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Abstract

Telecommunications sector policy makers and regulators have a wide range of instruments available to them that can be used to increase access to telecommunications services in rural and low-income areas. The paper provides a review of these instruments, evaluating them against a set of criteria. It then goes on to identify a number of them that are worthy of further consideration by policy makers and regulators while demonstrating that the effectiveness of the identified instruments can be greatly enhanced by the establishment of a conducive legal, regulatory, and institutional framework. The paper concludes by confirming that while no single instrument taken in isolation can provide a full solution to universal access, a mix of the measures identified can be devised to achieve specific policy objectives in a particular country environment.

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Foreword

Extending telecommunications services to rural and low-income areas has been a paramount concern for policy makers in developing countries. The sector reforms and liberalization of the early 1990s have improved access to quality and affordable services in urban and more densely populated areas. Extending the same opportunities to rural and low-income areas remains a challenge, and countries around the world have applied different approaches to address this objective.

This paper discusses the main mechanisms that are being implemented around the world. It includes a simplified effectiveness evaluation analysis and a brief discussion of the main implementation arrangements required to increase the chances of success. The authors conclude that even though some mechanisms appear to be more effective than others, there is no single solution for achieving universal access in developing countries. What is needed instead is a combination of mechanisms, with implementation arrangements that are tailored to each country's particular environment.

The paper builds on a 2006 report on the performance of universal service strategies across 19 countries in Latin America, published by the Public-Private Infrastructure Advisory Facility, the Global Partnership for Output-Based Aid, the European Union through the @LIS program, the Forum of Telecommunications Regulators in Latin America, and the World Bank. The report found mixed results for the different models adopted throughout the region. It encouraged policy makers to include broadband provision in their universal access objectives, and to put in place creative mechanisms to speed up the disbursement of funds for access programs. This paper provides valuable insights on some of the alternative mechanisms that could be introduced.

With the growing evidence that information and communication technologies drive economic growth, the debate on universal access policies is shifting from access to basic voice services toward national broadband coverage. Our more current work, included in the *Information and Communications for Development 2009* report, substantiates this argument. We hope this paper will provide governments and regulators with a useful framework and policy options that could help them meet their universal access objectives.

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Acronyms and Abbreviations

ADC	access deficit charges
DOT	Department of Telecommunications (India)
FITEL	Telecommunications Investment Fund (Peru)
FONN	Fibre Optical National Network (Kenya)
GDP	gross domestic product
IDA	International Development Association
Indotel	Dominican Telecommunications Institute
IP	Internet protocol
ITU	International Telecommunication Union
KII	Korea Information Infrastructure
KII-G	Korea Information Infrastructure—Government
MIC	Ministry of Information and Communication (Republic of Korea)
OBA	output-based aid
SMEs	small and medium enterprises
USAID	United States Agency for International Development
USF	universal service fund
USO	universal service obligation
USOF	Universal Service Obligation Fund (India)
VDC	Vietnam Data Communication Company
VoIP	voice over Internet protocol

CHAPTER 1

Introduction

Recent evidence suggests that increasing overall service coverage and promoting access to telecommunications services have a high economic benefit. Overall, it is estimated that a 10 percent increase in mobile telephony penetration could increase economic growth by 0.81 percent in developing countries, whereas a 10 percent increase in broadband penetration could increase economic growth by 1.4 percent.[1] In rural and low-income areas in particular, not only do basic telephony services and broadband access allow population to connect with relatives and friends, but they have also introduced a dramatic increase in productivity[2] and in many cases have become the only way for small and medium enterprises in rural areas to access national and, in some cases, global markets. Moreover, the impact of access to telecommunications in rural areas on health, education, disaster management, and local governments has allowed better and more rapid responses, improved coordination, and more effective public management.

However, government universal access[3] policies aimed at increasing access to telecommunications services in rural and low-income areas have not evolved sufficiently in line with the latest market and technological trends. Taking into account the above-mentioned benefits, together with the appearance of new technologies and continuous reductions in the cost of required investments, governments should consider expanding their original universal access policies, designed almost 15 years ago to pursue an important but limited social inclusion goal. In many cases, given the right conditions, a strong case could be made to shift current policies towards universal broadband coverage objectives.

It is therefore worthwhile to take a second look at all possible policy options, both conventional mechanisms (some of which underutilized) as well as new approaches, to determine whether some of them may be relevant for the emerging agenda of universal broadband access. This paper will first address the necessary conditions required to adopt a more ambitious universal access policy in developing countries. After that, a brief account of the main relevant trends in the industry will be made, followed by a description of twelve different mechanisms for project implementation and six different mechanisms for funding of universal access strategies. Then, an evaluation of the mechanisms will be carried out to identify the most suitable ones. Finally, some recommendations to policy makers on implementation of the preferred mechanisms are also drawn from the analysis.

Notes

[1] Qiang (2008).

[2] For example, Jensen (2007) reports the economic benefits of mobile telephony on small-scale fishing in Kerala, India.

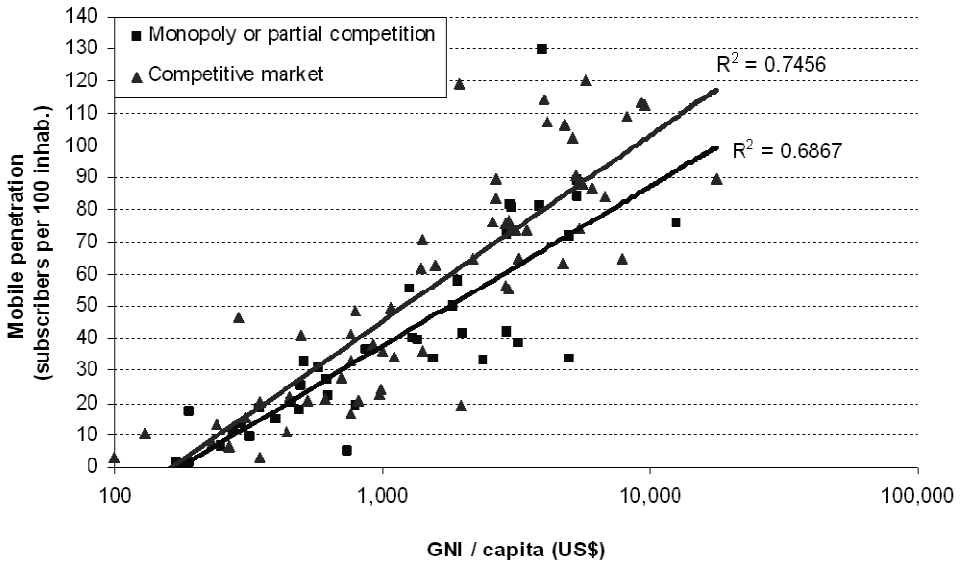
[3] Throughout this paper, "universal access" implies that the whole population has access to the service; "universal coverage" means that population can obtain a service if the user finds it affordable. Finally, "universal service" is reached when all individuals or households are subscribers to a service.

CHAPTER 2

First Things First: Allow Markets to Work Well

Universal access policies should not become substitutes for regulatory reforms aimed at making markets work in a competitive environment. Universal access policies deal with areas that are remote and isolated and that present a low appeal to service operators due to their low income and/or the high costs implied in reaching them. They address the so-called *access gap*. However, many countries could certainly achieve a higher level of penetration and overall usage by addressing basic regulatory bottlenecks, that is, by closing the *market efficiency gap*.[1]

Figure 2.1. Level of Competition in Mobile Markets and Mobile Penetration, 2007



Source: International Telecommunication Union (ITU).

Indeed, well-functioning competitive markets complement all of the policy instruments identified in this paper, in order to maximize social welfare. Figure 2.1 shows that countries with a competitive structure in their mobile market have a higher penetration than those with monopolies or partial competition schemes. A study on the performance of Latin American universal service strategies[2] found that just by addressing regulatory bottlenecks, penetration throughout the region could increase by approximately 10 percent. In Sub-Saharan Africa, a recent study concluded that cell phone coverage could increase in at least 95 percent throughout the analyzed countries with the appropriate regulatory environment.[3]

Hence, basic regulations on issues including interconnection, competition, licensing/authorization procedures, and principles to set tariffs should be put in place, especially in the current context of converging telecommunications, media, and content services. An enabling regulatory framework that takes advantage of new technologies and business models will increase penetration and broaden the range of services, without tapping on public monies other than those required to maintain a regulatory agency that will identify market failures in the telecommunications market, address them with the appropriate regulatory measures, and monitor and enforce them. Table 2.1 describes some of the most recent trends in regulation of telecommunications that should be taken into account when trying to increase competition in the sector.

We recommend that an accountable, independent, predictable, and transparent regulatory agency should be established for the sector, prior to the launch of any universal access program. As the next section shows, the telecommunications industry is one that constantly evolves and changes. It is important that just as universal access policies need to adapt to new innovations and challenges, so regulatory agencies should update regulatory frameworks so that they become enablers rather than bottlenecks for further service expansion.

Table 2.1. Emerging Trends in Telecommunications Regulation

Authorizations	There is a clear trend from narrowly to broadly defined authorizations for service operators. Some countries have reduced license requirements to a minimum, opening the market to free entry if spectrum or other scarce resources are not required.
Spectrum management	Spectrum management is moving away from traditional administration that involves allocating spectrum to specific uses. The trend is toward allowing a greater role for market forces in assigning spectrum and defining its uses. Open access spectrum regimes are also emerging.
Interconnection and access	The old paradigm of circuit-switched interconnection and switch-based cost allocation mechanisms is being replaced by capacity-based IP interconnection for multi-service networks. Countries are pushing for open access to essential facilities for greater competition.
Institutional design	The design of regulatory institutions is moving toward increased coordination or integration of previously separate functions, with several models in use. Some of these only involve increased coordination between regulatory agencies; others feature converged agencies.

Source: Adapted from Singh and Raja (2008).

Notes

[1] A brief explanation of the market efficiency and access gaps is included in the Appendix. For a more detailed analysis, see Navas-Sabater et al. (2002).
[2] Stern and Townsend (2006).
[3] Buys et al. (2008).

CHAPTER 3

An Ever-Changing Industry: Changes and Trends in Rural Telecommunications since the Early 1990s

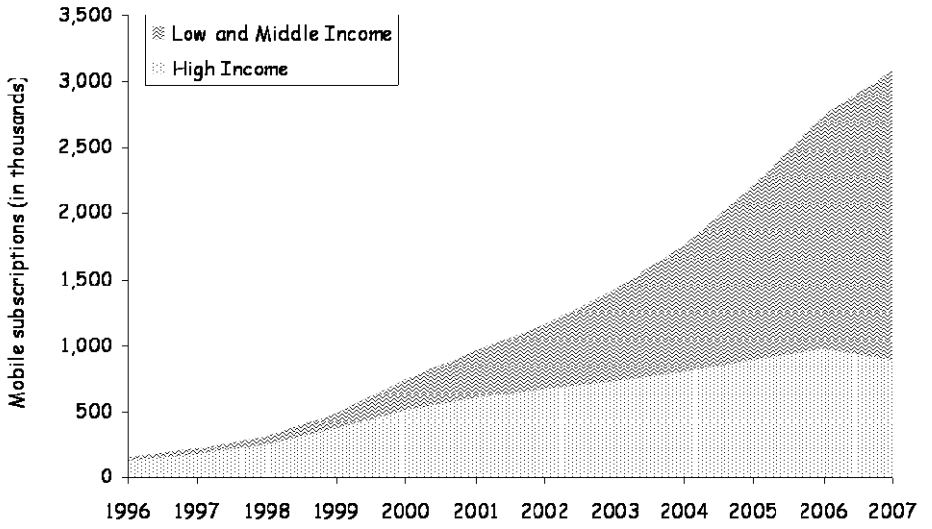
Many countries liberalized their telecommunications sector during the early 1990s. By introducing a competitive environment and allowing for private sector investments in the sector, total investments increased exponentially, bringing with them innovative technologies and business models. For example, it is estimated that a total $16 billion were invested in International Development Association (IDA) countries during the period 1997–2007, more than 80 percent of which came from the private sector. In 2006, telecommunications sector revenues represented, on average, 3.99 percent of GDP, up from 1.86 percent in 1990.[1]

This dynamic pace increased the quantity and quality of services and the coverage of networks in many countries, especially in low-income countries that had previously relied on usually inefficient state-owned enterprises. Rural areas certainly benefited from this move towards liberalization and competition. In fact, efficient and business-oriented operators have slowly started to acknowledge the importance of rural and low-income areas: in almost all countries, service coverage after liberalization has increased in rural and low-income areas. We have identified several trends that have slowly been driving this reshaping of the industry in rural and low-income areas, namely, the rapid growth of wireless networks, the emphasis on coverage rather than access, the adoption of voice over Internet protocol (VoIP), and the need to deliver broadband. This section briefly describes each of these trends.

