs and policies are generally more nascent and less developed in Asia than in Latin America. The stage at which each region finds itself depends on the levels of resources that are available, the objectives, and the various strategies followed. Emerging programs, for instance, will typically concentrate on access (e.g., rolling out required infrastructure) rather than the usage of services (e.g., developing local content).

In the Asian countries, landline infrastructure tends to be less developed, which makes a wireless delivery platform an easier and more compelling choice. In Latin America, however, especially in Peru—which is economically more prosperous—a national fiber optic backbone is yet to be introduced or is incomplete. This is a necessary step towards the development of UAS.

Latin American countries, including small ones such as the Dominican Republic and Costa Rica, have engaged in relatively comprehensive UAS programs. On the other hand—with the exception of Pakistan, which faces the challenge of transferring voice and low-speed data services to broadband services—the Asian countries under reference have not done so. The Asian countries have had to cope with a significantly wide digital divide in some areas where population density—as well as economic and social development—falls very much behind urban areas. Achieving the basic UAS objectives in

those remote areas should be considered a high priority, despite the fact that it will require a very large proportion of financial resources.

Approaches and Models for UAS

As with the reference countries of India, the Republic of Korea, the United Kingdom, and the United States, the Asian and Latin American countries under review have taken different approaches to achieve broadband UAS, which have depended on factors such as economic development, geographic and demographic constraints, political objectives, and the state of their ICT market. The approaches can be classified into five different UAS models (Table 2.9).

Depending on the type of UAS model adopted, there are various issues that countries must face to achieve broadband UAS. These vary in terms of optimal strategies to follow. Table 2.10 below summarizes some of the main characteristics of each model:

The following subsections list the problems and challenges that are most common to UAS programs. A set of best practices and recommendations, depending on the UAS model, are included.

TABLE 2.9: Characteristics of UAS Policies

Model	Description	Examples
1	Very recent and immature (or possibly nonexistent) UAS policies, facing significant obstacles in implementing broadband UAS.	Bolivia, Bangladesh, Vietnam
2	Recently established UAS policies that are well designed and follow good practices, but are still at an early stage of development and face difficulties in implementing broadband UAS.	Costa Rica, Dominican Republic, Sri Lanka
3	Relatively established UAS policies in middle-income or emerging countries, with a strong focus on broadband.	India, Chile, Pakistan
4	Mature and long-established UAS policies in wealthy countries that rely heavily on the private sector to achieve UAS targets and make the transition from voice to broadband. These countries are creating new regulatory frameworks but also need to decommission the old ones.	United Kingdom, United States
5	Advanced UAS policies in wealthy countries that have made extensive and early investment in ICT and broadband in a highly centralized way.	Republic of Korea

Source: Authors' elaboration.

Key Challenges

Developing countries usually encounter a number of challenges when attempting to increase broadband usage. These are exemplified in Table 2.11.

These barriers are not consistent between the various UAS models. In particular, very new UAS policies that are not fully developed usually face most— if not all—of the challenges listed above. Due to the lack of resources, relatively new UAS policies are usually significantly constrained with regard to installing broadband (as opposed to other services), and priorities are difficult to undertake. Countries with this experience should, therefore, focus primarily on supply-side constraints (e.g., available infrastructure in remote areas, and limited economic growth prospects in certain areas that discourage private sector investment).

The UAS policies that are relatively solid in middle-income or emerging countries will attract significant financial resources to manage the high cost that relates to new infrastructure in rural areas. Depending on the country's topography, however, the possibilities may be limited and result in significant costs (e.g., the mountain regions of Chile). This also applies to the demographics of a country (e.g., the large population of India). If the supply side is adequately encompassed by UAS initiatives, there may be other issues in terms of demand, such the lack of local content or the limitation of ICT skills that will need to be addressed.

On the other hand, UAS policies that are considered advanced or have been long established and can rely considerably on the private sector will need to address the disbanding of old frameworks. This can be a complex process, which could include issues relating to spectrum availability, given that other services may be using the spectrum (although the digital dividend that is released from the analogue TV switch-off could be a potential solution). In addition, countries that fall within this category need to overcome the high cost relating to new infrastructure in rural areas.

The UAS policies that have a significant centralized approach usually are not financially constrained, thus allowing for broadband installation to be a priority (as opposed to voice telephony and other basic facilities). It is unusual to encounter the other aforementioned barriers.

Despite the geographic and socioeconomic variances between the reference countries and those developing countries in this review, the policies and regulatory frameworks of both can be compared. All the countries are undertaking measures to improve access to and affordability of broadband. In addition, they are seeking ways in which to develop UAS policies more efficiently with existing financial resources. The examples in this study are

TABLE 2.10: Approaches Toward UAS

Country	USF Fund / Program exists and is used	USO focuses on broadband	Broadband National Policy/Plan	Specific targets related to rural areas	Incentives to the private sector (fiscal, matching, grants, etc.)	Type of Intervention
US	Yes	Yes	Yes	Yes	Yes	Intervention is mostly made through the private sector. The private sector is involved in most strategies, either through PPPs, auctions, or compensations for investments from the private sector.
UK	Yes	No (commitments are not legally binding)	Yes	Yes	Yes	Intervention is mostly made through the private sector. The private sector is involved in most strategies. The private sector bids for funds.
Korea	Yes	No	Yes	Yes	Yes	Intervention is mostly made through the private sector. The private sector is involved in most strategies. The private sector bids for funds. However, the government has also made direct investments and provided subsidies and loans.
India	Yes	Yes	Yes	Yes	Yes	Intervention is made through the public and private sectors. The government is undertaking the establishment, management, and operation of a national optical fiber network. Besides that, there are also different types of incentives to the private sector.

Source: Authors' elaboration.

TABLE 2.11: The Challenges of Broadband UAS: Examples

Challenges	Description and Selected Examples
Low level of purchasing power in certain rural and suburban areas	The low level of purchasing power, combined with the relatively high price of retail broadband services, makes broadband unaffordable to a proportion of the population (e.g., in Pakistan, the price for broadband in 2004 was 60 times higher than in the Republic of South Korea, comparing the lowest unlimited plans available).
Limited amount of available financial resources through the USF	The financial resources are not sufficient to support UAS plans; (e.g., in Bolivia, there was no telecom-specific USF until 2011 prior to that, a nonsector-specific national fund was used to fund otherwise unprofitable projects with no priority for broadband development).
Low levels of ICT skills in a proportion of the population	A proportion of the population has a low level of education, particularly with regard to ICT skills (e.g., many schools in Sri Lanka lack ICT connectivity and awareness of ICT is limited).
Lack of basic commodities (water, electricity, etc.)	This is relevant in two ways: first, broadband services are dependent on the availability of utilities, such as a reliable power supply; secondly, broadband will naturally be given lower priority than more critical needs, such as access to water (e.g., a large percent of households in Bangladesh do not have access to basic commodities; thus broadband access is perceived by the government as a nonpriority).
Limited availability to the consumer of electronic equipment	The availability of electronic equipment (PCs, tablets, and smartphones) required by consumers to use broadband services is limited (e.g., ICT uptake has been slow and limited in Bolivia, partially due to limited access to electronic equipment by the consumer).
High tax rates on telecom services or electronic equipment	High tax rates have an indirect impact on the retail price of broadband services and cannot be directly tackled within a UAS policy (e.g., the tax rate applicable to telecom services in the Dominical Republic is relatively high, estimated at 30 percent in 2013, indicating that broadband is not a priority within the government's development agenda).
Lack of telecom infrastructure, especially that which is critical	There is a lack of critical infrastructure, such as a national fiber optic backbone, resulting in unserved areas or areas in which the cost of bandwidth is high (e.g., the fact that Bolivia is landlocked prevents direct access to international capacity via submarine cable, and results in a high cost for international telecommunications).
High cost of installing new infrastructure in rural areas	The cost is high due to geographic constraints and low population density levels; e.g., Chile's mountainous topography in remote rural areas makes installation excessively expensive.
Difficulty of obtaining administrative authorization to install new infrastructure	The process of obtaining new infrastructure permits is complex and time-consuming (e.g., in the Dominican Republic, various projects encountered difficulties in obtaining environmental and local permits).

