NEW MODELS FOR UNIVERSAL ACCESS TO TELECOMMUNICATIONS SERVICES IN LATIN AMERICA:

LESSONS FROM THE PAST AND RECOMMENDATIONS FOR A NEW GENERATION OF UNIVERSAL ACCESS PROGRAMS FOR THE 21ST CENTURY

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Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Figures

Table of Contents

Table of Contents

Tables

Table of Contents

Boxes

Table of Contents

Definitions of Key Terms

For the purposes of this document, the following definitions of key terms will apply. Figure ES.1 incorporates a number of these terms, and illustrates how they fit together conceptually. Box ES.3 contains examples of how to quantify these terms.

Access Gap is the difference between the market efficiency frontier and a 100% penetration level. People that fall within the access gap live in areas where private operators cannot provide service on a commercially sustainable basis without some form of financial incentive from a USF subsidy. Well-designed universal access fund programs only target the access gap, not the market gap, because the unaided market is fully capable of closing the market gap.

Affordability Frontier is the boundary on the demand-side that indicates the maximum percentage of households that could afford to pay for market-based services in an efficient market.

Broadband refers to a high-capacity, two-way link between an end user and access network suppliers capable of supporting applications beyond simple voice and messaging. While there is no common definition of what constitutes broadband in a data communications network, any speed that is higher than that which can be obtained through source encoding and modulating a common voice channel (usually 64 Kbps, using, for example, pulse code modulation), can be considered broadband.

Market Efficiency Frontier is the penetration level achievable in a well-functioning and competitive market under a stable regulatory environment.

Market Efficiency Gap and or Market Gap is the difference between the current level of service penetration and the market efficiency frontier. Improvements to the legal, regulatory and institutional framework can reduce the market gap.

Penetration Level is the extent to which acess to a given service has been achieved.

Sustainability Frontier is the penetration level achievable in an efficient market with the aid of a one-time financial intervention to support start-up costs.

Universal Access to telecommunications implies the reasonable availability of network facilities and services, on either a private or a shared, public basis, to citizens and institutions within a given community. Absolute universal access is achieved when 100% of a designated population has access to a given service. Access, in this case, means that the given service is available through reasonably available and affordable public or community facilities, and those who are willing and able to pay full cost-based prices can obtain individual or household service on demand.

Universal Access Fund is a financial mechanism established to create an extra level of economic incentives for private investment in network expansion and service delivery, while maintaining market conditions. It is defined through a legislative instrument (law, regulation, decree, etc.), which describes its objectives, operation, administration, internal organization, and method of collecting and disbursing funds.

Universal Access/Service Obligations are obligations imposed on operators usually at the time of privatization to provide certain services to anyone that requests them in their concession area. The operator accepts these as conditions of its licence and receives no compensation for meeting them. In certain other cases the operator may receive a subsidy from a universal access/service fund to cover the excess cost of the universal access/service obligation. This is the model in Canada, USA, Australia and Europe but not in Latin America.

Universal Geographic Coverage: Absolute universal geographic coverage is achieved when a given telecommunications service is *available* to 100% of the population living in population centers above a certain size.

Universal Service in telecommunications intends a more absolute condition, in which telecommunications services are delivered ubiquitously to households or individuals throughout an area, and thus are both accessible and affordable, with no practical impediments to subscription and usage. Absolute universal service is achieved when a given telecommunications service is affordable to 100% of a designated population on an individual, household or institutional basis.

EXECUTIVE SUMMARY

Contents

A. Study Background and Overview

This executive summary provides key findings and recommendations of a study on telecommunications universal access and universal service policies and programs in Latin America. This study was jointly financed by the following organizations: (i) Regulatel; (ii) two World Bank-administered trust funds, the Public-Private Infrastructure Advisory Facility (PPIAF) and the Global Program on Output Based Aid (GPOBA), (iii) the European Commission through the @LIS program; and (iv) the United Nations Economic Commission for Latin America and the Caribbean (ECLAC).

The objectives of the study were as follows: (i) to review and assess current and planned universal access programs in the 19 countries where regulators are members of Regulatel (herein called "Regulatel countries");[1] (ii) to estimate the market efficiency and universal access gaps[2] (Figure ES.R), and the public sector investment/subsidy needed in order to reduce the universal access gap; (iii) to identify new models for universal access programs and provide concrete policy recommendations for a new generation of universal access programs; and (iv) to assist policy-makers and regulators worldwide to develop a new generation of universal access programs and policies based on the experience of Latin America, because Latin America pioneered many of the first generation of universal access programs that are currently being implemented in developing regions.

The key recommendations highlighted in this executive summary are as follows:

- there is a need for a redefinition of the concepts and goals of universal access and universal service programs;

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1 The 19 members of Regulatel are: CNC of Argentina, SITTEL of Bolivia, ANATEL of Brazil, SUBTEL of Chile, CRT of Colombia, ARESEP of Costa Rica, MIC of Cuba, INDOTEL of Dominican Republic, CONATEL of Ecuador, SIGNET of El Salvador, SIT of Guatemala, CONTATEL of Honduras, COFETEL of Mexico, TELCOR of Nicaragua, ANSP of Panama, CONATEL of Paraguay, OSIPTEL of Peru, URSEC of Uruguay and CONATEL of Venezuela.

2 See Box 1 and Chart 1 for definitions and illustrations of the market efficiency gap and the access gap.

- universal service funds need to speed up, simplify and diversify how they use their funds;
- legal, regulatory and institutional reforms are needed.