Wireless Networks Are Rapidly Expanding in Rural Areas

Almost two thirds of mobile users are located in developing countries. As of December 2007, there were 3.3 billion mobile subscribers, that is, 2.8 mobile subscribers per each fixed-line subscriber (figure 3.1). By year end 2008, the total number of mobile subscribers worldwide had reached 4.0 billion (19.5 percent increase). Moreover, between 2001 and 2006 fixed lines grew at an average of 2.5 percent per year, whereas mobile subscribers grew at a rate of 22.8 percent per year.

Figure 3.1. Growth of Mobile Subscribers Globally



Source: ITU.

Developing countries have driven the growth of the sector in the last years. In 1999, low- and middle-income countries accounted for only 25 percent of the 500 million mobile subscribers in the world, and by 2007 this proportion grew to 71 percent (out of 3.1 billion subscribers). In many developing countries, urban areas are already well covered, and growth strategies from operators are slowly shifting towards serving rural and low-income areas with innovative business models based on low-cost technologies.

An interesting example of such innovations is the "Village Connection" model developed by Nokia and currently being piloted in India. This model allows for rural entrepreneurs to manage small operations in their towns, with lower investment required, more efficient use of spectrum and totally relying on IP. Related to this (though not targeted specifically to rural areas) is Celtel's "One Network" in Sub-Saharan Africa. Through this offering, subscribers in 12 different countries in Sub-Saharan Africa can currently move freely across all countries without roaming call surcharges and without having to pay to receive incoming calls abroad.

"Universal Coverage" Objectives Are Emerging as Options to Be Considered

As mentioned before, there is a strong case for an expansion of the "social inclusion" objective to include broadband connectivity, telephony service coverage, and Internet access, aimed at medium-sized rural communities. As new technologies with lower costs are becoming available, universal access policies can be more ambitious without necessarily incurring in higher costs or continuous subsidies.

For instance, the Last Mile Initiative of the United States Agency for International Development (USAID) sets forth the premise that creating local access networks (that is, small local companies able to sell telephone lines to households within rural communities) will in fact contribute to the sustainability of new rural telecommunication companies. Current initiatives under this program are on a pilot basis and still need to prove their sustainability. The wide majority of the projects are based on wireless broadband technologies, including Wi-Fi, pre-WiMax, and GSM (see box 3.1).

In the past, lack of energy in many areas hindered some of these ambitious objectives. However, operators and communities are implementing creative solutions to overcome this. In India, rural entrepreneurs turn their bicycles into dynamos that recharge mobile phone batteries. Digicel, a mobile company with operations in the Caribbean and in the Pacific Islands, is about to launch solar-charged phones in late 2009. The company is already commercializing solar chargers that sell for $20 and are testing alternative energy sources for base stations (in Papua New Guinea, for example, they are currently testing palm oil–powered base stations).

Box 3.1. Enabling Rural Areas with Broadband Coverage

The village of Ta Van is located in the Lào Cai province, 300 km northwest of Hanoi, in Vietnam. It has 150 households (700 inhabitants), with each resident earning $13 a month from farming activities. The town also has some guest houses for tourists which generate approximately $50 a month.

In 2007, a public-private partnership formed by Intel, USAID, and the Vietnam Data Communication Company (VDC), implemented a project to provide broadband access to the Ta Van village. The project used WiMAX technology for local coverage and a satellite backhaul connection through IPSTAR.

Basically, after implementation of the network all households in the town could access broadband applications. Additionally, telephony functionality was introduced through VoIP (though limited to calls within the province at first). Soon after implementation, guest houses' tourists were using the Internet and VoIP applications. Public entities such as the local health center use the Internet to search for medical and pharmaceutical information. Internet access has become the main source for news and information in the village, and now many villagers can communicate with relatives living in urban areas of the province.

According to Intel, the cost of a similar network supporting 40 subscribers would add up to approximately $20,000 ($12,000 in base station equipment and around $200 per user), which implies a cost of approximately $29 per inhabitant (assuming all inhabitants benefit from the project). If we assume a subsidy for 50 percent of the capital expenditure, total public resources required would still be somewhat high compared to other subsidy ratios Besides, operation expenses are expected to be high due to the satellite backhaul.

It is clear that the wealth of services, applications, and opportunities that the project has introduced to the village far exceed those of public telephony projects. Additional estimations of development impact in the village would support replication of the project in other areas. However, the challenge in this case, more than the size of a one-time subsidy, is to guarantee the sustainability of the operation.

Source: Taken from "Cost-Effective Rural Broadband: A Vietnam Case Study", Intel Corporation, 2007.

Transition from Traditional Voice to Broadband and VoIP

In many countries, voice services have become the killer application for broadband in rural areas. The pent-up demand for voice in underserved areas is invariably the main source of revenues for rural operators with broadband offerings, especially during the first years of operation.

In this context, regulation to allow voice communications using the Internet cloud becomes a critical issue, and universal access programs that evaluate the inclusion of broadband services need to take in account this. In order to let small rural access networks provide voice and data services over a broadband network, they need to deliver voice services over the Internet. Additionally, interconnection regulation for such services is a necessary condition for determining the attractiveness of local access networks based on broadband connectivity. In Ecuador, the lack of enforcement of interconnection arrangements for voice communications is jeopardizing the sustainability of an operator awarded with the deployment of Internet centers in rural areas. The expected revenue stream from voice services is critical in their business model. Finally, competitive and open access to international gateways is also critical for Internet-based voice services.

Voice service delivered through the Internet (VoIP is a widely used example) is important inasmuch as it builds a better case for broadband access in rural areas. However, the potential economic value that other applications could bring to these communities once broadband access is available is compelling. In the case of other broadband applications, there are training and content-development activities that must be undertaken simultaneously in order to reap all the benefits they can deliver. Experience shows that these activities will be effective if they are carried out in close coordination with the communities involved.

Backbone Infrastructure as a Critical Requirement to Deliver Broadband in Rural Areas

The additional revenue opportunities for local entrepreneurs, together with the demand for high-capacity connections at the local level, are shifting the pressure towards backbone networks. Local access networks in rural areas may be sustainable given reliable and affordable access to a backbone network: in rural Nicaragua, broadband connections are now available at similar prices as those found in Managua ($20 for a residential 128 kbps connection). Before, similar connections could cost up to $500 per month.

However, backbone investment alone will not take care of actual service delivery to end users. In Peru, a pre-feasibility study was completed in 2007 to determine the required investment to rollout a backbone across the Andes: The Telecommunications Investment Fund (FITEL) will also have to address last-mile services in order to effectively deliver services in benefited areas.

The Kenyan government launched in November 2007 a 4,000 km backbone network, the Fibre Optical National Network (FONN). FONN will connect various district headquarters and border towns, linking Kenya with neighboring Tanzania, Ethiopia, Sudan, Uganda, and Somalia. Box 3.2 includes an extract of the government's

objective, which in this case includes the development of outsourcing facilities in secondary urban areas.

An appropriate incentives structure and training and capacity-building activities are required to ease the emergence of complementing initiatives that will provide additional revenue streams to the proposed infrastructure and hence reduce uncertainty and increase the chance of success in the medium term.

As shown in these examples, some countries have adapted their universal service strategies to these trends, moving to more aggressive objectives. However, many countries remain with schemes that are becoming obsolete and that basically hinder the potential for development and increased productivity in rural areas. Policy makers should try to update their objectives and have mechanisms to allocate projects that also adapt to these trends.

Chapter 4 describes the main challenges that universal access schemes have to face. Then, twelve different mechanisms for extending the reach of networks and six mechanisms related to funding options for universal service strategies are explained. Later, we will propose an evaluation framework for universal access policies and apply it to these mechanisms to determine their effectiveness.

Box 3.2. The Fiber Optic National Network in Kenya

The following is an extract of the speech given by Hon. Mutahi Kagwe, Minister of ICT from Kenya, during a presentation at the World Bank:*

> Having a submarine cable terminate in Mombasa without the terrestrial cabling would be a waste of time. And consequently, we've been working on the terrestrial backhaul. We have got the cable lying down from Mombasa to Nairobi already.… We are currently working on the section between Nairobi and Malaba which is in the Ugandan border. At the same time, we have advertised for three other terrestrial cables that are going to serve as a connection towards Tanzania via Namanga on towards Arusha, we have got a cable that is moving past Eldoret via Lokichokio all the way to Sudan; there's another cable going via Isiolo upwards all the way to Ethiopia and so we are not working just on having this cable supplied only for Kenyans, we are looking at it as a regional project.
>
> And so other stakeholders are also interested in use of the cable. So what we have done is registered an organization, a special purpose vehicle which we are calling FONN which simply means the Fiber Optic National Network. This organization will be a stakeholders' owned organization that is going to be responsible for managing the terrestrial cabling in the country. So, as a matter of privatization, we don't want the Kenya government to be responsible to control what is happening in ICT. Our philosophy and our policy is that we will do everything possible to create competition; we will do everything possible to make sure that business people who want to invest in this area are able to do so with maximum ease. And this is exactly what has happened.
>
> Our idea is to diversify and the reason why we are doing all this digital fibers within the country is to create an opportunity for investors to go outside Nairobi so that in far towns it will be possible to set-up a BOP* there and it will be possible to have a call center in some rural areas.… We want to create opportunities in other areas of the country.

*April 20, 2007
**BOP: Business Outsourcing Provider

Notes

[1] *Source*: ITU. Includes only 85 countries with available information for both years.

CHAPTER 4

Rationale for Universal Access Policy Instruments

In order to explain the rationale for policy instruments presented in this paper, this section will first present a brief description of the main challenges faced by policy makers in promoting access in rural and low-income areas. Then, the 12 different instruments that have been identified will also be described. Finally, financing mechanisms required for those policy instruments that imply some kind of transfer from the government will also be discussed.

Challenges for Universal Access

Policy makers trying to increase access to telecommunications services in rural and low-income areas find themselves facing different challenges. Overall, these challenges comprise two different groups: those related to the costs and investments implied in reaching and serving low-income and rural areas (supply-based), and those related to the characteristics of the population in these areas (demand-based).