(continued on next page)

TABLE 2.11: The Challenges of Broadband UAS: Examples *(continued)*

Challenges	Description and Selected Examples
Limited amount of suitable spectrum	There is a limited amount of spectrum that is available for wireless broadband solutions in some countries (e.g., the spectrum available in the Dominican Republic for wireless broadband was limited prior to the recent spectrum re-farming and re-allocation).
Limited availability of relevant local content	The limited availability of relevant local content makes broadband services less accessible or less relevant to a proportion of the population, usually due to a language barrier (e.g., in Pakistan, there is a chronic lack of local content in the various local languages, such as in terms of an online stock market, online education, e-government, e-commerce, home shopping, among others).

Source: Authors' elaboration.

intended to be used as guidelines and best practices by other countries seeking to develop UAS. The comparative analysis can assist policymakers to assess the challenges they may face when they develop or improve their UAS policies. Some of the developing countries in this study have implemented a range of strategies to overcome these challenges. Table 2.12 summarizes the key ones.

Key Terms

1. **ADSL (Asymmetric Digital Subscriber Line):** Is one form of the Digital Subscriber Line technology, a data communications technology that enables faster data transmission over copper telephone lines than a conventional voice-band modem can provide. It does this by utilizing frequencies that are not used by a voice telephone call.
2. **Backbone:** A local backbone refers to the main network lines that connect several local area networks (LANs) together. The result is a wide area network (WAN) linked by a backbone connection. Internet backbones are huge data pipes (routes) that connect networks, countries, and even continents.
3. **Bandwidth:** The range of frequencies available to be occupied by signals. In analogue systems it is measured in terms of Hertz (Hz) and in digital systems in bits per second (bit/s). The higher the bandwidth, the greater the amount of information that can be transmitted in a given time.
4. **Digital dividend:** The spectrum efficiency gain due to the switchover from analogue to digital in the frequency bands currently allocated to broadcasting.

TABLE 2.12: Examples of Strategies in Developing Countries to Overcome the Challenges to Broadband UAS

Challenge	Examples of Strategies to Overcome Challenges
Low level of purchasing power in certain rural and suburban areas	Provide direct subsidies to end users to ensure adoption of broadband, once access is secured. Require operators to offer discounts to certain end users (e.g., operators in the Dominican Republic: operators offer discounts in exchange for frequency assignments). Establish public telecenters that provide shared access to kick-start the broadband and ICT markets (e.g., Pakistan).
Limited amount of USF resources	Increase the levy imposed on operators, depending on the magnitude of local needs and the amount of direct additional funding that is available from the government budget (e.g., operators' contributions to the USF in Costa Rica are set annually and can vary between 1.5 percent and 3 percent of gross revenues). Obtain additional funding (e.g., international institutions) for specific ad hoc projects (e.g., Sri Lanka has received support from the World Bank and the Export-Import Bank of Korea). Prioritize UAS projects, based on strict criteria; (e.g., the First FONATEL Program in Costa Rica identifies priority locations that are based on the human development index at the community level, as well as the population density).
Low levels of ICT skills in some of the population	Provide ICT training (e.g., the eNABLE project in Sri Lanka has introduced ICT into schools, training institutes, and universities for disabled persons). Provide mandatory ICT lessons in schools and universities and make ICT equipment available at low or no cost (e.g., the Dominican Republic has created several projects for ICT training, such as the Virtual Technology Higher Education, Computers for Outstanding Young, and Fund for Academic Excellence).
Lack of basic facilities (water, electricity, etc.)	Establish public telecenters (e.g., Chile, Sri Lanka, and Pakistan). Roll out WiFi access in public spaces (e.g., the Dominican Republic's Universal Access Project provides WiFi Internet access and terminals in metro stations in Santo Domingo, public spaces, and educational institutions).
Limited availability to consumers of electronic equipment	Distribute equipment directly or provide subsidies to poor consumers for the purchase of electronic equipment.
High tax rates on telecom services or electronic equipment	Reduce taxes on these services and equipment (e.g., this is considered in the forthcoming broadband UAS policy of Sri Lanka).
Lack of telecom infrastructure, especially critical infrastructure	Develop a National Broadband Plan, including the roll out of a national backbone. Offer grants to operators to build infrastructure. Demand the sharing of infrastructure with regard to installing further infrastructure (e.g., in the Dominican Republic, a new policy will require the sharing of infrastructure, in order speed up the installation of new infrastructure and reduce costs).

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TABLE 2.12: Examples of Strategies in Developing Countries to Overcome the Challenges to Broadband UAS *(continued)*

Challenge	Examples of Strategies to Overcome Challenges
High cost of installing new infrastructure in rural areas	Same as above.
Difficulty in obtaining authorization to install new infrastructure	Involve relevant agencies and ministries early in the policy development process in order to design comprehensive implementation strategies and avoid such problems.
Limited amount of suitable spectrum	Re-farm spectrum (e.g., the National Frequency Allocation Plan in the Dominican Republic was modified to increase the amount of spectrum allocated to wireless broadband services). Re-allocate some of the digital dividend spectrum (when this becomes available) to wireless broadband services.
Limited local content	Provide subsidies for the creation of local content (e.g., Pakistan's incentives will enhance local creation of content in local languages). Develop e-government services (e.g., in the Dominican Republic, an integrated platform of services was developed for the Ministry of Labor and a management system was introduced for hospitals and maternity services).

Source: Authors' elaboration.

5. **Last mile:** The "last mile" is the final leg of delivering connectivity from a communications provider to a customer.

CHAPTER 3

Conclusions and Recommendations

Some key lessons have been drawn from the analysis of the reference countries, India, the Republic of Korea, the United Kingdom, and the United States. In relation to the comparisons made of Costa Rica, Dominican Republic, Chile, Bolivia, Sri Lanka, Pakistan, Vietnam, and Bangladesh, 15 recommendations that can be useful for governments in their efforts to promote Universal Access and Service (UAS) broadband and social inclusion are outlined below. In contrast to the lessons learned, these recommendations cover the activities that are necessary from the development of UAS policies to their implementation. The objective is to assist national authorities to bridge the gaps between their own countries and those that have achieved UAS. The recommendations are discussed below and include proposed steps to take in support of these guidelines. They are applicable to developed countries and developing countries, but should be adapted to the specific characteristics of each country. In particular, care should be taken with regard to the type of UAS model applicable (as discussed previously).

Policy and Regulatory Issues

A.1 – *Recognize the benefits of broadband*

As described earlier, broadband can provide significant benefits to a country from an economic and societal perspective. In terms of the economics, broadband is increasingly used in all sectors of the economy and contributes significantly to growth and efficiency. Many sectors can benefit, such as agriculture (e.g., weather forecasts and online market distribution), industry and, in particular, the booming services sector. Furthermore, the information economy represents a tangible opportunity for many developing countries. India, for example, has made ICT a key pillar of its overall development strategy and has had considerable success.