The first generation of universal access programs were comparatively simple, and focused largely on voice telephony. The study recommends that the new generation of universal access programs be more complex, and focus on infrastructure and services that provide Internet-protocol (IP) access.

The executive summary is a stand-alone document aimed at senior policy-makers, regulators, and private and non-profit sector leaders. This document seeks to achieve the following: (i) provide the foundation for stimulating a dialogue among public, private and non-profit stakeholders regarding universal access and universal service programs; (ii) help policy-makers, regulators and universal access fund administrators to design a new generation of universal access programs; and (iii) encourage readers to read and use the full study, including the 19 country studies, the economic model, and the extensive number of associated documents, which can be downloaded from the Regulatel website (www. Regulatel.org).

B. Key Findings

1. Economic Development Impact

The economic development impact of improved coverage and access to telecommunications has been significant in all Regulatel countries. On a micro-economic level, numerous studies have demonstrated that there is a tremendous amount of direct and indirect cost savings accruing to the general rural population from using universal access fund financed payphones. For example, a 2006 study conservatively estimated that, in Peru, those savings equaled 2 to 3.5 times the cost of using the FITEL phones. The savings were even higher for poorer households.[3] On a macro-economic level, a growing number of studies have estimated that the economic development impact of a 10% annual growth in the number of cellular phones in Latin America contributes to a 0.3% to 0.5% annual increase in GDP.[4] Applying the most conservative, 0.3% estimate, yields a finding that the mobile growth between 2000 and 2005 increased on average the annual GDP in the 19 Regulatel countries by 4.78%. Furthermore, the telecommunications sector during the last decade has continued to grow even during periods of economic contraction.

During the last decade, all 19 Regulatel countries established some form of universal access program or initiative aimed at increasing access to telecommunications networks and services. Nearly all Regulatel countries have implemented a wide variety of initiatives that use one or a combination of the following four mechanisms that directly or indirectly aim to increase investments and access to telecommunications infrastructure in high-cost rural and low-income areas:

[3] Galdo, Virigilio and Torero, Maximo, "The impact of telephones in rural areas: the case of Peru," in Information and Communications Technologies for Development and povert reduction." Edited by Maximo Torero and Joachim von Braun, The International Food Policy Research Institute, 2006.

[4] See, for example, David Lewin and Susan Sweet, "The economic impact of mobile services in Latin America." GSM Association, December 2005, pp 47-49.

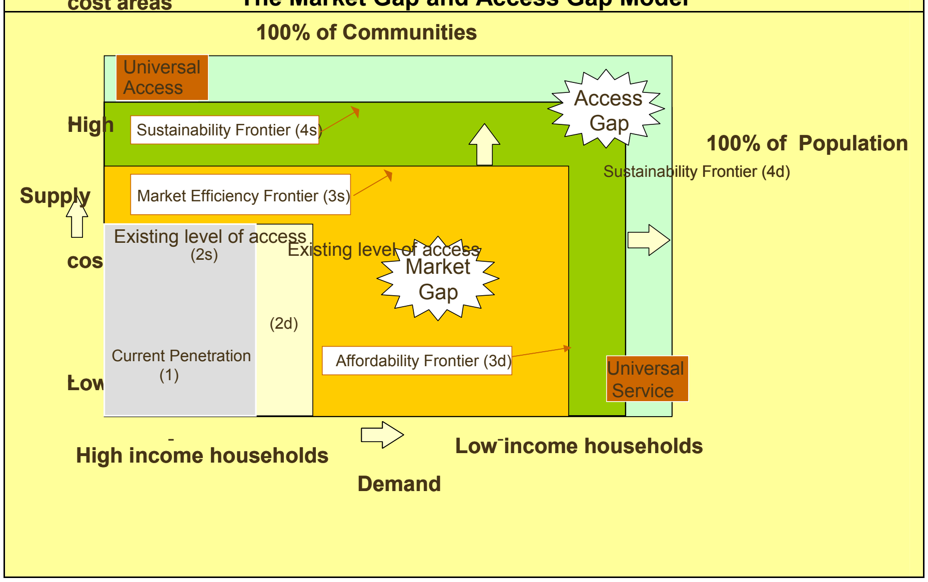
a. Market liberalization combined with regulatory initiatives. This includes universal access obligations and special regulations and conditions that favor projects and operations in high-cost or low-income areas. Almost all Regulatel countries have adopted aspects of this approach.

b. Universal access funds that provide partial subsidies for programs largely aimed at stimulating private sector provision of infrastructure in rural or unserved regions. Twelve Regulatel countries have universal access funds. Ten of them have actually disbursed a portion of the funds.

c. Other financing methods and project initiatives by national, state and local governments, cooperatives, NGOs, etc. (13 countries). An increasing number of private operators are also putting in place programs aimed at expanding coverage in high-cost rural areas and increasing demand among lower income consumers.

d. State-mandated and controlled approaches, using cross-subsidies and other financing mechanisms aimed at state-owned companies (three countries).