High investment and operation costs make operations in rural and low-income areas unattractive for private operators. Serving these areas would be unprofitable, unless provided with alternatives that could reduce overall costs of providing service. For example, new technologies that can allow operators provide telecommunications services for lower costs could expand network reach and increase service availability in rural and low-income areas.

On the other hand, the inherent characteristics of the demand from population in rural and low-income areas might also become obstacles for service delivery in these areas. Low purchasing power, low usage, and seasonal income are some characteristics that reduce the expected revenues that operators could realize. These obstacles can be overcome by finding alternative ways to increase revenues for operators. For example, government transfers for every new connection in rural and low-income areas could create enough incentive for operators.[1]

To overcome these challenges, different policy instruments can be put in place. In the following sections several mechanisms are presented and analyzed.

Universal Access Policy Instruments

We have identified 12 broad sets of different universal access policy instruments that have been used in the past and look promising for future use. Even though specific cases may vary, many of them are just variants of these mechanisms.

To clarify specific challenges to universal access, we divided them into supply-based and demand-based groups. However, policy mechanisms will be classified depending on the type of intervention required. For this, two groups are used: (i) mechanisms that promote efficient markets through regulation (that is, to close the *market gap*); and (ii) mechanisms that foster access beyond what market forces alone could achieve (that is, close the *access gap*). Table 4.1 includes a brief description of each instrument and the specific obstacle it addresses.

Table 4.1. Universal Access Instruments

Mechanism	Specific obstacle addressed	Description
Aimed at promoting efficient markets (close the market gap)		
Asymmetric interconnection	Operation costs in rural areas are higher than in urban areas	Higher termination rates for rural networks are set depending on cost estimations
Facilities sharing	High investment costs in challenging environments	From passive infrastructure to open access, operators are obliged to share their assets with entrants at a "fair" rate
Flexible use of spectrum in rural areas	Operators focus their operations in urban areas and allocated frequencies are not being used in rural areas	Allows rural operators to use available spectrum in commercial frequencies for better and profitable coverage
Introducing licenses for rural local operators	Operators focus their operations in urban areas and do not develop tailor-made solutions for rural areas.	Local entrepreneurs are allowed to create small-scale operations. On-net revenues improve the business case
Elimination of sector-specific taxes and duties	Sector-specific levies introduced that represent an unnecessary burden to operators: Tax Policy/spectrum charges/ annual license fee	Evidence suggests that reducing sector-specific taxes and duties increase penetration and may have a positive impact on GDP growth
Aimed at reducing the access gap		
Reverse auctions (award) + Output-Based Aid (disbursement)	Though sustainable in the medium term, some projects are not initially attractive to investors.	*Reverse auctions*: Award projects to operator that will deliver required services for the lowest subsidy *Output-Based Aid*: Disbursement schedule tied to delivery of "outputs" rather than infrastructure
Introduce bottom-up projects for universal access	National operators usually don't design projects/products addressed for low-income rural areas	Allow for community-based initiatives to be financed
Institutional demand stimulation	Low demand in rural areas reduce attractiveness of supply	Create "captive" demand for service in rural and low-income areas by committing government agencies to pay for these services. Could imply cost-reduction for the government, but requires high level of coordination between sector ministries
License obligations	Lack of interest of entrants established in main cities to rollout nationwide	Include mandatory areas for coverage as part of the licenses of new players
End-user subsidies	Low-income and rural households are unable to afford telecommunications services	Target population is given a subsidy that allows them to pay for services
Designated universal service operator	Reaching high costs areas is a disadvantage for incumbents when facing aggressive competition in densely populated/low cost areas	An operator, usually the incumbent in countries with preexisting national coverage of fixed networks, is given the task of fulfilling the universal service strategy of the country. In return, they receive a per-connection transfer from the government
ADC (Access Deficit Charges)		Incumbent operators are allowed to receive a compensation for every connection deemed as "high cost" (pre-existing or new rollouts according to UA policies)

Source: Authors.

Financial Support Mechanisms

In order to address the access gap, many of the analyzed mechanisms require government transfers. We have identified six different mechanisms for financing these transfers (see table 4.2).

Table 4.2. Financial Support Mechanisms

Mechanism	Brief description
Internal cross-subsidies	Network expansion and service delivery is financed through mark-ups on high-return services and low-cost users
General government budget	Budget is allocated annually to universal access/service programs
Interconnection surcharges	A mark-up on interconnection charges is used to finance service expansion in rural and low-income areas
Operator contributions into a universal service fund (USF)	Operators contribute to a fund that is then used to finance universal access/service projects
Virtual USF	Similar to a USF but the monies are never transferred to a fund and are instead kept but operators
Pay or play	Operators are given the chance of providing services in rural and low-income areas instead of contributing to a USF

Source: Authors.

The first four mechanisms have been used by many countries, whereas the last two have been proposed as alternatives, but have yet to be implemented.

Twelve different universal access policy instruments have been presented along with six different financial support ones. The following section will present some criteria for the evaluation of these instruments.

Notes

[1] Actually, this is one of the mechanisms covered in Chapter 5.

CHAPTER 5

Assessing the Suitability of the Instruments

What makes some of these instruments more suitable than others in addressing the abovementioned universal access challenges? We propose the following dimensions that can help assess the suitability of a specific policy option and funding mechanism:

For policy options:
(i) Overall effectiveness to deal with the gap it intends to close
(ii) How well targeted it is to the intended population
(iii) Extent of private sector involvement
(iv) How transparent it is in the allocation of public resources (only for those policy options that require public resources, that is, those that deal with the access gap)

For funding mechanisms:
(i) Whether it introduces major distortions in the sector
(ii) Whether the funding source is certain and sustainable

Table 5.1 summarizes the main issues and the evaluation criteria that have been used to assess the effectiveness of each mechanism. All policy instruments and funding mechanisms are analyzed in the following section using these criteria.

Assessment of Policy Instruments

1. Asymmetric Interconnection[1]

In almost all countries, mobile networks have interconnection charges different (usually, higher) than those for fixed networks. The main reason of course is that both networks have different cost structures and originating/terminating a call in a mobile network is more expensive than doing so in a fixed line.

A similar case could be made for rural networks. That is, due to the specific characteristics of their network and the market they serve, costs per call in rural areas are reckoned to be more expensive than in fixed networks. While asymmetric interconnection for rural networks has been implemented in countries like Chile and Peru, widespread application of this mechanism is still limited.

Table 5.1. Evaluation Criteria

			
Policy Mechanisms			
Overall effectiveness to deal with the gap it intends to close	Does not address the specific obstacle/gap	Partially addresses the obstacle/gap	Effective in addressing the obstacle/gap
How well targeted it is to the intended population	No targeting at all	High risk of not reaching the intended population	Specific for target population
Extent of private sector involvement	No private sector involvement	Partial private sector involvement	Effectively leverages private sector involvement
How transparent it is in the allocation of public resources	Nontransparent	Somewhat transparent	Transparent
Funding Mechanisms			
Whether it introduces major distortions in the sector	Introduces distortions in relative prices of telecommunications services	Keeps relative prices of telecommunications services	Does not introduce direct distortions in the sector
Whether the funding source is certain and sustainable	Source of funds is uncertain and unsustainable	Source of funds is certain but unsustainable	Certain and sustainable source of funds

There are some principles that are critical for asymmetric interconnection to be effectively implemented:[2]

- "The terms of interconnection must be based on transparent, public domain procedures;
- Rates and practices must be monitored and enforced by an unbiased and independent regulator;
- Rates must be based on forward looking incremental costs; but
- There is a special need to account for the costs of network expansion into regional and rural areas during a country's development phase or for very high-cost areas."

These requirements may not be easily implemented and might be some of the main reasons for the lack of additional cases where asymmetric interconnection has been applied. However, if correctly applied, the requirements create incentives for rural operators to expand their services, as interconnection rates would be cost-oriented and not loss-making, as would happen if fixed interconnection rates were applied on them.

Assessment Box 1. Asymmetric Interconnection

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		This mechanism certainly solves the gap it intends to close. However, implementing—especially in the case of existing operators that serve urban and low cost areas—could be challenging. Complexities beyond charge calculations may arise (location of points of interconnection, VoIP interconnection, etc.).
How well targeted it is to the intended population		It is very well targeted as it provides with a cost-based pricing solution to service delivery in rural areas.
Extent of private sector involvement		Private sector operators could reconsider certain locations that were previously discarded due to the high costs implied. It also promotes the emergence of rural operators.

2. Facilities Sharing and Open Access

There are certain investments that companies would not be able to afford individually but, if deployed collectively, could extend service coverage towards low-income areas. In these cases, collaboration between companies that would benefit from such infrastructure could be explored. As explained before, the Kenyan government is sponsoring FONN, which in essence will have all existing operators sharing a nationwide fiber optic network that none would have rolled out on their own.

In other cases, market dominance situations in isolated areas create incentives in many operators to avoid sharing their existing infrastructure with potential competitors. By allowing (enforcing) infrastructure sharing, operators diversify the risk of covering high-cost, low-income areas and/or enforce competition without inefficient duplication of investments. This, in many cases, can be achieved without the need for public subsidies.

Tower sharing in India has been a business in itself for a long time. According to Morgan Stanley,[3] for an operator it makes sense to lease rather than to build a tower from a cash flow perspective. As an independent business, a tower company would lose money with one tenant. However, payback with two tenants would occur after eight years, and this period falls to six years with three tenants. Both Reliance and Bharti have created separate companies to manage the towers business.

Furthermore, Indian regulation states that companies that install towers financed through the Universal Service Obligation Fund (USOF) are obliged to share them without charging rent for the first five years of operation. During the first half of 2007, the Department of Telecommunications (DOT) tendered for 7,871 towers in two components, one for capital expenditures and the other for actual mobile service delivery. For the capital expenditure component, subsidy requests were below DOT's estimations, whereas for the second component of the tender (service delivery) some companies requested no subsidy, reinforcing the idea that most of the cost burden involved in serving isolated areas with mobile services is related to passive infrastructure.

Ericsson's initiative with Rural Netco (see box 5.1) is an attempt to share the inherent risks of a rural telecommunications operation between different stakeholders, not only competing operators.

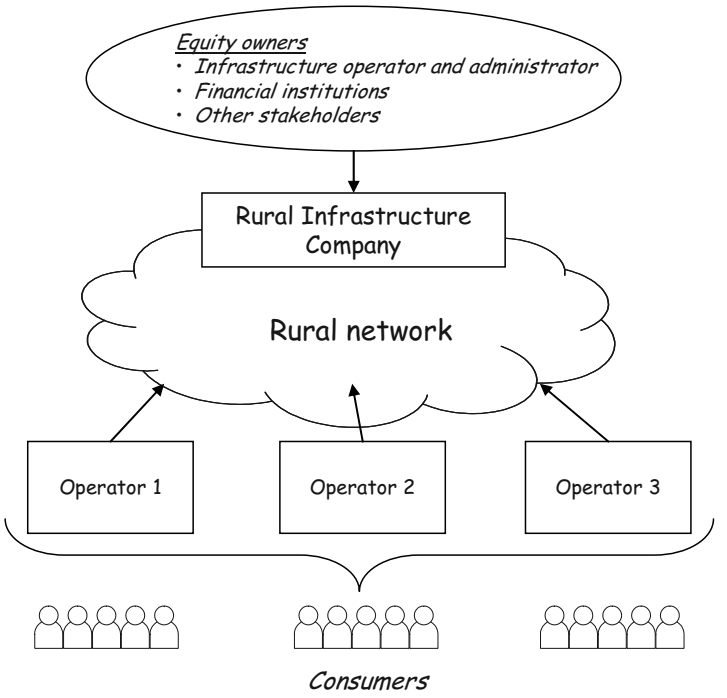
Box 5.1. Sharing the Risks to Increase Access in Tanzania

Ericsson is in the process of implementing a rural business model that leverages the advantages of infrastructure sharing and open access in the regions of Lindi and Mtwara, in southeast Tanzania. Rural Netco Ltd., a company owned in part by Ericsson, will provide "neutral" GSM network services to existing operators in the two regions, which are currently underserved.