TABLE 3.1: Recommendations	
A – Policy and Regulatory Issues	
A.1 – Recognize the benefits of broadband	The full benefits of broadband from an economic and societal perspective should be recognized by relevant authorities.
A.2 – Adopt a holistic approach to broadband development	A holistic approach toward the development of broadband should be made to include spectrum policy, and rollout of national backbone, etc.
A.3 – Recognize the role of the USF	The USF, in relation to UAS broadband, serves as an economic development mechanism and a catalyst for social inclusion (e.g., healthcare and education). This must be fully acknowledged.
A.4 – Collaborate with relevant stakeholders in designing UAS policies	UAS policies should be drafted in collaboration with relevant stakeholders (e.g., ministries, regulators, agencies, and industry associations) and, in particular, the private sector.
A.5 – Define a clear vision and set ambitious objectives	UAS policies should represent a clear vision and include ambitious objectives that can be achieved.
A.6 – Use alternatives to USOs	USOs that are imposed on incumbent operators are generally not an effective means of achieving objectives of UAS broadband policies.
B – Planning	
B.1 – Perform a thorough gap analysis	A thorough gap analysis is required to understand the focus of UAS broadband programs (e.g., poor, rural and remote, or other special groups).
B.2 – Define an appropriate governance structure for the USF	The governance structure of the USF should be adapted to the local context and should ensure full integration, coordination, viability, and provide a system for checks and balances.
B.3 – Focus on UAS projects that are sustainable	The long-term sustainability of UAS projects is important.
C – Funding	
C.1 – Diversify the funding sources	Funding sources should reflect the strategic vision of the UAS policy and the local economic environment.
C.2 – Maximize the level of funding	The level of spending needs to be significant to bring the desired results.
C.3 – Define clear rules for USF disbursements	The rules for USF disbursements should be fair and transparent.
D – Implementation	
D.1 – Ensure cooperation between public and private sectors	Implementation of UAS policies requires cooperation between public and private sectors, for example, through the establishment of PPPs.
D.2 – Focus on supply and demand	UAS programs should focus on carefully selected projects that address supply and demand, with some degree of flexibility (e.g., choice of technology).
D.3 – Ensure strict supervision	Implemented UAS programs need strict supervision.

TABLE 3.2: Proposed Actions to Support Broadband Benefits

Communicate results of recent and comprehensive analyses relevant to UAS broadband and services, such as the 2012 study undertaken by the IDB, *Socioeconomic Impact of Broadband in Latin American and Caribbean Countries*. Knowledge sharing can take place through (i) workshops that are organized by relevant ministries and (ii) the presentation of case studies of comparable countries.
Undertake an impact evaluation of broadband in the country, including a high-profile assessment of the impact of increased broadband penetration on the economy and on services to citizens. A simple cost-benefit analysis is usually sufficient to make the case that investing in broadband should be considered as a strategic priority.

From a societal standpoint, people and businesses are increasingly dependent on broadband services; the more there is UAS, the more dependent they become. Broadband also enhances the efficiency (as it does for the private sector) of government services to provide services that are useful to citizens (healthcare, and e-learning).

Governments and agencies should recognize the benefits of UAS broadband and, therefore, support such programs so that the digital divide is narrowed and access to broadband is possible in unserved and underserved areas. It is crucial to ensure that broadband is included in UAS policies and that these policies accept and understand the need to transition from voice telephony programs to UAS programs that include broadband. The various measures that can be applied to ensure that these benefits are fully acknowledged by all relevant stakeholders are presented below.

A.2 – *Adopt a holistic approach to broadband development*

Once the benefits of broadband have been fully established, care should be taken to explain that the policy environment should be favorable in order for broadband uptake to occur. This, in part, is the purpose of national broadband policies, rather than that of UAS programs. A UAS policy, therefore, should be designed to complement a national broadband plan and not to replace it since UAS programs, alone—while necessary—are not sufficient.

The national broadband plan should aim to create an environment where regulatory and commercial obstacles to the development of broadband are addressed at the national level. The policy should include comprehensive measures that will generate supply (e.g., reduce costs and prices; increase market access) and stimulate the demand for broadband services (e.g., facilitate the creation of local content and the development of services in areas such as education, healthcare, and businesses).

While UAS policies are critical for the success of UAS programs, they are not meant to address the regulatory issues that relate to spectrum allocation, licensing, or interconnection rules. Nevertheless, UAS programs and national broadband policies are interconnected; UAS policies will promote broadband uptake in some cases which, in turn, can increase overall demand. On the other hand, national broadband policies can ensure that there is a regulatory agency in place for UAS policy to be effective.

In general, the success of UAS programs requires a favorable ICT environment that will usually include:

i. **A liberalized telecom sector:** Liberalization ensures increased participation by the private sector in developing a competitive broadband market to attract investment. For instance, international gateway liberalization usually reduces the cost of international bandwidth and, ultimately, the price of Internet service for the end user.
ii. **An investment-friendly industry policy:** This will allow for fair competition in the private sector; there will be insufficient incentive for the private sector to invest in large projects if there is the risk of unfair competition.
iii. **Programs and incentives to promote rollout:** This is necessary for the rollout of telecom infrastructure.
iv. **Dedicated programs:** These are required to stimulate demand for broadband at the national level.
v. **Technology-neutral and unified licensing programs:** In particular, operators that are restricted to fixed services can be an obstacle to the provision of UAS, since wireless technologies are a more cost-effective way in which to bring UAS broadband to under served and unserved areas.
vi. **Available spectrum for broadband wireless technologies:** The allocation of spectrum in large countries may vary from region to region, based on conditions and the ease in which the installation of mobile broadband technologies can be made in rural areas. In addition, the switch-off of analogue TV will release spectrum that can be reallocated to wireless broadband services.
vii. **Appropriate policies for Internet-based services:** Examples are VoIP and related regulatory aspects, such as rules for Internet traffic over Internet protocol networks.
viii. **Available national and regional fiber optic backbone:** Should be supported by regulations that ensure open access and the sharing of infrastructure—a critical factor for UAS programs—since the high cost of a national bandwidth (resulting from a monopoly of national backbone

facilities) can significantly prevent broadband uptake in rural areas or in those areas that are too far from international connectivity points, such as submarine cable landing stations. Furthermore, a monopoly on the fiber optic backbone can restrict the ability of small business or local stakeholders (who lack such infrastructure or access to it) to participate effectively in UAS programs.

ix. **Tax relief in selected areas:** This should be applied to select services or for select customers. Taxes may include import duty on electronic equipment, levies on communications services or user equipment, and corporate taxes.

UAS policies are usually considered in the context of national broadband plans and should be designed as such, in coordination with national policies, so as to address the areas and population groups that require special interventions for their access to broadband services.