Figure ES.1:
The Market Gap and Access Gap Model



The following section highlights some of the key findings of the study regarding universal access programs and initiatives. Readers, especially universal access practitioners, are encouraged to review the full report, which contains extensive information on each of the findings.[5]

2. Privatization and Competition

Penetration, coverage and access to telecommunications in Regulatel countries dramatically improved due to privatization and competition, especially in the mobile sector. In some countries there does continue to exist significant portions of rural populations that lack voice telephone service. As a result of the above noted four mechanisms, the total number of telephones

[5] The full report contains in-depth assessment of universal access programs in Regulatel countries, and extensive discussions of highly innovative technological solutions to providing ICT infrastructure in rural areas.

in Regulatel countries between 1995 and 2004 increased nearly six times from 45 million to more than 265 million. Total teledensity levels increased from 10 telephones per 100 persons to 50 telephones per 100 persons[6]. The main driver of this growth was the expansion of mobile telephones. This service grew at a compound annual rate (CAGR) of 54%, compared to a CAGR for fixed lines of 10%. This study also found that the geographic coverage of mobile networks is rapidly expanding from urban and peri-urban into more high-cost rural areas. Mobile and cellular networks are also expanding more rapidly than expected into areas that previously were considered commercially unattractive. This is due to market competition, decreasing equipment costs, and higher than expected demand. Operators are finding ways to sustain commercially viable operations in areas with increasingly lower average revenue per user (ARPU). Cellular telephones are no longer considered luxury items, but rather they have become the preferred de-facto basic service for many low-income consumers, due to lower prices, calling party pays and pre-paid plans.

The study found a notable increase in access to the Internet, mainly in urban areas. The number of Internet users increased from less than one million in 1995, to almost 62 million in 2004. Internet penetration levels stand at 10 users per 100 inhabitants. Increased Internet penetration is due not only to expansion in the business sector and among upper-middle income consumers, but is also due to the explosive growth of telecenters. A 2005 ECLAC study of 12 Regulatel countries estimates that almost 100,000 private telecenters were established by mainly micro and small firms, and that an additional 50,000 telecenters were established with the aid of public financing.

The main driver of improved telecommunications penetration, coverage and access during the last decade has been private sector investments unleashed by privatization and liberalization initiatives. Between 1994 and 2005, the private sector invested more than $116 billion in the Latin American telecommunications sector. Most of the private sector investment took place during and right after privatization, when operators invested large amounts to meet large pent-up demand, and, in some cases, to meet build-out obligations. Investment levels have decreased after this initial wave of post-privatization investment.

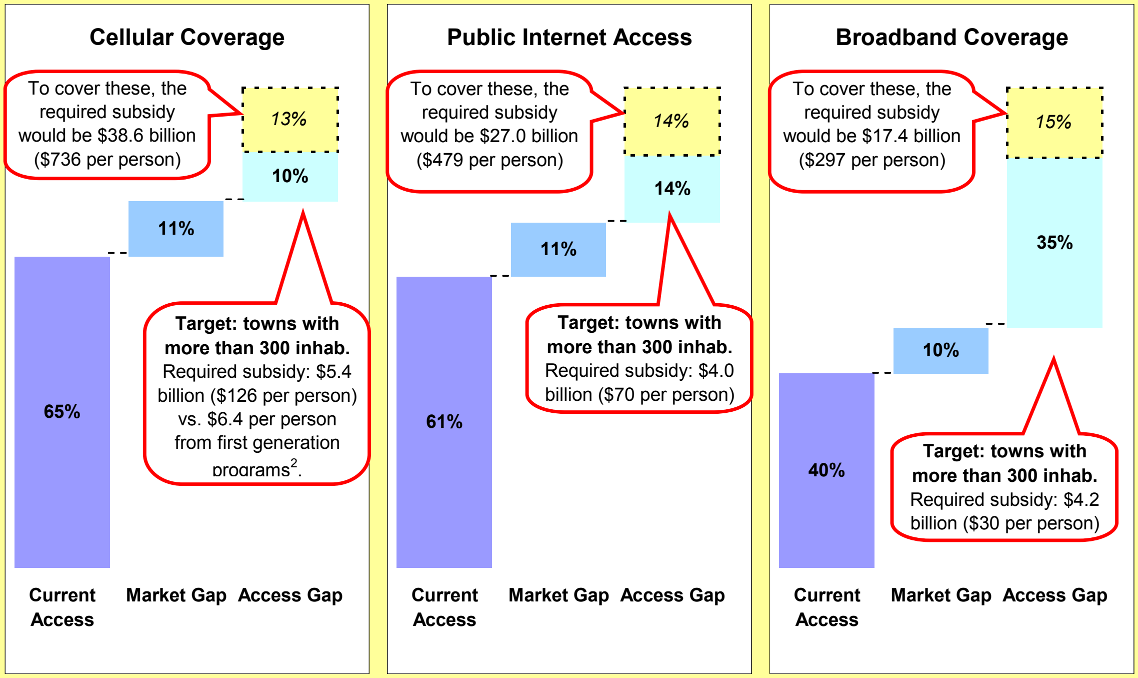
3. Gap Assessment

The market efficiency gap for telephone service and for community access to the Internet is smaller than expected, while the access gaps for broadband Internet remains very high. The analytical framework that provides the foundation for this study is illustrated in Figure ES.1. Highlights from the study findings on the market and access gaps in the 11 Regulatel countries that provided sufficient data, are illustrated in Figure ES.2[7].

[6] As of 2004, there were 96.2 million main lines, with penetration levels of 18.1 per 100 inhabitants in the 19 Regulatel countries. There were 169.6 million cellular phones, with penetration levels of 31.9 per 100 inhabitants.