The main idea is to reduce the inherent risk to operators of entering into these areas by taking away the operational and financial risks, which would be assumed by Rural Netco. Rural Netco would receive roaming revenues from operators' users in the area and will not offer retail services in order to keep its "neutrality." This arrangement would be transparent to users, as long as their handsets work on the frequency that has been assigned to the company (900MHz).

The scheme seems to attract operators. They would reduce their capital and operations expenditures, as well as increase their subscriber base and traffic revenues. Users in many locations would have access to mobile services at lower prices than current alternatives.

Ericsson's Rural Business Model



Preliminary demand studies are based on a survey carried out in 2004 and on the experience from operators and the regulator. Rural Netco has no public funding and according to initial estimations it should break even within the first four years of operation. Currently, the company has been granted a national network facility license and has been allocated spectrum in the 900MHz frequency band.

Source: Authors.

In general, governments should facilitate collaboration between operators in cases where there is no infrastructure and/or analyze the convenience of enforcing infrastructure sharing in specific cases.

Assessment Box 2. Facilities Sharing and Open Access

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		By allowing sharing and more efficient utilization of existing infrastructure, this mechanism reduces overall costs of rollout and allows for additional coverage.
How well targeted it is to the intended population		There is a risk of it being applied mainly on highly competitive areas such as densely populated urban areas, so this mechanism might require complementary mechanisms to create incentives to reach more rural and low-income areas.
Extent of private sector involvement		The mechanism leverages and creates additional private sector investments.

3. Flexible Use of Spectrum

In rural areas, spectrum has become a costly entry barrier for small operators oriented towards low-income segments. Many countries have spectrum allocation policies that grant nationwide licenses, not bearing in mind that license holders are usually going to concentrate their operations in urban areas.

Even in those cases where operators granted with nationwide licenses do provide service in rural areas, usage of spectrum in rural areas is certainly different than in urban areas. That is, in urban areas, due to population concentration and intensive use, the value of spectrum as a scarce resource is much higher than in rural areas. So, the opportunity cost of spectrum in rural and low-income areas is different, building a case for different approaches when dealing with frequency allocation between rural and urban areas.[4]

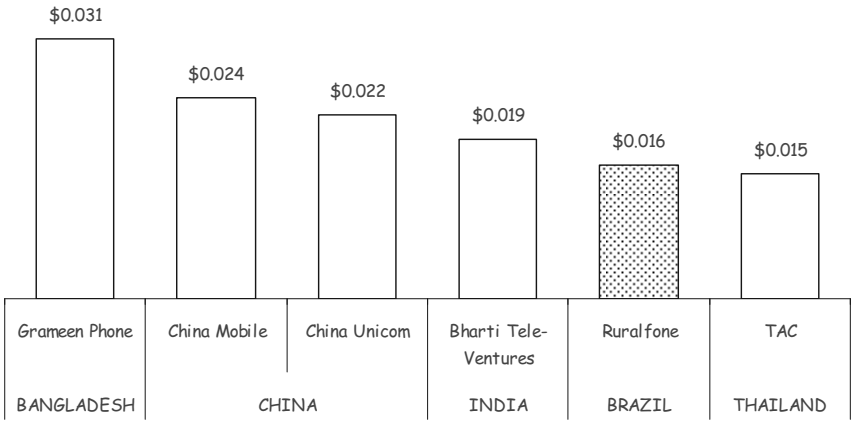
Spectrum allocations in Brazil (as in many other countries worldwide) have been driven by market characteristics in urban areas: companies have to be able to manage the expected traffic from cities such as Sao Paulo, with more than 11 million inhabitants. Additionally, revenue potential from mobile operations in such locations makes the cost of spectrum very high. However, for national licenses, this means the creation of substantial excess capacity in rural areas, where even a 100 percent penetration would leave unused spectrum. Aware of this, Anatel, the regulatory entity in Brazil, issued Resolution Nª271 in August 2001, allowing the secondary use of GSM spectrum for the provision of fixed wireless services. Anatel also allowed the use of mobile terminals as fixed terminals (limited mobility within the cell for fixed-wireless services).

This created the opportunity for small local companies to provide fixed wireless services over mobile networks in secondary locations (in practice, just by disabling handoff and roaming capabilities of GSM network equipment). Lower costs in spectrum, network, and handsets would allow these companies to provide services to low-income segments, and local on-net calls would help sustain their operations.

Ruralfone is an example of such an operator. The company started operations in 2005 under the "Local" brand, providing fixed-line services over GSM technology in two towns in the state of Ceará, one of the poorest regions in the country. Even though there are other operators present in both locations, Ruralfone is able to provide creative and competitive products that appeal to the low-income segments of the towns. So far, the results are promising: in Quixada, the first city to be served by the company, Local

has increased the teledensity by approximately 65 percent and accounted for nearly half the lines as of March 2007. Price per minute is among the lowest in the world, and the company is currently developing its expansion plans to other cities.

Figure 3. Mobile Tariffs for Selected Operators (US$ per minute)



Source: Ruralfone (2007).

Before this scheme was put in place, spectrum in rural areas was in practice valued at the same price as in urban areas. By having a more flexible approach towards spectrum management in rural areas, the government of Brazil has eliminated a costly barrier for the emergence of companies oriented towards low-income segments in secondary urban and rural areas. It must be said, however, that the replication of this creative approach in other countries would depend on previous decisions taken by governments on spectrum management and on existing regulations.

Assessment Box 3. Flexible Use of Spectrum

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		This mechanism does not solve the problem by its own and would mostly require complementary mechanisms like local licensing. Implementation can be controversial since many existing operators might see this as a breach to nationwide allocation of spectrum included in their license.
How well targeted it is to the intended population		Target areas can be defined by population threshold. The main concern for its implementation is the probability of existing operators entirely using the frequencies they have been assigned.
Extent of private sector involvement		This mechanism is an enabler of private entrepreneurs in rural and low-income areas that may emerge and develop customized local offerings.

4. Licensing Local Operators

Closely related to the earlier mechanism, licenses for local operators allow specific solutions targeted for small towns. By issuing such licenses, governments support local entrepreneurs and increase their sustainability by allowing revenues from on-net communications (hard to get through payphones).

Manufacturers are developing solutions for such local-oriented models. Nokia Siemens, for instance, is currently testing its "Village Connection" model in India. This model allows entrepreneurs to manage a GSM access point in their community. The access point can manage call completion within each village (supporting up to 80 subscribers) with a standard personal computer, reducing investment and the need for communication with regional access points (done in IP and only for long-distance calls). The amount of local calls in this operation provides an opportunity for additional revenues for local entrepreneurs. However, this model may not require the establishment of a local license regime if a franchise or reselling approach is adopted.

In the Dominican Republic, the Dominican Telecommunications Institute (Indotel), the regulatory agency, launched in 2007 a rural broadband tender aimed at installing broadband connections for 500 communities under an output-based aid (OBA) scheme. These points of presence have allowed local entrepreneurs that already were operating telecenters (known as "Informatics Training Centers") to work as local ISPs within their communities, offering broadband Internet access to private users and VoIP phone services.

The main characteristic of this approach is that it gives the opportunity for local entrepreneurs to serve their communities with tailor-made solutions in a self-sustainable manner, leveraging low-cost technical solutions and minimizing public funds requirements.

Assessment Box 4. Licensing Local Operators

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		By allowing small local entrepreneurs take advantage of new technologies in areas where margins might not justify the entrance of a national player, this mechanism helps reach the market efficiency frontier.
How well targeted it is to the intended population		In general, could be applied at any local level.
Extent of private sector involvement		This mechanism is an enabler of private entrepreneurs in rural and low-income areas that may emerge and develop customized local offerings.

5. Taxes and Import Duties

Table 5.2 describes the different taxes and duties that are in place on mobile services in African countries. As can be seen, some countries collect taxes up to 30 percent on services and more than 40 percent on handsets. Traditionally, taxes on telecommunications have been higher than in other sectors due to the high growth that the industry showed despite tax increases. This apparent inelasticity was due to the unattended demand for telecommunications across all segments of population.

However, after companies reached all profitable segments, high taxes become a more apparent cost and a barrier for further expansion of services into new areas. Some countries have acknowledged this and have reduced sector taxes. Moreover, in some cases import duties for handsets have been reduced or eliminated to foster service penetration.

Table 5.2. Taxes on Mobile Services in African Countries

	Taxes on handsets			Taxes on services		
	VAT or similar (%)	Customs duty (%)	Other (%)	VAT or similar (%)	Other (%)	Fixed taxes (US$)
Angola	10.00	5.00		5.00		
Botswana	10.00		7.00	10.00		
Burkina Faso	18.00	12.50		18.00		0.04–0.10
Cameroon	19.25	31.50		19.25		
Chad	18.00	30.00		18.00		
Côte d'Ivoire	18.00	5.00	2.50	18.00		
D.R. of Congo	13.00	20.00		18.00		
Egypt	10.00			15.00		
Ethiopia	15.00	10.00		15.00		
Gabon	18.00	10.00		18.00		
The Gambia	15.00	20.00		18.00		
Ghana	12.50	20.00	5.50	12.50	2.50	
Guinea	18.00	12.50		18.00		
Guinea-Bissau	15.00			15.00		
Kenya	16.00			16.00	10.00	
Lesotho	14.00		7.00	5.00		
Madagascar	18.00			18.00		
Mauritania	14.00			14.00		
Mauritius	15.00			15.00		
Morocco	20.00	2.50		20.00		
Mozambique	17.00	25.00	1.00	17.00		
Nigeria	5.00	10.00		5.00		
Rwanda	18.00	(1)		18.00	(2)	
Senegal	18.00	10-20.00	1.50	18.00		7.18
Seychelles		12.00		17.60		
Sierra Leone	10.00			10.00		
South Africa	14.00	8.05		14.00		
Swaziland		14.00				
Tanzania	20.00			20.00	7.00	
Tunisia	10.00		8.00	18.00	5.00	
Uganda	18.00			18.00	12.00	
Zambia	17.50	5.00		17.50	10.00	
Zimbabwe	15.00			22.50		

Source: Deloitte Analysis (2007).
Notes: (1) Import duties of 30 percent were removed in 2006, though this is still to be signed and gazetted. (2) In Rwanda, the introduction of a 10 percent excise tax on usage is currently proposed.

The basic decision for policy makers is whether reducing taxes will create more net welfare in society. Many times however this decision is reduced to analyzing the impact of reducing taxes on public revenues. Even in such cases, reducing taxes could in fact increase overall revenues in the medium term. In the case of Afghanistan, a study on the impact of tax reduction on the economy concluded that "reducing tax rates for the telecom sector is expected to have net positive effects for all parties including the government (higher tax receipts in the medium and long term), industry (tax savings can be diverted to investments by telecom operators) and consumers (lower tariffs due to decreased taxes promote usage and increase consumer surplus)."[5]

It has long been said that tax regimes that differentiate among sectors create distortions and artificial changes in relative prices. Even though it could be argued that lower taxes for rural and low-income areas could increase usage of telecommunications services, and probably public revenues, it would be hard to design a mechanism that would discriminate among users and be targeted efficiently.