A.3 – *Recognize the role of the USF*

The increase in the supply of broadband accessibility and in the need (demand) for its services is a result of increased usage. There are various options to support and sustain supply and demand that relate to the acknowledgement by governments and their agencies that USF programs are, in fact, a

TABLE 3.3: Proposed Actions for a Holistic Approach to UAS Broadband

Ensure that liberalization of the market includes key components of broadband service delivery: international gateway, national and regional backbone, and Internet access.
Ensure that technology-neutral and unified licensing programs are in place, so that operators are equal in implementing UAS programs, and the incumbent fixed operators are not disadvantaged.
Promote rollout of broadband infrastructure through suitable instruments, such as tax incentives for infrastructure investments; apply government funds as direct investment through PPPs; develop national backbone plans with an enforced open-access policy; and allow or mandate infrastructure-sharing agreements.
Ensure that spectrum policy is in line with UAS goals. For instance, some frequencies allocated to GSM may be underused in rural areas—even though they are fully used in urban areas—because of differences in population density. These frequencies could be reallocated to mobile broadband services in rural areas. Another option is to reduce or even eliminate spectrum licensing fees for unserved areas for providers of UAS, as this could reduce UAS costs. Finally, spectrum may be allocated in exchange for UAS commitments.
Increase public awareness and the ability to use broadband services through dedicated training, the development of e-learning or e-government services, the development of local content, or subsidies on broadband-related equipment in schools, universities, and telecenters.

key component of any broadband development policy. As mentioned above, major reforms, such as those carried out in the regulatory environment of the telecom sector, are necessary to ensure greater broadband uptake; a simple regulatory measure that allows for more competition will also be helpful. These could be in the form of fiscal measures such as lowering the tax on ICT equipment or services, or enabling measures such as ICT training and education.

USF programs are a necessity in most developing countries (unlike in some of the emerging and advanced countries). They are the policy mechanisms that are best placed to reduce the digital divide that prevents segments of the population from benefiting from broadband. USF programs have significant advantages in terms of supporting the development of UAS broadband.

i. **USFs provide a transparent means to distribute subsidies to achieve UAS:** By defining specific objectives and targets and implementing an open process for consultation, USFs can ensure—for the public good—that all stakeholders are involved in UAS programs.
ii. **USFs are efficient when funding is awarded competitively:** Tendering should be competitive. While USFs require all industry players to participate in the financing, only operators that are in the best position to implement the UAS programs should be selected. This contrasts with a USO obligation that is imposed on incumbent operators with no reference to what the real costs are likely to be.
iii. **USFs allow governments and other donors to contribute financially to UAS:** This applies in a liberalized market and avoids direct involvement in less efficient or more complicated forms of project implementation (e.g., direct subsidies).
iv. **UAS programs can fill market gaps:** In most developing countries, this is the only way to narrow the gaps. These gaps remain due to the following reasons:
    - Geographic: some countries have challenging geographic constraints, such as large areas with low population density that cannot be covered with telecom infrastructure in an economically viable way;
    - Economic: disadvantaged people will be denied access to broadband because it is unaffordable.
    - Social: some segments of the population, such as the disabled and elderly, will not have access to broadband.

There are various ways that relevant authorities can ensure that UAS programs are considered a necessary economic development instrument and catalyst for social inclusion, as outlined below.

A.4 – *Collaborate with relevant stakeholders in designing UAS policies*

Although developed countries have more substantial resources to invest in the planning of UAS programs, developing countries can also obtain a significant degree of effectiveness by ensuring that all stakeholders are closely involved in planning the UAS programs. The UAS programs that have been most successful have been designed with cooperation from stakeholders. Several types of stakeholder should be involved in the development of a UAS policy. This is important to ensure that their needs are appropriately assessed, the goals are mutual, and the means to achieve these goals are shared and understood, in order to put in place a coordinated and informed policy. The potential stakeholders include the following:

i. **National and regional authorities:** Bodies that should be involved in UAS policy design, primarily, should include government ministries (e.g., ICT, economic affairs, and rural development), telecom regulators, and ICT development agencies. UAS programs can include a variety of measures that require the collaboration of various ministries; for example, tax concessions for electronic equipment (Ministry of Finance), support for national infrastructure (Ministry of ICT), and development of programs for schools and universities (Ministry of Education).
ii. **Participants in the UAS programs:** These include national industry players such as telecom operators and ISPs. These stakeholders have a key role to play in contributing to and implementing UAS programs. For instance, industry players can provide vital information regarding market gaps and achievable UAS targets, as well as the technologies that are available to bridge the gaps. They also form the crucial link between market regulation and commercial reality.
iii. **Beneficiaries of the UAS programs:** The beneficiaries of UAS programs are usually end users. They can be consulted through consumer associations, community representatives, local authorities, and organizations or associations representing groups of citizens (e.g., associations for people

TABLE 3.4: Proposed Actions to Recognize the Role of UAS Broadband UAS Policies

Communicate results of studies that highlight the ability of USFs to sustain broadband development (such as this study). Communication can be made through specific workshops organized with relevant ministries at which theoretical results can be shared.
Undertake a well-designed study relating to the potential benefits of UAS programs in the country by presenting case studies of comparable countries.

with disabilities). Their opinions and needs can also be assessed through field demand studies. In Chile, for example, UAS projects are not initiated by the regulator; rather, they are initiated in response to requests from telecom carriers, consultants and professionals, municipalities, neighborhood associations, and other community and social organizations. These demands are then aggregated into a project portfolio, which is evaluated by the regulator from a technical and a financial perspective. In this way, the locations for the Rural Internet Network program were selected based on the demand expressed by local and regional authorities and civil society organizations, and also the development priorities in agriculture, small and medium enterprises, and tourism.

A.5 – *Define a clear vision and set ambitious objectives*

There are two dimensions to the challenge of achieving broadband UAS: high-cost areas, where access infrastructure costs outweigh potential revenues; and disadvantaged sections of the population, for which the service is unaffordable (e.g., remote or poor households) or for which the services are not well adapted (e.g., blind people). The vision and objectives of the UAS programs are crucial to their success, given the following:

i. A precise vision of the UAS programs can re-emphasize the benefits of broadband, detail the concepts of UAS, and justify the need for UAS programs in the broadband market.
ii. A well-defined vision will ensure that the UAS programs are in line with other national broadband policies in terms of goals and complementary to them in terms of means.
iii. A vision shared with all key stakeholders, combined with a set of agreed targets, will help to ensure that these stakeholders are on board and

TABLE 3.5: Proposed Actions to Involve Stakeholders in the Development of UAS Policies

Put in place a public consultation on UAS. Consultations are a critical part of policy development. This is also true for UAS.
Engage in a coordination process at an early stage of policy development to make the link between the political goals (e.g., as set by Parliament), which are transposed into government actions (e.g., through Ministry plans) and the UAS policies themselves.
In most (if not all) countries, a chief information officer will be needed, with the necessary mandate and resources to drive broadband adoption.

committed to the fulfillment of the objectives. Targets should be ambitious but achievable.

As a result, it is good practice to have a UAS policy that is clearly separated from other policy documents. This UAS policy can be incorporated within a national broadband policy or be formulated as a stand-alone document. In any case, it should be clearly identified as a separate policy with specific targets and means (in particular, with a dedicated fund) integrated within broader national policies.

A.6 – *Use alternatives to USOs*

One way to enforce UAS policies is to mandate a broadband USO via license obligations or specific policies. The analysis in this study suggests that this approach is not favored by countries with advanced broadband markets, all of which prefer to rely on provision of incentives for private investment.

While most countries do impose mandatory contributions to their USF, the implementation part of the UAS policy is usually achieved through targeted subsidies awarded during public competitive tenders, instead of through a mandated USO. Such a process expressly extends what private enterprise can and must do beyond what it would do without subsidies. Such a process asks the question "What is the minimum subsidy that private enterprise will need to get to goal X (e.g., coverage of an additional 10 percent of the population)?" Metrics and milestones are set out, and then competitive bidding occurs for the minimum subsidy, and the efficiency of private enterprise provisioning is preserved.