[7] The 11 countries that provided enough data to be included in the model are Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Mexico, Nicaragua, Paraguay, Peru and Uruguay.

Chart 2:
Gap Analysis in Selected Countries[1]: Aggregate



[1] Countries that provided enough information to include in the model are: Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Mexico, Nicaragua, Paraguay, Peru and Uruguay. Detailed tables are contained in the gaps model spreadsheets of each country that can be obtained from the Regulatel website (soon to be released).
[2] Estimates regarding average amount of first generation subsidies estimated from data compiled by the World Bank trom projects in Chile, Colombia, Dominican Republic, Guatemala, Peru, Nepal, Nicaragua, Nigeria and Uganda.

The market efficiency gap for cellular telephone service is much lower than initially expected. The cost of providing public subsidies to address the remaining cellular market access gap will be significantly higher than the per unit costs of the first generation of universal access programs (i.e. the opportunity cost of universal access programs will be very high).[8]

This study found that the private sector could provide cellular signals on a commercial basis to cover on average more than 75% of the population in most Regulatel countries. However, it also found that a few countries, with extremely challenging geographic conditions and low incomes, have cellular or mobile coverage that is below 60%. Expansion of cellular networks into these isolated rural areas may not be feasible in the near-term without additional regulatory or financial incentives.[9] The study found that current access to the Internet is similar to that of cellular coverage. The current coverage of broadband networks is comparable to that of telephone service in the early 1990s, and there remains a very large access gap. It is important to highlight the fact that costs, and therefore, required subsidies, climb exponentially as universal access programs try to reach smaller and smaller towns. For instance, addressing the broadband access gap for towns with over 300 inhabitants would cost approximately $26 per person. If communities with less than 300 inhabitants are incluced, the cost jumps to $297 per person.

[8] The full study contains a detailed explanation of how the market efficiency and access gaps were measured and estimated, and detailed spreadsheets of the model that was applied to each country.

[9] This study used "cellular signal" coverage, rather than simple cellular telephone penetration levels to estimate the market efficiency gap and access gap. Using this indicator results in higher coverage estimates than those that rely exclusively on traditional penetration level data. This is because it includes data, not only on current subscribers, but also on non-subscribers who live in an area covered by cellular signals. The gap estimates in this study allow for a better assessment of the minimum investment and subsidy requirements from a supply-side perspective. Additional demand studies would be required in order to estimate the subsidy needs for universal service programs.

4. Universal Access Funds

Universal access programs that use universal access funds to increase community access to telephones and to leverage private investment, have been highly successful. As summarized in Box ES.1, programs targeting public payphones have been highly successful. This study found that universal access programs implemented in 12 out of 19 Regulatel countries (out of which 10 are functioning), have brought public telephones on a commercially-sustainable basis to at least 10.7 million people. Previously, many of those people had to travel tens if not hundreds of kilometers to reach a telephone. In Peru, the average distance that 6.4 million rural people needed to travel to reach a public payphone decreased from an average of 56 km to 5.7 km, in the space of three years, from 1999 to 2002. This shortened the average travel time from a day or more, to at most a few hours. Community telecenter programs have also had a significant impact, though this is more difficult to measure. Universal access funds provided financing to at least 19,190 telecenters, that benefit a population of at least 9.77 million.[10].

As summarized in Box ES.1, universal service funds that provide a partial subsidy on capital investment, have on average leveraged between one and four times the amount of private sector investment.[11] The use of public funds for universal access programs has had a significant multiplier effect. This demonstrates the effectiveness of well-designed public-private partnerships (PPP).

Box ES.1: Achievements and Shortcomings of Universal Access Programs

- 27,131 public payphones have been installed in more than 12,927 rural localities, benefiting approximately 10.7 million people.
- 19,190 community telecenters have been installed, benefiting approximately 9.7 million people.
- A remarkably high amount of the rural population has been provided with service on a commercially-sustainable basis.
- $290 million has been allocated for programs, which has leveraged on average one to four times additional private sector investment.
- Universal Access Funds in 12 countries have raised more than $2.6 billion, but they have spent only $297 million (i.e. 10% spent). Among Universal Access Funds that have spent some portion of the funds, the disbursement level increases to 40%. There are some individual countries that have spent 80% or more. It is important to note that some of the most effective Universal Access Fund programs are in countries with low disbursement ratios. Therefore, disbursement ratio should not be the main mechanism to evaluate Universal Access Fund effectiveness.

There is a growing number of telecommunications initiatives, some very innovative, that are being designed or implemented by private operators, and on a sub-national level by cooperatives, small operators, community organizations and NGOs. Only three countries, those that have not privatized and reformed their sectors, continue to rely on universal access obligations imposed on state-owned or partly state-owned operators, with varied results.

[10] It should be noted that based on anecdotal information, it appears that the number of private telecenters in rural areas that did not use public financing far outnumber the number of telecenters that did.

[11] Estimates regarding the multiplier effect of USF subsidies are taken from an internal World Bank study on USFs in Chile, Colombia, Dominican Republic, Guatemala, Peru, Nepal, Nicaragua, Nigeria and Uganda.

The most common mechanisms used to allocate universal access funds have been the minimum subsidy tender[12], and the payment of subsidies over a period of time. These are classified as forms of output-based aid (OBA).[13] The use of publicly competitive tenders has been highly successful, in terms of increasing transparency and leveraging additional private sector investments. Furthermore, due the competitive nature of tenders, the amounts of subsidies required have often been lower than initially estimated by universal service funds. In some cases, no subsidy whatsoever was required.