Assessment Box 5. Taxes and Import Duties

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		Tax policy is based on the assumption that basic telecommunications services are inelastic, which in turn comes from the pent-up demand that existed before well-functioning markets were established.
How well targeted it is to the intended population		It is rather a mechanism to create additional revenues for Treasury and hardly ever channeled back to the sector.
Extent of private sector involvement		These policies create artificial additional costs for private operators and reduce the attractiveness of the sector.

6. Reverse Auctions and Output-Based Aid (OBA)

It is important to separate reverse auctions from output-based aid (OBA) approaches. Reverse auctions relate to the mechanism for the allocation of projects, whereas OBA relate to disbursement of subsidies (or "aid"). The former emphasizes the efficiency in the allocation of public resources by selecting the operator that complies with a pre-specified set of requirements and requests the lowest subsidy; the latter is more focused on the effectiveness of implementation.

OBA strategies use performance-based subsidies (also known as "smart subsidies") to deliver telecommunications services. Many universal service funds around the world use reverse auctions under OBA guidelines, where basically a set of desired services (outcomes) are previously designed and requested in an open tender, and subsidies are awarded to the operator that—fulfilling all technical and legal requirements—demands the lowest subsidy.

OBA tenders increase accountability, improve transparency, leverage public resources in a competitive manner, and reduce economic distortions. In the telecommunications sector, they have covered a wide range of services, starting with rural payphones in the mid 1990s and currently including broadband connectivity and mobile network extensions. OBA tenders are used not only in telecommunications but

in other sectors such as energy, water, education, and health.[6] The design of each tender must be carefully crafted, as no OBA tender is exactly the same. Identification of the beneficiaries of the program, definition of specific service targets, and competition between operators for the tender are critical and must be ensured in order to achieve a successful outcome.

Reverse auction tenders carried out in this context usually address the access gap, but for sustainable projects. That is, the "smart subsides" that governments grant through these tenders are for projects that private parties are not willing to undertake by themselves, but that won't need an endless stream of public funds. Sustainability in the medium term is important, so that the operator has incentives to continue operations after the term of the contract is due.

Table 5.3. Outcomes of Minimum Subsidy Auctions for New Public Rural Telephones

Indicator	Colombia	Nicaragua	Peru	Dominican Republic
Service provided	Internet community Centers	Mobile coverage	Public telephony, phone coverage and Internet	Public telephony
Total subsidy	$51 million	$4.2 million	$49 million	$6.4 million
Localities served	9,745	343	3,852	1,750
Population served (millions)	5	0.5	1.7	n.a.

Source: *New Models for Universal Access to Telecommunications Services in Latin America* (2006).
n.a. = Not applicable.

Due preparation of reverse auction and OBA tenders require demand studies and appropriate field work in order to set fair outcomes that are to be met by the awarded operator. As projects supported by universal access programs are more community oriented, smaller in scope, and involve other actors (local authorities, training programs, content creation), reverse subsidies may not provide the flexibility and turn-around time required.

Assessment Box 6. Reverse Auctions and OBA

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		By providing with "smart subsidies" to operators that will make deployments to rural areas worth doing and sustainable, this mechanism deals with the gap effectively. However, when dealing with nationwide, cross-sectorial projects, the preparation process has proven to be long and ineffective.
How well targeted it is to the intended population		It is very well targeted as tenders usually either include a list of the locations to be served or a set of characteristics that each of the locations must comply with.
Extent of private sector involvement		By providing the "smart subsidies" this mechanism is designed to attract private sector investment in rural and low-income areas.
How transparent it is in the allocation of public resources		By carrying out a reverse tender and continuous audits in order to verify targets for disbursement of subsidies, this mechanism proves to be very transparent.

7. Introducing Bottom-Up Projects in Universal Access Programs

Successful reverse auctions may need complementary mechanisms to deliver next-generation projects involving community participation. According to Stern and Townsend (2006), only 11 percent of funds collected for universal access strategies in Latin America had been committed as of 2005.[7] Among its recommendations, the study identifies implementation of more flexible and faster allocation mechanisms, including bottom-up approaches (that is, projects that stem from communities, operators, or local entrepreneurs) as a way to accelerate delivery of services to beneficiaries.

Bottom-up approaches accelerate service delivery. Peru's Telecommunications Investment Fund (FITEL) included in its 2007 rules of operation the possibility of financing projects proposed by third parties (whether operators or not). Such projects can be submitted to FITEL at any time, and FITEL has up to 45 days to determine whether the project is worth tendering, under the existing framework for tenders. If an operator proposes the project, a certain number of points are given to the company during the tender as a way to acknowledge the initiative.[8] If a third party proposes the project, then the costs of preparation assumed by this party are submitted to FITEL and, if deemed reasonable, are to be covered by the winning company after the tender.

Box 5.2. Financing for Small Local Operations

New technologies allow for innovative business models at the community level. Many of these projects are in fact sustainable and in some cases they do not need a subsidy to be implemented, but rather the availability of financing options such as lending. There is however a "financial gap" that affects small and medium enterprises (SMEs) at large and ICT-related ones in particular.

A study commissioned by infoDev (2007) on the challenges and opportunities of financing IT entrepreneurs and SMEs in developing countries found out that there are several barriers that impede adequate access of SMEs to financing. From the supply side, the main barriers identified are:

- Informational asymmetries between SMEs and potential lenders.
- Higher risk associated with small-scale activities.
- Increased transaction costs in SME financing.
- Intangible nature of many activities, which leads to lack of collateral.

There are some barriers that have also been identified on the demand side:

- Poor quality of projects submitted for financing.
- Entrepreneurs are unable to articulate a good business model despite real opportunities.
- When dealing with equity financing, there is an unwillingness of relinquishing control over the company to outsiders.

In the case of rural initiatives, most of these barriers become more relevant and more difficult to solve. Allowing real financing options for rural entrepreneurships and facilitating training and capacity building to local entrepreneurs could in fact become a viable policy initiative that would help expand the market efficiency frontier, creating operations that do not need public subsidies in uncovered areas.

An alternative that sacrifices some of the benefits of tenders would be to set fast-track processes for specific rural areas.[9] Under this approach, a capped subsidy per location could be tendered given to any company that is willing to serve rural towns that fit certain criteria (for instance, less than 500 inhabitants, with no telephony service and a formal request from the town mayor endorsing the project). Even if no reverse auction is involved, an OBA scheme should be implemented to ensure the effectiveness of the intervention.

Supervision and quality of service requirements would still be applied as with other projects, but the cumbersome process of going through a tender would be avoided and resources would be channeled in a more expeditious way.

Related to this mechanism, offering real financing options for certain rural ICT operations could also help in the emergence of local operations (see box 5.2).

Assessment Box 7. Introduction of Bottom-Up Projects

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		This mechanism allows local entrepreneurs propose complementary projects at a community level. It complements nationwide tenders and creates opportunities for projects that may leverage specific characteristics from individual communities.
How well targeted it is to the intended population		Bottom-up projects should be aimed at rural communities that lack telecommunications services. It is very well targeted.
Extent of private sector involvement		Even though projects are to be endorsed and presented by local authorities, they require the involvement of existing operators at the design and implementation stages.
How transparent it is in the allocation of public resources		Criteria for selection of projects to be funded (expected economic benefits, lowest requested subsidy, first-come first-served, etc.) and selection mechanism (tenders vs. direct allocation based on cost benchmarks) are among the issues that could jeopardize the transparency of the allocation process.

8. Institutional Demand Stimulation

In some cases, governments have offered a guaranteed revenue stream to reduce the risk of investment projects and to help sustain operations. This is done in order to increase the interest from private companies in the tender, as government revenues would reduce the risk of the project and help sustain operations, especially when dealing with Internet service. Basically, this mechanism leverages governments' purchasing power as an anchor tenant.

Institutional demand also helps create private demand for services. For example, the government of Nicaragua is currently designing a national tender to provide broadband access to approximately 100 municipalities that currently don't have affordable Internet connections. Many of the points of presence will be housed in municipalities, and access to the public will be allowed.

This mechanism can reduce both public transfers to universal access programs and overall government expense on communications, but it is critical in these schemes to involve local authorities from the start. If service connectivity is to improve significantly (for instance, from limited phone service to broadband connectivity),

contents and training must be put in place so that local authorities (and the general population) are able to get the most out of the new technologies.

A successful example of this initiative is the KII-G initiative (Korea Information Infrastructure—Government), led by the Ministry of Information and Communication in the Republic of Korea (see box 5.3). Basically, by committing to become an anchor tenant of a nationwide fiber optic network and providing soft loans to operators, the government leveraged its investment 19 times and created benefits estimated at $4 billion.

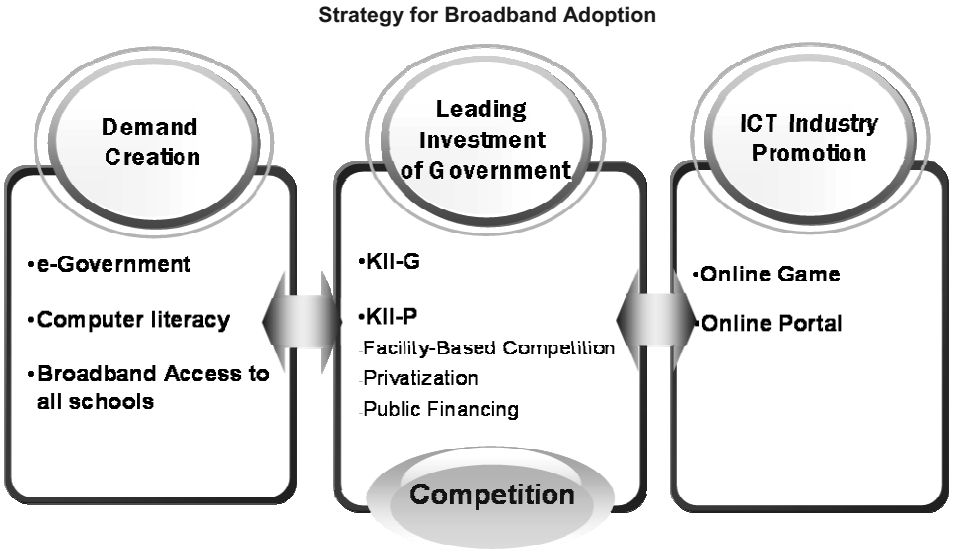
Box 5.3. Government Demand Increases Broadband Coverage in Korea

In 1995, the Korea Information Infrastructure (KII) project was launched by the Ministry of Information and Communication (MIC), as part of a wider strategy for broadband adoption throughout the country. In order to foster nationwide network infrastructure deployment, the government launched the KII-G initiative. This initiative aimed at providing high-speed connectivity to the 144 call zones in the country, covering government entities, and nonprofit organizations.

Between 1995 and 2000, the construction of the optical backbone network implied a total investment of US$9.5 billion, out of which only US$0.5 billion (5.3 percent) came from the government of Korea as a soft loan to operators that was later paid in the form of free service provision to public schools and other public entities for a limited period of time.

The infrastructure that was deployed as part of this project set the path for the KII-P (private) program, which complemented the initial government-driven infrastructure to create the current national backbone, covering 99 percent of all the households in the country.