TABLE 3.6: Actions to Define a Clear Vision and Set Ambitious Targets

The objectives of the UAS programs should be plainly stated and justified.
The vision of the UAS programs should be compliant with the resources that can be made available.
The objectives of the UAS programs should be precise and clearly defined. The targets must be ambitious, but they need to remain achievable. This digital agenda can be assessed through workshops with stakeholders, which aim to reach general agreement on those targets. The targets can be expressed in terms of population coverage, Internet usage, kilometers of backbone, etc. Setting overly ambitious goals that the stakeholders perceive as not achievable will immediately undermine the programs, and so each government has to be clear as to how far it expects to go beyond what private enterprise will provide of its own accord.
The objectives should give priority to areas that will have a high impact and achieve rapid results, whenever possible.
The objectives should be reviewed and adjusted regularly to ensure that the policy is relatively future-proof and does not become obsolete too quickly as a result of market developments.

Another reason to take this approach is that competitive tendering helps to limit potential market disruptions. Older USFs were usually designed in a pre-liberalization world where an incumbent fixed operator received financing to provide fixed services in areas that would otherwise not be commercially viable. In today's mostly liberalized world, operators are also competing at the infrastructure level, and subsidizing an operator to rollout costly infrastructure that might help it to make the transition from a PSTN to a next-generation network could represent an unfair subsidy. For instance, this is a major concern in the EU, where member states are not allowed to require market players to make contributions to finance measures which do not form part of USOs.

Lastly, USOs tend not to be future-proof, as they often focus on certain technologies or solutions instead of leaving the market to decide which technology is the most appropriate because it is the most economically efficient.

The relevance of a USO differs from country to country, depending on many factors, such as the current state of the broadband sector and the existing market gaps, the market position of the incumbent fixed operator and the major mobile operators, and existing broadband policies.

TABLE 3.7: Summary of Recommendations in Terms of Regulatory Environment

Recommendations	Priority (Depending on UAS Model)
A.1 The full benefits of broadband from an economic and societal perspective should be recognized by the key authorities	**All UAS models:** Some recommendations come at virtually no cost, but are critical for the achievement of UAS targets, and should therefore be given high priority in any model. This is the case for recommendations **A.1** (Recognition of broadband benefits), **A.3** (Recognition of the role of broadband UAS policies), and **A.4** (Involvement of all stakeholders). **A.5** (Clear vision and ambitious targets) is also relatively simple to ensure but is less critical. **Mature UAS models: A.2** (Holistic approach to broadband development) and **A.6** (Use of alternatives to broadband USOs) only become a priority for established UAS policies, as these approaches are more complex to implement and are not required to yield results in countries with very recent UAS plans.
A.2 A holistic approach to broadband development should be pursued, encompassing spectrum policy, national backbone rollout, etc.	
A.3 The role of broadband USFs as an economic development instrument and catalyst for social inclusion (e.g., healthcare and education) should be fully acknowledged	
A.4 UAS policies should be designed by involving all relevant stakeholders (e.g., ministries, regulators, agencies, and industry associations)	
A.5 UAS policies should contain a clear vision, as well as ambitious but achievable objectives	
USOs imposed on incumbent operators are generally not an optimal way to achieve the objectives of broadband UAS policies	

Planning

B.1 – *Perform a thorough gap analysis*

The general accepted vision of a market gap is that the private sector will leave certain population segments (e.g., poor people, and people with disabilities) or geographic segments (e.g., rural areas) underserved or unserved, as they would never become commercially profitable. This is a vision that was established before wireless technologies had been developed. With the advent of cost-efficient, reliable, adaptive and good-quality broadband technologies, the extent of underserved and unserved areas or population segments has shrunk somewhat. The use of advanced technologies, however, is expanding quite quickly and it is arguable that the gap (e.g., between technologies for rural areas and technologies for urban areas) is actually widening, thus sustaining a digital divide among citizens. Because of the complexity of this problem and the fact that the specific characteristics of each country are highly important, there is a need to conduct a thorough gap analysis to identify the areas where broadband UAS investment should be made.

Once the gaps have been identified in detail, the needs for action should be prioritized appropriately to ensure that the use of funds has optimal impact. The prioritization of projects to be included in the UAS programs can be achieved through a combination of the following:

i. **Detailed cost-benefit analysis:** In Chile, for instance, the regulator carries out a detailed cost-benefit analysis to ensure the viability of projects. Similarly, in the Dominican Republic, the USF gives preference to programs with high social returns and takes into account the cost effectiveness and cost efficiency of the projects.
ii. **Detailed assessment of the socioeconomic context:** In the Dominican Republic, for example, the prioritization of projects is based on a comprehensive assessment of the socioeconomic context of the targeted areas, such as income, population size, and existing infrastructure, among others. Similarly, in Vietnam, the Ministry of Information and Communications identifies the regions that require priority by using two criteria: the local fixed teledensity and the socioeconomic status (GDP per capita). In Pakistan, priority is typically given to rural, remote, and small towns with the highest number of unserved or underserved residents.

TABLE 3.8: Characteristics of Broadband Gap Analysis

An extensive but detailed scope: For this, it is necessary to understand and compare the current state of the broadband sector on the supply side (existing infrastructure, roll-out plans, quality issues, competition levels, retail prices, etc.) and on the demand side (usage of ICT tools, and broadband in particular, by the population). It is also important to analyze the geographic, demographic, and socioeconomic components with a specific focus on income and expenditure data, and to review the current plans or policies being implemented through other related programs (e.g., ad hoc broadband development projects).
A fine granularity: This can be achieved by conducting a geographic analysis at the local level, and also an analysis of the various segments of the population (e.g., in terms of income levels) in a significantly targeted way. The larger the area/segment, the smaller the impact of the UAS programs (for a similar amount of funding). This approach was used successfully in Costa Rica, where 80 locations were identified and prioritized, down to the granularity of small villages.
A forward-looking perspective: It is important to understand the current market trends and how the market could evolve without public support—although subsidies may appear to be required in the short term, this might not be the case in the medium term for some areas, while in other areas subsidies may be essential as no uptake may be foreseeable even in the longer term. Sri Lanka followed this approach and implemented a comprehensive 10-year development plan that was broken up into shorter, focused projects.
A view on sustainability: Areas which require high-cost coverage and have a low-income population may need UAS programs to provide access (e.g., by financing access infrastructure) and to sustain service (e.g., through discounted Internet subscriptions), as otherwise the UAS programs might not be viable in the long term. A detailed understanding of affordability issues is thus required to assess whether the gap only needs a temporary solution (as the service will eventually become economically viable) or longer-term support. The resources needed for ongoing support are sometimes more substantial than for one-off support only, and this has to be incorporated into the long-term budget of the USF (as those resources will not be available to meet one-off support needs in other areas). Some countries, such as Vietnam, have experienced project sustainability issues of this type.

B.2 – *Define an appropriate governance structure for the USF*

A multitude of options are possible for the governance of USFs. Governance can be entrusted to three types of organizations:

i. **ICT or telecom ministries:** Ministries have control over and responsibility for national policies, which give them an extensive view of UAS programs. In some countries, however, there are co-ownership issues (where the government obviously owns the ministry, but also retains some stake—however small—in the incumbent operator). When a government does still have a residual stake in the incumbent operator, this can make participation by the private sector more complicated: government ministries must

be especially careful that any and all subsidies are clearly and economically justified.

ii. **National regulatory authorities:** Regulators have a broad and deep industry expertise, combined with available and skilled staff and established relationships with all ICT players at the national level (which is useful when implementing UAS programs), as well as other regulators or agencies at the international level (which can help to ensure adoption of best practices). In addition, regulators are usually perceived as being independent from industry and government, which is helpful in obtaining participation by all stakeholders.

iii. **Dedicated UAS agencies:** These agencies are perceived by the industry as having a higher degree of independence than regulators, but they may need time to establish relationships that regulators already have. Moreover, the addition of a new entity increases the number of participants in the coordination process—and, hence, its complexity—and can also raise the administrative costs of UAS programs.