Some universal access funds are underutilized, and disburse funds inefficiently. Some of the most effective Universal Access Fund programs are in countries with slow disbursement ratios, due to reasons beyond the control of Universal Access Fund administrators. Therefore, disbursement ratios of Universal Access Funds (i.e. the amount of used, as a function of the amount raised) should not be the main mechanism used to evaluate Universal Access Fund effectiveness. Nonetheless, it is unfortunate that of the US2.61 billion that 13 Regulatel countries have managed to raise for universal access programs, only US$297 million, or 11.3%, have been disbursed or utilized (Box ES.1 and Table ES.1). If one excludes countries that have not disbursed any funds at all, the average disbursement ratio increases to 40%. Three countries have utilized or allocated 90% or more of their funds, four have utilized or allocated 40% or less, and six have not been utilized at all.

Non-disbursal of universal access funds is largely due to the following: (i) jurisdictional or legal disputes between universal access fund administrators and other ministries; (ii) diversion of Universal Access Funds for uses other than those for which they were designed; and (iii) restrictions imposed on Universal Access Funds to improve fiscal balances.

Inefficient disbursal of funds is largely due to the following: (i) defining eligible programs too narrowly – accepting only those proposals linked to public payphones and community Internet; [14] (ii) over-estimating the amount of subsidy that operators would request; (iii) requiring that programs be approved by two or more ministries, that they must comply with all public expenditure review and monitoring procedures, or that they must conclusively demonstrate that the subsidies are well-designed; and, (iv) imposing significant legal, administrative and financial burdens that act as a barrier on operators' participation in tenders, especially for smaller operators.

In some cases, well-designed universal access programs have been required to carry-out extensive supply and demand studies in the field, a design and public consultation process, and a tender process. This typically takes one to two years to complete, and creates further delays in the use of funds. In several countries, universal access funds have been diverted to finance government initiatives in other sectors.

Universal access programs are largely self-financing, and provide sufficient funding, given current goals. The two predominant mechanisms used to finance universal access

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[12] Minimum subsidy tenders are open and competitive tenders that are awarded to the company that requests the lowest amount of public subsidies.

[13] OBA programs link the payment of subsidies to meeting pre-defined performance criteria, such as installation of rural telephones in certain areas. They pay subsidies over a period of time, based on meeting pre-defined performance or continuous service milestones. OBA programs often use minimum subsidy tenders. However, OBA programs can also be awarded and allocated using other criteria.

[14] If Universal Access Funds adopt the definition recommended in this study, the demand for using those funds will likely increase. See recommendations section of this report.

programs are as follows: (i) taxes or assessments of 1% to 3% imposed on the revenues of telecommunications operators; and (ii) periodic allocations from general government revenues. In most Regulatel countries, these mechanisms provide more than sufficient financing for universal access programs as currently defined. The current challenge is to use effectively, and disburse in a timely manner, the funds that are being raised. Some developed countries impose significantly higher universal access assessments on their operators. But these funds are generally used in a timely manner, and finance a wide variety of universal service programs targeted at low-income persons, senior citizens, and disabled persons. They also finance many programs aimed at increasing access to the Internet in schools, libraries and public areas.

5. Universal Access Programs

The use of universal access funds for community telecenters has a mixed track record, because these projects require complementary programs to ensure effective use of the Internet. Many universal access programs have financed the establishment of general-purpose community Internet telecenters. Telecenter programs have been fairly successful in terms of providing community access to the Internet to many rural communities for the first time. However, many of these general-purpose telecenters require on-going subsidies in order to finance operations, and they have a mixed track record in terms of their effective adoption and use by the targeted communities. That is especially true of those that have been developed with limited consultation with local communities. The most successful community telecenter programs are linked from their inception to specific goals, such as e-education and e-government, and include a wide-range of capacity-building and support programs. The latter are often implemented in coordination with other government entities, local communities, businesses and NGOs.

Universal access programs are no substitute for sector reforms and periodic updating of the legal, regulatory and institutional framework. Universal access programs are most effective when they are part of a broader effort to reform the entire legal and regulatory framework of the telecommunications sector. This broad-based effort need to focus on attracting more investment, fostering competition, and putting in place transparent and accountable regulatory institutions. Many operators are indicating that for them the greatest challenge to providing services in rural areas is not commercial, but rather legal or regulatory barriers. This includes licenses and permits, spectrum management and fees, interconnection, rights-of-ways, taxes or other fees imposed by state or local governments, and lack of infrastructure sharing requirements. In some countries, regulatory barriers are hindering the use and deployment of new market and technological innovations, such as VoIP, WiFi, and WiMAX, that could lower the cost and improve ICT access in rural areas.

The success of the first generation of universal access programs was due largely to the fact that they were part of wide-ranging government reform initiatives aimed at reforming the role of the state in the economy, increasing private sector investment, and stimulating the development of the telecommunications sector. Their success was also due to the fact that the technological challenges and requirements were much simpler in those days. As the first wave of reforms have matured, and the range of ICT services has broadened to include the Internet, universal access programs have increased in complexity. As a consequence, the coordination between universal access programs and other government initiatives has generally grown weaker. This has often resulted in a duplication of government initiatives and programs that causes public financial resources to be used inefficiently. Increased coordination between government initiatives has often proven to be very challenging, even when such efforts are supported by Universal Access Fund administrators and regulators.