KII was one of the components of the strategy for broadband envisaged by the government of Korea. In addition to infrastructure provision, the government also implemented programs for demand creation and ICT industry promotion:



Overall, it is estimated that the KII program created economic benefits worth US$4 billion, including telecommunications costs savings for the public sector of approximately US$3.4 billion. KII improved the efficiency of public administration and created 12,000 job opportunities*.

**Source*: National Computerization Agency, Korea.

Finally, it is important to stress the fact that this mechanism implies a medium-term commitment to a recurrent expense. Including institutional demand in universal access programs requires serious buy-in from local authorities and stakeholders.

Assessment Box 8. Institutional Demand Stimulation

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		By creating a "captive demand" from government, infrastructure projects will reduce uncertainty. However, this mechanism alone will hardly attract operators into unprofitable areas. Effectiveness, therefore, depends on the implementation of complementary mechanisms.
How well targeted it is to the intended population		This mechanism is not targeted at the intended population. However, it must be noted that it does not create unnecessary distortions or inefficiencies by benefiting other segments of the population.
Extent of private sector involvement		The mechanism relies entirely on the provision of telecommunications services by existing operators.
How transparent it is in the allocation of public resources		One of the main outcomes of the mechanism, if implemented right, is to reduce overall government spending on IT.

9. Licensing Obligations to Rollout Nationwide

In many countries, both the privatized incumbent and new entrants are obliged to rollout their network nationwide. In some cases, specific locations were included as part of the license award. The main rationale behind these licensing obligations is that, due to the attractiveness of capital cities in highly centralized countries, operators of telecommunications services could be tempted to only serve one or two cities in the country, or delay the expansion of their network to other locations. The obligation to rollout would make operators look at those other locations and benefit a broader segment of the population.

Whereas these first set of obligations are meant to create incentives for operators to start commercially viable operations in less attractive markets, in some cases such obligations have been expanded towards areas that may not be commercially attractive but could become sustainable once the network investment was done (addressing the access gap). The main reason to do this is that once telecommunications networks are available in such locations, providing service would be profitable and there would be no need for public assistance later (through a universal access program, for instance). However, it could be argued that these obligations, whenever included in a tender process for licenses, reduced the amount that operators would be willing to pay to the government (especially if involving spectrum frequencies).

In practice, obligations have worked and companies have expanded their operations to locations that were not as attractive as others. On the other side, some operators have just complied with the minimum requirements stated in their licenses, leaving some locations unattended or with a very small capacity, while concentrating—as expected—in the most profitable segments of the country. Additionally, these obligations, designed many years ago assuming a telecommunications sector with high economies of scale and high investment

requirements, currently constitute a barrier to entry for new local operators that could be able to serve effectively small regions or cities, but that are not willing to (or capable of) deploying a nationwide operation. Many countries are currently reviewing their licensing obligations to avoid this problem.

In conclusion, licensing obligations were implemented to create incentives in national operators to serve secondary locations and, in some cases, unprofitable communities. Even though they may have worked in some cases as expected, these obligations tend to create barriers to entry for new small entrants.

Assessment Box 9. Licensing Obligations

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		Operators have in all cases complied with license requirements. However, their active promotion and commercialization of services in these areas depends solely on the inherent attractiveness of the area.
How well targeted it is to the intended population		It is well targeted but static in time. New "pockets" of targeted areas cannot be included as they appear in time.
Extent of private sector involvement		This mechanism relies entirely on the private sector. Private sector companies calculate the cost of the obligations and apply it to their bid.
How transparent it is in the allocation of public resources		Public resources are "allocated" in the form of reduced bids in tenders that include licensing obligations. However, this amount is hardly ever disclosed and rarely explained in terms of its calculation.

10. End-User Subsidies

Under this mechanism, government transfers are given directly to end users, subscribers, and/or consumers. The government must first decide what segment of users (rural areas, low-income users, old citizens, handicapped citizens, and so forth) will be targeted. Then, policy makers must decide how the funds will be used by the recipients. For example, recipients may only be allowed to use funds to help pay for all or part of their hook-up costs, monthly phone bills, all calls, local calls, and/or long distance calls. Finally, policy makers need to decide on how will funds be effectively allocated to the target recipients. For example, funds may be allocated indirectly through carriers (through vouchers, rebates, or calling cards) or directly to recipients through government vouchers, tax credits, government checks distributed by a social agency, and/or government-sponsored calling cards.

This mechanism can be relatively simple and transparent at the design stage. However, implementation might be ineffective and challenging, as users may change their "status" in time, move to other locations, and/or transfer their benefits to other parties in a secondary market. There is therefore a high chance of distorting the market through this mechanism. Since it deals usually with continuous transfers to individuals, it deals most with the unsustainable portion of the access gap (users that are not capable of paying telecommunications services at cost-aligned tariffs). Hence, end-user subsidies are more common among universal service programs in developed countries.

Assessment Box 10. End-User Subsidies

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		Direct transfers can be used to complement the low income of beneficiaries. However, it becomes a continuous transfer and can eventually be traded in a secondary market if monitoring is inappropriate.
How well targeted it is to the intended population		In this context, initial targeting becomes easily outdated due to the dynamic nature of the intended beneficiaries (usually related to geographic areas and income rather than to intrinsic characteristics of individuals).
Extent of private sector involvement		It relies on private sector to the extent that the transfers are intended to allow existing operators provide services to low-income areas. However, actual subsidies are calculated by the government.
How transparent it is in the allocation of public resources		It is very hard to keep track of the overall transparency of this mechanism as it usually involves a large volume of transfers to individuals.

11. Designated Universal Service Operator

This mechanism has been used by many European countries where, despite having introduced competition, there is still one large company that would in fact be the most likely to serve rural and low-income segments (in many cases, an incumbent with pre-privatization geographic coverage). Administrative procedures for allocating universal access/service projects have been developed in countries like the United States, Canada, Australia, and France, where the incumbents are clearly better placed to fulfill universal access obligations.

In these cases, instead of competitive procedures, allocation is based on calculations of the *net avoidable* costs that the company incurs, that is, revenues that stem from these services and only those costs items that are incurred exclusively due to the specific obligation are to be considered in the calculation. Calculation of costs under this approach is a difficult task. Other considerations such as intangible benefits could also be considered in the calculation. In the case of the United Kingdom, Ofcom has established that British Telecom universal service obligations are not to be compensated because, overall, the company does not incur in a loss by serving these consumers. Australia, after a review in 2004, determined that funding would be based on estimates rather than on detailed modeling due to the high costs involved in the latter.

As with access deficit charges, this mechanism deals mainly with existing network and does not necessarily create incentives to expand existing coverage. Additionally, calculations for cost estimations are cumbersome and time consuming. If the funding mechanism for USO is a percentage of industry revenues, during the first years of implementation it will be the incumbent who contributes the most for its own obligations. However, as competition and liberalization allow entrants to increase their market share, they will be financing a higher portion of the program, and more precise cost calculations become necessary to avoid cross-subsidies.

12. Access Deficit Charges

Access deficit charges (ADC) are set to "compensate" a telephone company (usually the incumbent) for providing certain services below cost. This, unlike other mechanisms that involve transfers to companies, is a self-financed mechanism: ADC is actually a form of cross-subsidy from profit-making services (traditionally, long-distance calls) to loss-making services (traditionally, local services).

ADC has been slowly disappearing as privatization and liberalization have expanded worldwide. Remaining schemes are either part of transition programs towards cost-aligned tariffs (tariff rebalancing programs) or a variation that compensates operators for service delivered to high-cost areas, given that competition usually focuses on low-cost areas. This last argument has been successfully held by incumbents, resulting in ADC added to interconnection charges for call origination or termination on the incumbent's network, in recognition of the benefits that competitors receive from the network in areas they don't cover. The actual surcharge in these cases stems from the difference between the fully allocated costs of providing access lines to these areas and the revenues attributed to providing the access lines.

Access deficit charges are not as transparent as other mechanisms presented in this chapter. Even though it is a self-financed mechanism, it introduces distortions in the market if applied directly to all interconnection charges (only entrants would be paying for this). Additionally, ADC does not create incentives to expand an existing network (that is, reach new users) in incumbents or entrants, but relates to loss-making existing users.

Assessment Box 11. Access Deficit Charges

Criteria	Comments	
Overall effectiveness to deal with the gap it intends to close		When applied on incumbents with low coverage, this mechanism does not create incentives to expand the network but rather to deal with high-cost clients in an existing network.
How well targeted it is to the intended population		Only covers that portion of the target population currently covered. This mechanism by itself does not create enough incentives to expand the network to areas that are not currently covered.
Extent of private sector involvement		This mechanism usually relies on private sector delivery, but calculations and eligibility are determined by the government.
How transparent it is in the allocation of public resources		The allocation process is transparent. However, the calculation itself is complicated, challenging, and expensive.

Assessment of Financial Support Mechanisms

1. Internal Cross-Subsidies

This has been the most common mechanism in monopolistic environments with state-owned enterprises. Internal cross-subsidies between services and users allowed for service delivery to low-income areas and lower prices for some services. For example, in many countries high prices for international calls (incoming and outgoing) would create cross-subsidies for local calls, which were usually quite cheap and in some cases even priced below cost.

However, with competition and liberalization these cross-subsidies just created distortions in the market that jeopardized the incumbent's survival: entrants would compete aggressively on those services that had high mark-ups (the ones generating the subsidies) and leave the incumbent provide the ones with little mark-up or even being delivered at a loss (those receiving the subsidies). Eventually, incumbents would lose their share of the high-priced services or be forced to reduce their price.

The effects of lack of competition on the efficiency of the sector far outweighed the benefits from the network expansion that could be carried out using this mechanism, so cross-subsidies were usually eliminated before the liberalization process started in many countries.

2. General Government Revenues

Universal access projects in Chile are funded directly by the treasury, with no specific levy on telecommunications companies for universal access. In general, government direct allocations can occur on a continuing basis or for a limited period of time. On one side, this is a very transparent, explicit, and effective mechanism that minimizes economic distortions since no single economic sector or industry is singled out for funding. On the other side, it must generate and maintain the political support to allocate government revenues to the USF. As a result, it may be an unreliable funding mechanism for programs that require continuous support.

A variation of this approach involves the universal access program being funded with proceeds from privatizations, licensing, and/or spectrum auctions. If the amount of revenues raised on these processes is large enough, funds can be placed in a trust fund. The major problem in this case is to overcome the inclination of policy makers to allocate funds back to government treasury and the impact that the uncertainty on the exact amount of the fund has on the scope of the universal access program. Additionally, experience has shown that as new services appear and as they become essential in the competitiveness of companies, universal access programs require additional funding.

This is the only mechanism that does not introduce major distortions in the economy as it would be financed from the general pool of government income. However, many governments have a very important constraint in terms of alternative uses of public resources, and meeting the requirements of a universal access strategy might not be fully prioritized and/or become subject to political pressure. Some countries where the universal service strategy has been depending on general government revenues have seen their strategies stalled or inactive for many years as leadership in the government prioritized other sectors.

3. Contribution to a Universal Service Fund through Interconnection Surcharges/ Surcharges on International Calls

Some countries raised universal service funds through a series of hidden cross-subsidies embedded in interconnection or access charges that long distance or other carriers paid to local companies. However, these mechanisms create economic distortions in the market, placing the burden of USF funding on a narrow group of telecommunications companies and/or services, altering relative prices and potentially benefiting incumbent carriers and undermining rebalancing efforts to align tariffs with costs. In the case of surcharges on international calls, VoIP gives an opportunity to

some operators to avoid the surcharge. For example, the Jamaican Universal Service Fund has been registering a reduction in collections over the past years, arguably due to unreported VoIP-based international traffic.[10]

It must be said that asymmetric interconnection, as explained in this report, is not an interconnection surcharge as it only reflects the cost structures of providing services in different types of locations.