It appears from this analysis that regulators or dedicated agencies are better adapted for managing UAS programs, mostly for reasons of efficiency and independence. Whichever organization is selected, it is important to take care to ensure that the governance follows certain principles, as summarized below.

TABLE 3.9: Governance Principles for Entity Managing the USF

Efficient in its management, with streamlined and centralized processes: In some cases, it can be more appropriate to create a dedicated entity to take charge of UAS programs, either as a department within a regulator or as a separate body. This approach was followed in Costa Rica, where FONATEL was created, separate from the regulator SUTEL.
Accountable to the government.
Independent and fair to the industry: This can be achieved by creating an entity in which all key stakeholders have a seat on the board, and by ensuring that suitable checks and balances are in place. For instance, the USF in Pakistan is managed by an independent but wholly state-owned company, whose board of directors includes equal representation from the public and private sectors; it also has an independent chief executive officer.
Transparent to the citizens: The USF should have a distinct accounting system with proper auditing and monitoring in place. Also, it is best practice for the entity to publish regular monitoring reports on the funds collected and disbursed, as well as on the programs implemented, for instance through a detailed annual report. In the Dominican Republic, INDOTEL publishes a considerable amount of detail on the projects that have been implemented (e.g., duration, costs, description, and progress status).

B.3 – *Focus on UAS projects that are sustainable*

UAS projects can either be one-off investments, ongoing support, or a combination of both. It is important to understand which categories each project falls into. One pitfall that needs to be avoided is setting up projects that make ongoing losses and fail to have a prolonged effect. A typical example of such a project might involve a subsidy to build broadband access infrastructure, but then failing to provide support for low-income households to take broadband services provided by it. The guidelines to ensure the sustainability of UAS projects are outlined below.

TABLE 3.10: Guidelines to Ensure the Sustainability of UAS Projects

Design detailed business models with collaboration of the entity in charge of project implementation to ensure that long-term service usage assumptions are reasonable (e.g., affordability analysis). This is done in Chile, for instance, where the regulator carries out detailed cost-benefit analyses to ensure the viability of projects, and makes careful cost estimates using a detailed engineering model.
Ensure that retail service prices are within reach of the targeted population through detailed market analysis.
If market prices are not affordable to the targeted population, mandate discounted prices to the operators (at least for a certain period of time), or provide direct subsidies to the targeted population, as is done in the Republic of Korea, the United Kingdom, and the United States (through their programs for low-income households).
Set the targets for UAS projects in the form of usage metrics over time, rather than access metrics immediately after completion of a project. Many recent UAS programs now properly set usage targets, as well as medium-term goals; for instance, the UAS programs in Sri Lanka highlight the difference between access and usage and, therefore, put great emphasis on content and service development (e.g., e-government, ICT skills, and capacity building).

TABLE 3.11: Summary of Recommendations in Terms of Planning

Recommendations	Priority (depending on UAS model)
B.1 Carry out a thorough gap analysis to understand what the UAS programs should focus on	**Recent UAS programs: B.1** (Gap analysis) should be a priority for recent UAS programs, where the limited resources need to be allocated carefully, as well as **B.3** (Sustainability), as sustainability is more difficult to achieve in countries with a lower level of economic development. **Mature UAS programs: B.2** (Governance structure) is mostly relevant for established UAS programs.
B.2 Set up a governance structure for the USF that is adapted to the local context and ensure full integration, coordination, viability, and checks and balances	
B.3 Focus on the longer-term sustainability of UAS projects	

Funding

C.1 – *Diversify the funding sources*

Before redistributing funding to operators that implement UAS programs, the USF collects funding through a number of sources, such as the following:

i. **Levies on operators:** This is the most usual source of funding, in which all or some of the national operators are required to contribute to the USF through a levy in proportion to their revenues. In some instances, it may be appropriate to reduce the levy paid by small rural operators.
ii. **Contributions from the government's budget**
iii. **Contributions from other regulatory sources:** For example, spectrum fees or financial penalties imposed on operators (e.g., for failure to comply with rollout obligations).
iv. **Contributions from international funding providers:** For example, the World Bank.

TABLE 3.12: Guidelines for USF Funding

Diversify the sources of funding: This is important as it (a) maximizes the amount of resources available for UAS programs; and (b) facilitates the collection of funds; for instance, if the fund is strictly financed by the government budget (as in the case of Chile), the revenues can be affected by changes in budget priorities on an annual basis, whereas UAS programs ideally need long-term and predictable investment plans. Using a levy on operators, independent of available government funding, can be a way to put aside financial resources for ICT projects if a government has more pressing needs. For instance, in Sri Lanka, funding of the USF comes from various sources, including a levy on operators, direct contributions from the government, and funds from international institutions. Similarly, FONATEL in Costa Rica receives an annual contribution from operators, as well as additional revenue streams from regulatory sources (e.g., licenses, penalties, and interest).
Design the levy on operators so there is no impact on competition: For instance, if fixed infrastructure was defined as the key technology for providing broadband services, then mobile operators would become major contributors while fixed operators would become the main recipients of the fund. A levy on all market players, set as a percentage of revenues, is often seen as a fair scheme.
Flexibility of rules: To adapt to market evolution, especially in relation to the market positions of different players, rules should be flexible. As a result, when there is a levy on operators, it is best practice for this levy to fluctuate within precise boundaries, according to the fund's need during the next investment period.
Use exemptions in exchange for UAS commitments: An efficient way to reach UAS targets is to exempt UAS contributors from paying part or all of the levy in exchange for commitments to implement UAS programs. This solution streamlines and simplifies the management of UAS programs.
Aggregate the different revenue streams into a single fund: This will simplify the monitoring and auditing of funds.

C.2 – *Maximize the level of funding*

Designers of UAS policy need to understand the maximum amount of financial resources that could be collected in the context of UAS, which is related to the following:

i. The scale of the UAS programs that the government intends to put in place to meet the objectives set in the policy and the estimates of the related costs.
ii. Telecom sector revenues, if the sources of funding are based (fully or partially) on operators' revenues.
iii. The portion of the budget that the government is willing to invest in the broadband sector.

Several metrics can be used (and benchmarked against peer countries) to assess the maximum amount of financial resources that could be collected, such as the level of spending on UAS programs as a percentage of total telecom revenues, as a percentage of overall GDP, or as a percentage of GDP per capita. The difficulty lies in the data gathering, as multiple programs usually co-exist and in some countries the financial reporting may be relatively inaccurate (or even nonexistent). It is also not straightforward to compare the different financial instruments (e.g., grants, loans, and subsidies).