Lack of sufficient domestic backbones and last-mile broadband networks are bottlenecks for universal coverage and universal access goals. With few exceptions, the expansion of commercially-viable networks into more rural areas and into the interior of many countries, is limited by the lack of affordable backbone infrastructure and insufficient last-mile bandwidth. This is especially true of those designed to provide more bandwidth-intensive applications and integrated voice-data IP services. Universal access programs narrowly focused on increasing telephony or community access to the Internet have not as of yet created sufficient incentives for increased backbone or broadband infrastructure investments. These gaps in infrastructure are a major roadblock to the provision of last-mile broadband solutions using new wireless technologies. Nevertheless, there has been a single universal access program in Latin America that has explicitly set as a goal to expand backbone infrastructure. There is increasing pressure that last-mile infrastructure provide more than narrow-band/dial-up Internet access, as consumers and applications require more bandwidth in order to make effective use of the Internet. Recent technological and market innovations, especially in terrestrial and satellite technologies, have reduced the cost of backbone and last-mile broadband infrastructure, and dramatically expanded the range of viable solutions that use less bandwidth.[15] Technological and market innovation, and changing consumer needs, are increasing the demand for more bandwidth, while at the same time enabling more bandwidth to be provided using a variety of low-cost wireless solutions.

Universal access programs focus largely on stimulating supply, and are largely designed by government agencies to follow a top-down approach. To date, most universal access programs have focused on stimulating increased supply of telecommunications infrastructure in rural areas. These supply-side initiatives are largely aimed at channeling resources directly to operators and suppliers of telecommunications and ICT equipment, based on objectives that are set by government agencies. A few countries have recently allowed operators and local communities to propose universal access programs or pilots. But these bottom-up approaches pose special challenges for financing with public sector funds, without going through a public tender process or some other mechanism to assess the proper subsidy level. Recently, a few countries have begun to use some of their universal access funds to partly finance small pilots generated by local communities or operators. There are a number of innovative potential uses for universal access funds, that have not, as of yet, been used by any Regulatel countries. Some of these potential initiatives are as follows: (i) to provide low-cost loans for rural operators, which has been done in some developed countries; (ii) to create rural access venture capital funds; (iii) to assist operators in applying for or complying with the legal, financial and administrative burdens that are required to participate in tenders or universal access programs; and (iv) to support training and assistance for small rural operators and cooperatives to adopt innovative business, administrative, marketing and service delivery practices.

Many universal access programs suffer from a lack of clear goals and a lack of adequate metrics, in their design and in their monitoring of progress. The most successful first-generation publicly-financed programs are those that established clear, measurable and achievable goals. These goals mainly related to universal access, such as the average distance people need to travel in order to reach a community payphone or telecenter.

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15 Readers are encouraged to review the full report, which contains extensive descriptions and assessments of how a wide range of technological, financial, business and service delivery innovations are creating new and commercially-sustainable options for the provision of ICT infrastructure and services to rural areas.

The most widely available statistic used to measure universal access is penetration on a national or sub-national level. This provides a basic, but inadequate benchmark to measure the success or failure of these programs. Lack of adequate and timely metrics for a dynamic sector like telecommunications, makes it especially challenging for policy-makers to gain support for programs and measure progress. That is critical for all publicly-financed programs. Furthermore, existing statistics do not readily enable benchmarking of universal access goals and programs between countries, or between regions within countries.

Universal service is not yet a goal. To date, no Regulatel member country has implemented a program aimed at true universal service, in terms of ensuring that service is affordable to virtually all individuals or households in a given area. The focus on universal access rather than universal service was a rational decision regarding the use of limited resources during the first generation of universal access programs. Private operators have put in place certain initiatives – such as subsidized handset programs, pre-paid calling plans and calling party pays – that have acted as de-facto universal service programs, insofar as they made it easier for low-income people to purchase and use cellular telephones.[16] More recently, some countries that have reached their initial universal access program goals have begun to consider whether they should put in place some universal service programs or pilots.

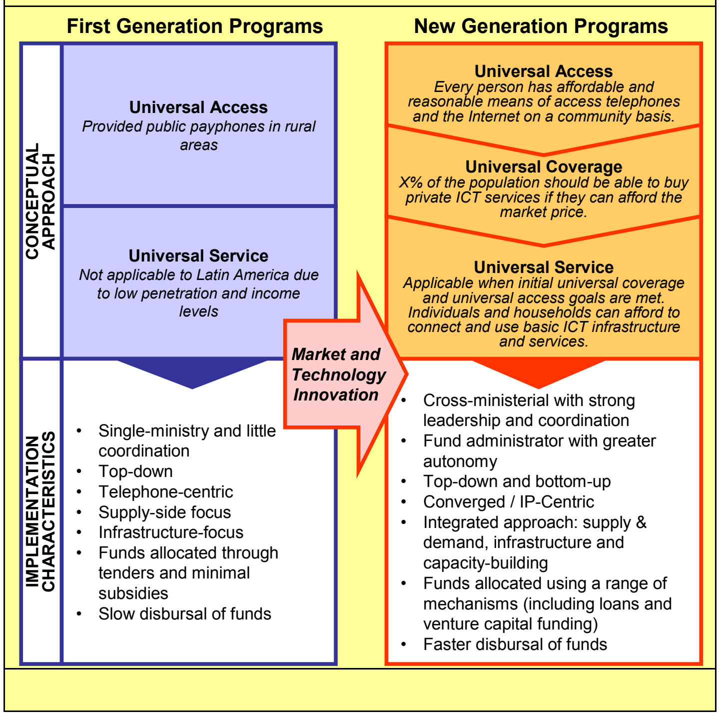
III. Recommendations

The full study provides a wide-range of recommendations aimed at policy-makers, regulators, universal access funds, the private and non-profit sector, Regulatel and financial institutions. The Recommendations Sections that appear throughout the study are gathered together in Annex 1, to provide easy access in one place. Though the recommendations are closely linked to each other, they can be categorized into three main groups. Those three groups are as follows:

1. **UPDATE AND REDEFINE UNIVERSAL ACCESS, AND ESTABLISH NEW GOALS.** Policy-makers and regulators should update and redefine universal access programs, and establish new and measurable goals consistent with the framework outlined in Figure ES.3 and Box ES.2.

[16] This study did not examine in detail or assess the nature and impact of these private sector programs, or assess their impact and affordability for low-income communities.

Figure ES.3
Evolution of Universal Access Programs



The new generation of programs needs to take the following into account: (i) the achievements and lessons from the first generation of universal access programs; (ii) the nature and size of the market efficiency and access gaps; (iii) market developments; (iv) technological innovation; and (v) the different income profiles and distributions, geography and politics in each country. There should be a greater focus on improving access to and productive use of the Internet. Few, if any, countries need or can afford to pursue all goals at the same time. Policy-makers should be provided with clearer and more explicit choices between policy goals. There will be variations between countries in terms of the exact definitions, goals and priorities.

The objectives that were categorized as "universal access" goals during the first generation, should now be recategorized as two distinct concepts. Those two concepts are as follows: (i) *universal geographic coverage*, which means deploying in a given geographic area key ICT infrastructure, such as signals from mobile networks, or interconnection points to backbone infrastructure; and (ii) *universal community access*, which means achieving affordable community access to a defined set of services such as community payphones or community Internet telecenters (Figure ES.3 and Box ES.2).

The objectives that were categorized as "universal service" should also be recategorized as two distinct concepts. Those two concepts are as follows: (i) *affordable connectivity*, which means reducing the entry cost to purchase or lease a telephone, cellphone or ICT device for specially-targeted low-income or disadvantaged individuals or households; and (ii) *affordable service*, which means making monthly or recurring costs for using ICTs more affordable to specially-targeted low-income or disadvantaged individuals or households (Figure ES.3 and Box ES.2).

Policy-makers should proceed very cautiously with universal service pilots, and take extra care to ensure that these pilots do not provide subsidies to non-targeted communities or beneficiaries.[17]

Box ES.2: Setting measurable goals for new generation

The success of new universal access programs is linked to setting clear, realistic and measurable goals. Regulatel members should agree on a common set of indicators. All Regulatel countries should set their own numerical goals using the same set of indicators, and that should be the basis upon which regional average targets are set. An example of the types of indicators is as follows:

Universal Community Access: X% of the population of a country is within X km of a public payphone or Internet community telecenter.

Universal Geographic Coverage: X% of inhabitants of all municipalities with populations greater than X, should be covered by the signal of a mobile/cellular network and the signal of an Internet access point, irrespective of ability or willingness to pay.

Universal Service Part 1: Affordable Connectivity: Once universal access and universal coverage goals are met, then the end-user price of a telephone/IP device should be affordable to X% of the population of a given country, as evidenced by actual subscription and use results.

Universal Service Part 2: Affordable Service: Once universal access and universal coverage goals are met, the end-user recurring price of a minimum level of telephone or Internet service usage should be affordable to X% of the population of a given country, as evidenced by actual subscription and use results.

Technological innovation is enabling backbone infrastructure or faster speed connectivity to be provided on a commercially-sustainable manner to increasingly smaller markets. Universal service fund policies should encourage the expansion of backbone infrastructure into rural areas where it is commercially sustainable in order to reduce the backbone bottleneck in these areas. Governments should consider allocating funds to develop backbone infrastructure as part of broader e-education and e-government programs based on public-private partnerships.

Universal Access Funds, on their own or as a complement to other public sector programs, should be designed to encourage the development and use of innovative wireless technologies, that could help to provide improved Internet access in rural and low-income areas.

[17] For example, subsidies should not go toward management costs. Subsidies should be structured to stimulate private sector investment. For e-education or e-government programs, the USFs should largely focus on infrastructure, while other ministries should be responsible for financing the other components.

2. **ACCELERATE, SIMPLIFY AND DIVERSIFY THE USE OF UNIVERSAL ACCESS FUNDS.** Policy makers and administrators should implement a range of innovations aimed at reducing or eliminating the bottlenecks that are slowing the use and disbursal of universal service funds. Specific steps will vary by country, but options include the following:

   a. **Put in place mechanisms that allow and facilitate operator-designed universal access projects.** These mechanisms need to have safeguards to ensure that public funds are used in an effective, efficient and accountable manner, and that all of the funds are not used by larger and better-financed operators.

   b. **Establish mechanisms that stimulate smaller operators and venture-oriented companies.** A portion of Universal Access Funds should be used for micro-financing operations, including loans and grants. Small pilots could be established that use Universal Access Fund monies to facilitate the financing of companies that provide universal access or universal service infrastructure or services.[18] These pilots need to have carefully developed criteria, conditions and safeguards.