4. Contributions from Telecommunications Companies to a Universal Service Fund

Most USFs collect a small percentage of industry revenues, which can be as low as 0.5 percent of gross revenues (net of interconnection charges) and as high as 5 percent. The idea is to have the industry itself financing projects to extend the reach of the telecom networks in the country. Operators acknowledge the social impact of extending telecommunications networks to rural and low-income areas, and are willing to contribute a small portion of their revenues to USFs as long as (i) they are managed in an independent, transparent, and accountable manner; and (ii) the USF is to be used solely for telecommunications universal service projects..

Latin American USFs have been among the first in the world, and the study carried out by Stern and Townsend (2006) provides several recommendations for policy makers in other regions, including the redefinition of universal access programs to adapt to technological and market changes; improvement in the use of funds, as only 11 percent of collected resources had been effectively committed; and the implementation of reforms in the regulatory arena to effectively close the market gap.

Overall, this mechanism has been the most used around the world. Companies tend to endorse this mechanism as long as its management is independent, accountable, and specific only for telecommunications projects (including complementing activities that will increase the chances of success of said projects, such as training and applications development). USFs do introduce some distortions in the overall economy as they represent an additional charge on sector revenues, but by applying them horizontally to the whole sector they end up both representing a small alteration of relative prices and keeping relative prices constant within the sector. This, for instance, is the main disadvantage of interconnection surcharges or surcharges on international calls: by concentrating collection on one specific service, it becomes more expensive than other services and ends up affecting negatively the behavior of both consumers and investors.

The sustainability of this mechanism might in some cases be jeopardized, especially if funds are not used fast enough and they build up in the fund: other sectors or even the central government might then be tempted to use the fund for other activities. However, some flexibility could be introduced in the mechanism. Many countries have legislation that sets a cap or a range for universal service contributions, and the specific percentage is to be calculated based on specific projects in the pipeline during the budgeting cycle.

5. Virtual Universal Service Fund

In general, collection of funds has not been a problem in those countries that have implemented universal access mechanisms. However, many of them end up with idle resources for a long period of time, either due to lack of projects to finance or an overestimation of the required funds. What could be done with those resources collected specifically for telecommunications network expansion that are not being

used? An alternative that has still not been tried in any country is the *virtual universal service fund*, by which funds would actually be held by the operators in a special account in their balance sheet. Financed projects would then receive funds from operators (or a trust could be set up for each specific project) with little or no time lag between funds collection and disbursement. This would allow for caps on USF contributions to be implemented on the basis of awarded projects and would also avoid the potential need for reimbursing companies for idle resources.

This mechanism helps solve the risk of building up unused resources. By keeping fund monies within operators' balance sheets, the political costs of reducing, suspending, or even returning part of the collected resources[11] are much lower than when actual transfers to an existing fund take place.

However, this mechanism creates some uncertainty regarding the actual disbursement process, as some companies might set barriers for disbursement or delay transfers, which in turn could jeopardize the viability of a project. Because projects are awarded on a tender basis, a delay in the transfer of resources could lead to an unsuccessful project for the winning bidder (this, on top of the so-called "winners curse" where operators underestimate the requested subsidy to win the tender). If this solution is to be considered, strong and credible penalties must be placed in case of delays in the transfer of resources to winning parties.

6. Pay or Play

As explained in this report, the role of government in addressing the access gap is to create incentives for companies to serve areas that they would not be willing to serve. On the other side, it is private companies who have a better understanding and react effectively to changing conditions in the market.

Taking this into account, policy makers could consider giving operators the option to either serve unprofitable locations (*play*) or provide resources to create traditional tenders for others to serve such locations (*pay*), as they usually do in most USFs. Besides creating the incentives in companies to serve some unprofitable locations (probably those closer to the market efficiency gap), this approach has an additional benefit in terms of reducing the time during which resources with high opportunity costs are kept by the government.

This mechanism allows operators to undertake specific projects without the need for long processes. However, some uncertainty in terms of the valuation of the "exemption" on their contribution would be introduced, as companies might be tempted to overinvest in these deployments to avoid contributing to the fund. Cumbersome project audits might offset the main advantage of this mechanism, delaying project rollouts. In essence, just as with the "bottom-up" approach, there will be a trade-off between this effect and the fast deployment of networks that policy makers will have to ponder.

Recommended Policy Instruments and Financial Support Mechanisms

Table 5.4 shows the authors' perceptions about the twelve policy options and the six funding mechanisms described earlier. While this high level assessment done in abstract can be considered subjective, these same criteria can be applied effectively to a particular country situation to screen for the most effective policies for that particular situation.

Table 5.4. Assessment of Mechanisms

Policy Option/ Mechanism	Effectiveness to deal with the gap	How well targeted it is	Private sector involvement	Transparent in allocation of resources	Introduces major distortions	Certain and sustainable
Mechanisms to increase access to telecommunications						
Aimed at reducing the market efficiency gap						
Asymmetric Interconnection	◑	●	●			
Facilities sharing	●	◑	●			
Flexible use of spectrum in rural areas	◑	●	●			
Rural local operator licenses	●	●	●			
Tax policy (taxes and/or import duties)	○	○	○			
Aimed at reducing the access gap						
Reverse auctions/OBA	◑	●	●	●		
Introduce bottom-up projects	●	●	●	◑		
Institutional demand stimulation	◑	○	●	●		
License obligation to rollout nationwide	◑	◑	●	○		
End-user subsidies	◑	○	◑	○		
Designated universal service operator	○	◑	◑	◑		
Access deficit charges	○	◑	◑	◑		
Funding Mechanisms						
Internal cross-subsidies					○	○
General government revenues					●	◑
Interconnection/ILD surcharges for a USF					○	○
Contributions from companies to a USF					◑	●
Virtual universal service fund					◑	●
Pay or play					●	◑

From the high-level analysis of the identified policy instruments, as screened against the proposed evaluation criteria, it appears that several instruments could warrant further consideration for use by governments in addressing the evolving universal access challenges. Including reverse auctions and asymmetric interconnection,[12] there are seven mechanisms that are worth further discussion:

- asymmetric interconnection
- facilities sharing
- flexible use of spectrum in rural areas
- rural local operator licenses
- reverse auctions
- introducing bottom-up projects
- institutional demand

With respect to funding alternatives, there are four mechanisms that policy makers could consider. These mechanisms minimize the distortions introduced in the economy and at the same time try to provide a certain and sustainable source of funds for national universal access strategies:

- general government revenues
- contributions from companies to a universal service fund
- virtual universal service fund
- pay or play

Notes

[1] For a more detailed description of this mechanism see Dymond (2004).
[2] Taken from "ICT Regulation Toolkit—Module 4: Universal Access—Inception Report," Intelecon, 2007.
[3] Morgan Stanley Research (2007).
[4] Following this approach, spectrum charges in rural areas should be much lower than those in urban areas.
[5] Source: Spectrum Strategy Consultants (2007).
[6] More information about OBA experiences in telecommunications and other sectors can be found at the Global Partnership for OBA (GPOBA) website: www.gpoba.org.
[7] This increases to 40 percent if countries with no disbursements at all are excluded. In most cases, the lack of disbursements in these countries is due to political reasons.
[8] This kind of tenders are also usually referred as a "Swiss challenge" or "unsolicited tender."
[9] Australia, the United States, and France follow similar schemes.
[10] Source: Caribbean Telecommunications Union at http://www.ctu.int/ctu/Default.aspx?tabid=117.
[11] It is possible that returning collected funds could create perverse incentives in some operators—mainly in incumbent operators—to stop or delay projects.
[12] Reverse auctions and asymmetric interconnection have been widely covered, and this section provides only a short description of each. For an in-depth analysis of these mechanisms, see Intelecon (2007) and Dymond (2004), respectively.

CHAPTER 6

Implementation Arrangements

Mechanisms aimed at closing the market gap mostly entail the implementation of specific regulations. Therefore, an effective regulatory and institutional framework is the essential requirement for these mechanisms to be introduced effectively. As explained in the ICT Regulation Toolkit,[1] there are three dimensions that constitute an effective regulator:

(i) **Structural independence.** In this sense, independence means "*guaranteeing that the regulator maintains an arms-length relationship with private industry and the other branches of the government.*"[2] Regardless of the actual institutional arrangements, structural independence reduces the possibility of political or industry capture.

(ii) **Financial independence.** Relying on a funding mechanism that is free from influences from the industry or other parts of the government is essential for effectiveness. Usual funding sources are a combination of government budget, regulatory fees, spectrum fees, licenses, and penalties, among others.

(iii) **Functionality.** For a regulator to function effectively, many elements have to be considered such as internal processes, staffing policies, decision-making processes, transparency, and accountability, among others. Having an effective functionality in the regulatory agency is probably the indispensible condition for a well-functioning telecommunications market.

In the case of policy instruments and funding options aimed at closing the access gap, additional specific arrangements need to be successfully implemented. Some of the most important characteristics are described below.

Reverse Auctions

Reverse auctions basically are designed to efficiently allocate subsidies to operators willing to carry out a specific predefined project through tenders that are awarded to the operator that requests the lowest subsidy. Operators will decide whether to participate in these tenders taking into account the following:

- Project definition. Information on the design of the project must be available to all interested parties. Operators need to understand the need for the project and a clear definition of what is expected from them in terms of service delivery and locations.

- Certainty of subsidies. Subsidies have to be available or at least certain. A clear definition of the source for the subsidies is required, and if they are not available yet a guarantee from the government might be required.
- Clear rules of operation. Operators will hesitate if the process does not seem to be transparent and open. This involves not only the actual tender event but also tender design, technology neutral technical specifications, overall transparency throughout the process with open communications between bidders and government, predefined clear triggers for payment of subsidy, overall legal and regulatory framework, design of the contract, among others.
- Sustainability. Demand uptake in the medium term should be sufficient to offset operating expenses after subsidy transfers end.

Bottom-up Projects

As mentioned before, by introducing bottom-up projects service delivery potentially speeds up and reaches the target population faster with tailor-made solutions, but in exchange project design is affected, as well as the process of subsidy allocation.

In order to maximize the outcome of this mechanism, it is important that policy makers consider the following elements while designing it:

- Clear procedures. It is important that operators and stakeholders in general are given straight-forward rules of operation. In the case of Peru, the rules of operation of the fund describe the procedure for bottom-up projects. Another example would be a simple first-come first-served allocation subject to an overall amount set aside for small projects, for proposals below a predefined threshold.
- Promotion activities. Many of the initiatives to be presented under this mechanism will come from partnerships between operators and the benefited communities. In order to increase awareness of both parties, promotion activities should be carried out.
- Enabling regulation. The possibility of stand-alone bottom-up projects is one of many possibilities that new technologies allow. However, for them to be effectively implemented, enabling regulation must be also enacted. For instance, VoIP regulation and local licenses might be required for a local wireless operator to begin offering services in his town/village.

Institutional Demand Stimulation

By aggregating demand from government institutions, a two-fold objective might be realized, since operators might increase their willingness to deliver service in some underserved areas and government expenditure might be reduced. However, for these benefits to materialize, some important aspects need to be considered:

- Coordination and commitment from various sectors. Coordination between sectors has to be achieved at the highest levels so that rural dependencies can benefit from these approaches. It would be ideal if the health center, police

station, and municipality, which are usually located close to each other in a rural municipality, could benefit from the same wireless connection. However, for this to happen they would have to share the costs of the connection; and this decision is hardly ever made at the municipal level.