TABLE 3.1: Guidelines for Maximizing the Level of USF Funding

Set operators' contributions to the USF to an appropriate level: It is important to strike the right balance in the level of contributions required from operators, as collection targets which are too ambitious may result in an inefficient diversion of capital from private operators (leaving them with insufficient funds to meet their other legitimate goals), while collection targets that are too modest may prevent the funding of programs that are needed to make an impact on broadband infrastructure and usage stimulation. Based on the case studies, dedicating a share of revenues to UAS programs that is much higher than 5 percent is difficult to enforce, and could be an impediment to healthy development of the sector and to private investment.
Balance USF spending with the level of funds collected: Clearly, overspending is undesirable, but care should also be taken that the level and rate of spending is in line with the ability of the USF to disburse the money collected. As shown in the case studies, several countries have had difficulty in making full or timely use of the money collected; this is the case in the Dominican Republic and Costa Rica, and also most presumably in some countries where financial reporting is too limited to give a clear view of USF spending (e.g., Vietnam).
Regularly reassess the levels of financing: With the rapid pace of development in the broadband sector, it is important to reassess the financing for UAS programs on a regular basis. This is true on the collection side (because operators' revenues will fluctuate) and on the spending side (because equipment and infrastructure costs change with technology developments).

C.3 – *Define clear rules for USF disbursements*

Inappropriate funding of projects through the USF can create difficulties in the broadband market, such as: market distortion by not supporting all operators fairly; project failure due to a miscalculation of needs and requirements; dependence of projects on ongoing or additional financing; and potential fraud if the conditions for award of funds are unclear.

To solve these difficulties, many countries have endorsed the Output-Based Aid (OBA) mechanism to disburse USF resources, which seems to be the best practice today for many developing countries. The main advantages of this solution are outlined below.

TABLE 3.14: Advantages of the Output-Based Aid Mechanism to Disburse USF Resources

When properly designed, OBA limits market distortions, as all entities (e.g., operators and agencies) are competing fairly to obtain the subsidies.
OBA favors strong involvement by the private sector, which usually ensures greater efficiency than with government-led implementations.
OBA encourages cost efficiency, through its auction mechanism.
OBA has clear result-oriented rules.

TABLE 3.15: Summary of Recommendations in Terms of Funding

Recommendations	Priority (Depending on UAS Model)
C.1 The sources of funding must reflect the strategic vision of the UAS policy and the environment	**All UAS programs: C.1** (Diversification of funding sources) and **C.2** (Maximizing funding levels) should be a high priority in all UAS programs, but especially for recent UAS programs as they are helpful in addressing financial constraints. **More mature UAS programs: C.3** (Clear USF rules) comes as a second step once resources have been made available.
C.2 The level of spending needs to be significant to bring the desired results	
C.3 The rules for spending the USF should be fair and transparent	

Implementation

D.1 – *Ensure cooperation between public and private sectors*

In the context of broadband UAS, the government's role is to ensure that citizens and businesses have access to broadband services in order to meet social and economic needs. Although governments have the financial resources

to fund the UAS programs directly, it is generally accepted that they are not the most efficient agents to actually implement these programs, and that their role should focus on the following activities:

i. Definition of UAS policies, in line with the wider direction of the ICT sector in general, and the broadband sector in particular.
ii. Partial funding, when needed or when relevant, to speed up the realization of economically viable projects or to enable the creation of noneconomically viable projects.
iii. Allocation and supervision of fund collection and disbursement.
iv. Monitoring the implementation of UAS programs.

Many countries do not require massive investments to achieve reasonable UAS targets, and the private sector is usually well positioned to fill in the market gaps once adequate support has been provided by the State. To a large extent, it is best practice for the private sector to take charge of the implementation of UAS programs and also to contribute (fully or partially) to the funding of such programs. As discussed earlier, this is because of the following reasons:

i. Private sector companies have a good understanding of the realities of the market (e.g., in terms of obstacles to uptake and market responsiveness).
ii. Companies often have solid expertise in cost–benefit analysis and can precisely assess the funding required to achieve breakeven on an investment (which also applies to UAS programs).
iii. Companies often have better project management capabilities, being motivated to be financially efficient, and are better than most governments at implementation in the field.

Most successful UAS programs have relied on the private sector for their implementation, with public tenders being made available to companies, which are willing to invest in projects that meet the conditions and obligations requested, in exchange for subsidies or low-interest grants. This is the case in Pakistan, for instance, where all projects under the USF are first approved by the board of directors and then advertised for open reverse auction. The auction amount is capped by the USF, based on the estimated project capital costs and expected market conditions.

It should be noted that some parts of UAS programs simply overlap with other programs, objectives, or private institutions. These would include the following:

i. Social responsibility programs, such as support for poor or disabled people, or provision of equipment to schools and universities.
ii. Projects to provide technical redundancy programs, such as deployment of additional infrastructure, which could, for instance, provide additional capacity that could be made available to small rural operators.
iii. Demand stimulation, such as local content development or ICT training, which ultimately provides operators with new Internet users/customers.

Public–private partnerships are now considered to be a good way to develop UAS programs, particularly for projects related to the supply side (e.g., infrastructure rollout). Ultimately, the aim is for the private sector to replace the public sector, once this is commercially viable.

Finally, best practice suggests that incumbent, or at least major operators, need to be fairly heavily involved in UAS programs, given the level of financial and technical resources that are usually available to them. Meanwhile, local authorities can provide key inputs in terms of planning the partnership, as illustrated by the approach taken to UAS programs in the United Kingdom. These recommendations are summarized below.

TABLE 3.16: Guidelines for Cooperation Between Public and Private Sectors

The main roles of the government in UAS programs should be: (a) definition of UAS policies, (b) partial funding where appropriate, (c) collection and disbursement of USF, and (d) monitoring implementation of UAS programs.
It is best practice for the private sector to take charge of implementation and also to contribute (fully or partially) to funding. Private companies can bring (a) good understanding of the market, (b) expertise in costing and cost-benefit analysis, (c) project management capabilities, and (d) implementation skills.
Consider the use of PPPs, particularly for projects related to the supply side (e.g., infrastructure rollout). If possible, the private sector should replace the public sector once the project is commercially viable.
The incumbent or other major operators should be fairly heavily involved in UAS programs.
Local authorities can provide key inputs in terms of planning the partnership.

D.2 – *Focus on supply and demand*

Countries have varying challenges in relation to UAS but, in most cases, successful UAS programs encompass both the supply and the demand sides. This was properly addressed in Sri Lanka, for example, where the e-Sri Lanka initiative was established to implement a holistic approach to support ICT development in the country. The major components of the e-Sri Lanka program include support for both supply and demand sides:

i. **Supply:** The rollout of broadband infrastructure through the provision of backbone networks, a government-wide broadband network, and the installation of a network of telecenters.
ii. **Demand:** The rollout of e-government services and development of human capacity in ICT at all levels of education and in all sectors.

Given the broad scope of areas to be covered by UAS programs and the typically limited amount of resources available, prioritization of programs is difficult but necessary. Attention must be given to the impact of a program, the time needed to achieve a return on investment, and the costs versus the benefits. There is no single way to identify the most suitable projects, as this is directly dependent on market specificities on the one hand and UAS policy objectives on the other.

Universal Access and Service programs need to be resilient to changes in broadband technology to ensure that UAS is provided in the most efficient and cost-effective way during all phases of the implementation. This is particularly important in the case of implementation plans lasting three to five years, which represents a significant timeframe in the ICT sector.

The most suitable technology for providing broadband UAS is relatively country-specific, and the choice must be made by taking into account a variety of parameters (e.g., affordability, quality of service, adaptability to geographic constraints, and compatibility with end-user devices). New protocols may be more efficient than existing protocols, for instance, but the cost of equipment change can be a strong barrier to adoption.