- Implementation of relevant applications and content. The value of access to broadband increases exponentially with relevant applications. Financial management applications and Internet-based public health systems, among others, are examples of applications that could benefit government officials and the general public.
- Relevant training. Training programs must be put in place in order to take advantage of the benefits that broadband access would bring to rural public entities, especially in those cases were relevant applications are involved.

The institutional and implementation arrangements described above are very important for a successful execution of any of the policy options identified in this paper. Besides these specific arrangements, agencies in charge of carrying out the proposed mechanisms should have technical and financial expertise (or at least access to it) and be able to monitor the performance of operators that have received the funds.

Fund Administration

Regarding the funding mechanisms that have been highlighted in this document, the entity in charge of managing these resources has to be transparent, accountable, and independent in order to gain the support of all stakeholders. There are again several options that lead to these attributes: on one side, in Colombia the Minister of Communications is in charge of the design and implementation of universal access programs. Pakistan, however, set up an independent, state-owned corporation to manage the USF. This corporation has to abide to reporting requirements as any other company in the country and has a salary structure that replicates that of the private sector.

Besides being consequent to the overall universal access strategy, there are three overarching principles that need to be present regardless the actual institutional arrangement: transparency, accountability, and independence. In general, there are four options for fund administration that could be considered:

- *Ministry*. Having the fund related to the ministry will provide a closer interaction and understanding of the overall universal access policy. However, it also exposes the fund to political interferences and could potentially affect the independence of the fund. A variant of this approach is to set the fund as an independent trust and appoint a technical secretariat within the ministry. This approach guarantees to some extent the transparency and accountability of fund management. Additional internal guidelines could also reduce the risk of non-independence.
- *Regulator*. Regulators, by design, have the attributes of independence, accountability, and transparency that fund administration requires. However, they are usually at arm's length of the ministry and this affects the

performance of the fund with respect to the universal access policies that are being designed in the ministry. Moreover, in many cases, especially when dealing with ambitious cross-sector telecommunications projects, the ministry is more suited for the design of universal access projects.

- *Other government agency*. In some countries, there is a specific agency in charge of managing development or rural funds in general. This entity usually has the experience in terms of funds management, but lacks the technical knowledge regarding project and tender design. Depending on the independence of this institution, this could translate in the fund being captured by hidden agendas or simply a unnecessary delay in project preparation.
- *Independent corporation*. As an extreme option, a private company (or a government owned corporation for that matter) could take care of fund management and even tender preparation. By having to comply with existing corporation laws, this scheme usually complies with the principles of accountability and transparency. Independence, as with other cases, would depend on the governance structure within this institutional arrangement.

The advantages and disadvantages of each of these options have to be pondered by decision makers and will depend on the specific context of each country.

Notes

[1] Intelecon (2007).
[2] Intelecon (2007).

CHAPTER 7

Conclusion

In many cases, additional access to telecommunications services in rural and low-income areas might be achieved by introducing well-functioning markets. However, it is most probable that even after introducing the right regulation and institutional arrangements a segment of the population will still be left unattended. For them, universal access strategies should also be designed.

This paper has provided an analysis of twelve different policy options and six funding mechanisms for universal access strategies. Policy makers will have to analyze the different options presented against the criteria set out in the paper to identify mechanisms that are better adapted to their particular country situation.

Overall, there are seven different policy options that are worth considering by policy makers:

- asymmetric interconnection
- facilities sharing
- flexible use of spectrum in rural areas
- rural local operator licenses
- reverse auctions
- introducing bottom-up projects
- institutional demand

Regarding funding mechanisms, four could be considered for further analysis by governments:

- general government revenues
- contributions from companies to a universal service fund
- virtual universal service fund
- pay or play

For each of these mechanisms, specific implementation arrangements that increase their chance of success have been discussed. These include among others, having an effective regulator and sustainable institutions, clear procedures, and relevant training and contents. That being said, implementation depends on the specific country context and specific policy objectives. Furthermore, a number of these policy options and funding mechanisms can be combined and tailored to constitute an effective universal access program.

The mechanisms analyzed above are not mutually exclusive. On the contrary, in some cases they complement each other and should be applied together. For instance, implementing flexible use of spectrum in rural areas without a licensing policy that allows small rural operators would be probably ineffective. Regarding financing sources, Papua New Guinea's newly created Rural Connectivity Fund will accept resources from general budget, loans, and grants, as well as a levy on operators' revenues.

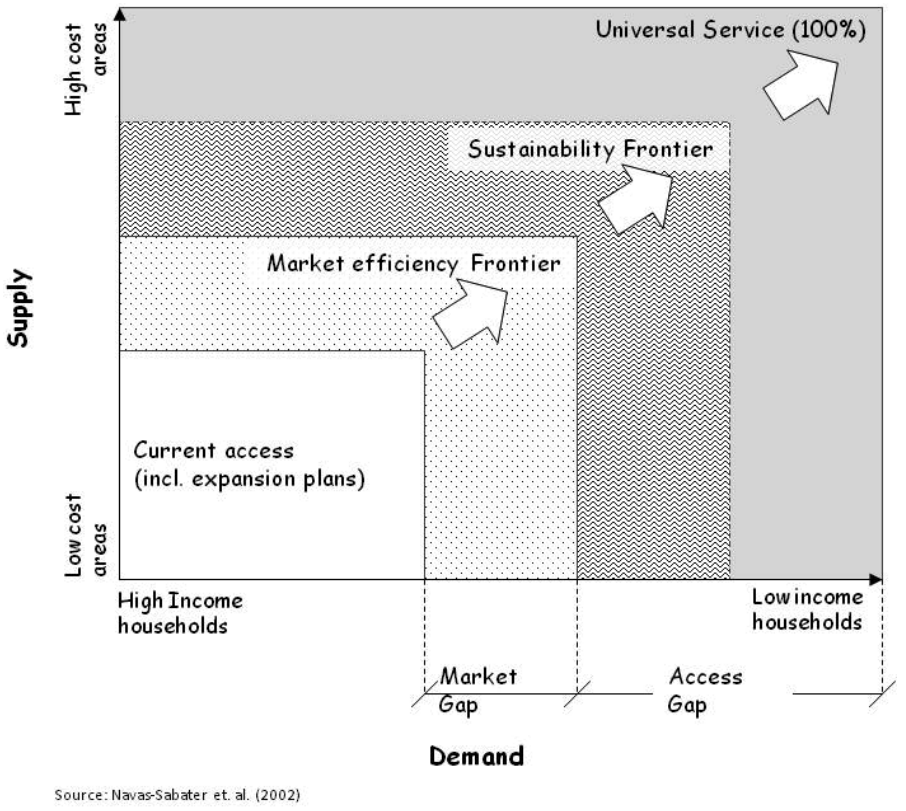
Policy makers in developing countries should therefore consider the inclusion of a combination of these mechanisms in their universal service strategies, as they are likely to improve the performance of existing programs or facilitate the design of new programs aimed at increasing access to telecommunications services, including broadband Internet access, as a pillar of economic growth and diversification.

APPENDIX

The "Gaps" Model

Given the wide array of mechanisms available for decision makers to increase access to telecommunications services, a general analytical framework could be useful. The basic framework used in this chapter builds on the gaps analysis model, first proposed by Navas-Sabater et al. in 2002. Basically, this model divides underserved areas into two different segments or "gaps": the *market efficiency* gap and the *access* gap (see Figure A.1).

Figure A.1. Market Gap and Access Gap Model



Source: Navas-Sabater et. al. (2002)

The *market* gap refers to the difference between the level of penetration that can be reached under current plans and conditions and the level that the market could achieve by means of an ideal regulatory and legal environment. This gap could be eliminated with adequate changes in current regulations and should not require public transfers.

The *access* gap, on the other hand, represents that portion of the market that even under an ideal legal and regulatory environment would not be covered by operators due to its high cost and/or low income level. In order to increase coverage beyond the market efficiency frontier into the access gap, public subsidies are to be considered.

Within the access gap, there is a level of penetration that is worth noting: the *sustainability frontier*. This frontier divides those projects that are expected to recover their operational costs and remain profitable (that is, projects where public financing works as a "jump-start") from those that would require ongoing subsidies.

Note that all boundaries under this framework are not static, but rather depend on many factors such as technology, appearance of new services or applications, and overall economic environment, among others. This calls for a continuous review of universal access policies and mechanisms, adapting them to these "moving targets." For example, throughout Latin America, many locations included in universal access tenders for basic telephony during the late 1990s are now being reassessed due to the arrival of mobile networks to these locations. Many satellite-based services located in these areas are thus being relocated (in most cases, at the operator's request) to more isolated areas.

References

Buys, Piet, Susmita Dasgupta, Tim Thomas, and David Wheeler. 2008. "Determinants of a Digital Divide in Sub-Saharan Africa: A Spatial Econometric Analysis of Cell Phone Coverage." Policy Research Working Paper 4516. World Bank, Washington, DC.

Dymond, Andrew, 2004. "Telecommunications Challenges in Developing Countries: Asymmetric Interconnection Charges for Rural Areas." World Bank Working Paper Nº27. World Bank, Washington, DC.

GPOBA. 2005. "Output-Based Aid: Supporting Infrastructure Delivery through Explicit and Performance-Based Subsidies." *OBApproaches*. GPOBA.

infoDev. 2007. "Financing Technology Entrepreneurs & SMEs in Developing Countries: Challenges and Opportunities." World Bank, Washington, DC.

Intel. 2007a. "Cost Effective Rural Broadband: A Vietnam Case Study."

———. 2007b. "Satellite and WiMAX bring high-speed wireless broadband to remote northern Vietnam." Press release. Available at: http://www.intel.com/pressroom/archive/reference/Wimax_in_Ta_Van.pdf.

Intelecon. 2007. "ICT Regulation Toolkit Module 4: Universal Access: Inception Report." http://www.ictregulationtoolkit.org.

Jensen, Robert. 2007 "The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector." *Quarterly Journal of Economics* 122(3): 879–924.

Morgan Stanley Research. 2007. "India Telecommunications: Towering Ahead, Despite Spectrum Constraints."

Navas-Sabater, Juan, Andrew Dymond, and Niina Juntunen. 2002. "Telecommunications and Information Services for the Poor." World Bank, Washington, DC.

Qiang, Christine. 2008. "Telecommunications and Economic Development." Forthcoming, World Bank, Washington, DC.

Singh, Rajendra, and Siddhartha Raja. 2008. "Nothing Endures but Change: Thinking Strategically about ICT Convergence." World Bank, Washington, DC. Available at: http://www.worldbank.org/gict/publications.

Spectrum Strategy Consultants. 2007. "Analysis of Taxation of Telecom Services in Afghanistan." Mimeo.

Spintrack A.B. 2006. "Open Access Models: Options for Improving Backbone Access in Developing Countries (with a focus on Sub-Saharan Africa)." infoDev, World Bank, Washington, DC.

Stern, Peter A., and David N. Townsend. 2006. "New Models for Universal Access to Telecommunications Services in Latin America." Forum of Latin American Telecommunications Regulators (REGULATEL).

Wellenius, Björn. 2006. "Extending Communication and Information Services: Principles and Practical Solutions." In *Information and Communications for Development 2006: Global Trends and Policies.* World Bank, Washington, DC.

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