Lastly, UAS programs should be defined to cover a realistic period of time, which the case studies suggest might be approximately three to five years. Longer periods of time do not seem appropriate, given the rapid rate of change in market conditions and the speed of technological developments. It is important to keep in mind, however, the broader vision of the UAS policy, and define

TABLE 3.17: Factors to Assess When Prioritizing UAS Projects
Compliance with overall UAS policy objectives.
Economic impact (i.e., economic growth through direct and indirect effects) and reduction of poverty.
Economic sustainability in the long term: the total costs, potentially quantified in terms of costs per capita, total costs, or the nature and level of subsidies required.
The overall economic benefits versus the costs of the projects: estimated by comparing the generated revenues with the costs, potentially quantified in terms of net present value for the project, or its internal rate of return.
Social impact: the extent of the needs of the population that is affected by the project, the total size of the population affected, and a reduction in the digital divide in societal terms (e.g., access to healthcare and education services in remote areas).
For a given amount of funding, it may be a good approach to focus the resources on a small number of high-impact projects instead of a large number of low-impact projects.

programs in the context of a sustained, long-term development plan with a horizon of 15 to 20 years. Best practice suggests that the following factors must be carefully assessed when selecting the projects to be implemented.

D.3 – Ensure strict supervision

As shown in the country case studies, it is best practice to engage in a clear monitoring of the progress and achievements of the UAS programs versus the targets set for reasons of efficiency and transparency. This monitoring is made difficult by the complex factors which need to be considered, such as Internet usage (for universal service) instead of Internet subscriptions, which requires more subtle and pools-type analysis. Such monitoring is best undertaken by a centralized body that can control and compare the progress and achievements (e.g., INDOTEL in the Dominican Republic). The monitoring process provides a suitable opportunity to assess whether there is a need to reorient the implementation plans or to adjust the targets that were previously defined. The need for such changes might arise due to the following:

i. **Technological developments:** These may make previous targets unambitious; it may be more efficient to realign the UAS objectives.
ii. **Market developments:** These may shift priorities. For instance, the market may become able to achieve coverage of previously high-cost areas with no need for financial support. In this case, the funding should be transferred to other UAS priorities.

The monitoring and control process should assess several aspects of UAS programs, such as those listed below.

Conclusions

In conclusion, our analysis of the reference countries confirms the view that broadband is a powerful tool for economic development and social inclusion, and it is one that has been well understood and successfully implemented by countries that are at an advanced stage of ICT development. The reasons for supporting broadband development are primarily associated with delivering socioeconomic benefits, such as improved economic growth and job creation, creating stronger community relationships, supporting regional development, promoting competition, and attracting and retaining investment.

TABLE 3.18: Factors for Control and Monitoring of UAS Projects

Achievement of the project against objectives to date.
A detailed analysis of the reasons behind the differences between objectives and achievements, if relevant, and suggested measures to correct these differences.
The impact of a program in the broadband market in general, compared with the impacts that were expected at the beginning of the program.
The amounts of money collected and disbursed.
The efficiency with which the money has been spent (i.e., the share of funds that is actually used for the projects compared to the amount spent on overhead).
Suggestions for improving the UAS programs in future, particularly in terms of implementation.
Suggestions for adjusting the UAS targets, if relevant.

TABLE 3.19: Summary of Recommendations in Terms of Implementation

Recommendations	Priority (Depending on UAS Model)
D.1 UAS policy implementation requires cooperation from the public and private sectors, for instance, through PPPs	**All UAS programs: D.1** (Cooperation of public and private sectors) and **D.2** (Focus on both supply and demand sides) always deserve a high degree of priority, as supply and demand are aspects that need to be addressed and may be more appropriately tackled by the private sector. **Mature UAS programs: D.3** (Centralized control and monitoring) is important for established UAS plans (where it can facilitate further industry participation and increase the efficiency of UAS plans). It is less critical for recent UAS programs (as monitoring is difficult to implement).
D.2 UAS programs must address the supply and demand sides with some degree of flexibility	
D.3 The implementation of UAS programs needs a centralized control that strictly monitors progress	

In the LAC region, this theory has been applied relatively early (e.g., by Chile, which is relatively wealthy) and with considerable benefits. Meanwhile, less developed countries are making progress toward including broadband in their strategic development plans. In Asia, aside from very advanced countries like the Republic of Korea, broadband is still relatively underrated in UAS plans compared to other ICT services, such as voice telephony, or more basic commodities, such as access to drinking water or power supply. This situation is primarily due to the less favorable socioeconomic development levels but, to some extent, it is also due to more limited acknowledgement of the full potential that broadband has to unleash economic growth and societal development.

Once the benefits of broadband have been acknowledged, national broadband plans and broadband UAS policies are key instruments to deliver those benefits to otherwise unserved or underserved people and businesses. In developed countries, these policies can benefit from favorable socioeconomic conditions, significant financial resources, and long expertise in UAS policies originally developed for voice telephony. These already established and usually complex policies, however, create a major difficulty, as adapting them to the specific requirements of broadband UAS is not straightforward. In many cases, it is better to decommission old policies and implement new ones. In the developing countries of Latin America and Asia, this problem does not usually arise—or at least not to the same degree. Greater financial constraints and less favorable socioeconomic conditions (e.g., low income levels and a lack of ICT skills), however, require greater political commitment to broadband and the design of well thought out, properly prioritized, and comprehensive strategies. In particular, the following are some key best practices that need to be noted in order to meet broadband UAS targets within a reasonable budget and timeframe.

i. **On the regulatory side:** The full benefits of broadband, from an economic and societal perspective, should be recognized by the key authorities; an holistic approach to broadband development should be pursued, encompassing spectrum policy, national backbone rollout, etc.; the role of broadband USFs as an economic development instrument and catalyst for social inclusion (e.g., healthcare and education) must be fully acknowledged; UAS policies should be designed by involving all relevant stakeholders (e.g., ministries, regulators, agencies, and industry associations); UAS policies should contain a clear vision as well as ambitious but achievable objectives; and USOs are generally not an optimal way to achieve broadband UAS policy objectives.

ii. **On the planning side:** A thorough gap analysis is required to understand what UAS programs should focus on; the governance structure of the USF should be adapted to the local context and ensure full integration, coordination, viability, and checks and balances; and the sustainability of UAS projects is key.
iii. **On the funding side:** The sources of funding must be adapted to the strategic vision of the UAS policy and the environment; the level of spending needs to be significant to bring the best results; and the rules for spending the USF should be fair and transparent.
iv. **On the implementation side:** Cooperation between public and private sectors is essential, for instance through PPPs; UAS programs must address both the supply and demand sides with some degree of flexibility; and implementation needs centralized control to monitor progress strictly.

The IDB and ADB are ideally placed to provide strategic and financial support to countries in the LAC and Asia regions that are willing to embark on this path. Although the effort required is inevitably significant and must continue for an extended period, experience indicates that the medium- to long-term benefits more than compensate for the hardships of the endeavor.

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Broadband is key to inclusive growth. It contributes substantially to social and economic development in the areas of job creation, business investment, and online services, among others. Several countries in Latin America and the Caribbean have already initiated reforms of their telecommunications framework to advance broadband towards universal usage. On one hand, the universal access service (UAS) policies that are relatively solid in middle-income or emerging countries will attract significant financial resources to manage the high costs that relate to new infrastructure in rural areas. Depending on the country's topography, however, the possibilities for development may be limited and costly. On the other, UAS policies that are considered advanced or have been long established (and rely considerably on the private sector) will need to address the disbanding of old frameworks. The objective of this publication is to assist national authorities in the region as they bridge the gaps between their countries and those that have developed effective UAS policies.

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