   c. **Simplify and streamline the allocation of universal access funds.** While universal access programs should maintain the same financial discipline required of other publicly-financed programs, they should also avoid long delays in the review process, which can undermine the rationale and support for these programs.[19] Many programs have taken two to four years to go from design to implementation – far too long a life-cycle for a dynamic sector such as ICT. This long life-cycle can create daunting challenges for governments, which often face budgetary restrictions that do not allow them to make financial commitments beyond a single fiscal year. Some countries have overcome this limitation by creating special escrow or trust fund accounts, but these add an additional layer of bureaucracy. In the same vein, policy-makers should streamline and simplify the process of applying for and using universal service funds, by eliminating unnecessary administrative requirements and providing some assistance to operators in complying with those requirements.

   d. **Highlight the role of public capacity-building and relevant content development, in promoting broader demand for and use of ICTs among target populations.** Funding initiatives should incorporate components and requirements for capacity-building among target populations, especially those in rural areas who may be unfamiliar with the potential and use of the Internet and other ICTs. Universal access funds should reward programs that encourage the development of ICT content and applications that are relevant and useful to local populations.

   e. **Eliminate overly-burdensome ex-ante approvals and other delays, and adopt "pay-as-you go" or "use-it-or-lose-it" mechanisms.** In a number of Regulatel countries, universal access funds are not being utilized, or are being utilized at an extremely slow rate. Policy-makers should consider adopting transitional mechanisms that limit the amount of funds that are collected until existing funds begin to be utilized for their intended purpose (Box ES.3). Policy-makers should consider adopting pay-as-you-go or use-it-or-lose-it mechanisms, which link raising of funds to disbursal of funds.

3. **IMPLEMENT LEGAL, REGULATORY AND INSTITUTIONAL REFORMS, INCLUDING BUILD-OUT OBLIGATIONS, TO CLOSE MARKET GAPS AND IMPROVE THE FUNCTIONING OF THE MARKET.** Latin American legal and

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[18] The use of Universal Access Fund monies for equity investments will need safeguards to ensure these companies do not become public sector companies that could compete unfairly with private operators or that benefit from special regulatory treatment.

[19] These delays also undermine Universal Access Fund programs because by the time the Universal Access Fund sare approved for use there may have been market or technological innovations that require re-evaluating the goals of a specific USF program.

regulatory frameworks, as is the case in nearly all developed and developing countries, have not kept pace with technological and market innovations. This is a key factor that contributes to the existence of market gaps.

Box ES.3: Innovative mechanisms for the awarding of Universal Access Funds

In order to accelerate the disbursement of universal service funds and to stimulate bottom-up proposals, policy-makers should experiment on a pilot basis with mechanisms other than minimum subsidy tenders. Funding of these pilots by universal service funds should be limited until they demonstrate their effectiveness. The following innovative approaches should be considered:

- Provide grants to small pilots: set aside funds each year to finance pilots to test new approaches and technologies.
- Implement a structured approach toward developing and vetting universal access projects eligible for funding. Consider adopting some procedures from the electricity sectors in Ecuador and El Salvador, where projects in designated regions are developed jointly by local government authorities, electricity distribution companies, and advisors of the fund. The process of developing and approving projects is subject to well-defined procedures and strict timetables. A large part of the work of identifying and planning these bottom-up projects is done in the field, by the engineers and other professionals of the companies that will eventually be implementing them. The turn around time is short[1]. There are also strict reporting requirements. Gaining approval for projects depends in part on performance with previous funded projects.
- Employ OBA-based mechanisms other than minimum subsidy allocation, e.g. set a fixed subsidy and award the funds to the operator that provides the most comprehensive service. That could involve, for example, providing the most telephone or Internet connections or social and economic ICT applications for the community, such as e-learning tools, and facilitating access to health and government services through the proposed network.

Depending on the service, the market gaps in Latin America range from 10% to 40%. In order to reduce these gaps, Universal Access Fund administrators should pro-actively work with policy-makers, ministries and regulators to implement reforms that eliminate or reduce legal and regulatory bottle-enecks that hinder investment in unserved areas. It is important to note that some of the most important bottlenecks are not under the jurisdiction of regulators or telecommun-ications ministries. Therefore, it is critical to have strong high-level leadership, that will ensure effective coordination and cooperation between ministries, and between national, regional, and local governments.

Given the rapid pace of technological innovation in the ICT sector, the reform process needs to be carried out on a continuous basis. The exact nature of the bottlenecks and needed reforms will vary by country. A non-exhaustive though prioritized listing of the key reforms include the following: (i) putting in place obligations on the larger operators to cover unserved areas that are considered to be commercially viable; (ii) reducing regulatory taxes and fees, especially spectrum fees; (iii) removing restrictions on the use of certain radio spectrum bands in rural areas, deregulating VoIP, and simplifying licensing processes for rural operators; (iv) facilitating interconnection and assymetrical tariffs for small and rural operators; (v) facilitating the process of obtaining rights-of-way; and (vi) requiring and enforcing infrastructure-sharing between telecommunications operators and electric, gas, water and road infrastructure providers.

Table ES.1: Overview of Universal Access Funds in Latin America – Disbursed Ratio

Country	Fund	Fund Legally Established[1]	Date of First Use of Fund for telecom[2]	Source of Funds[3,4]	Fund Goals or Prime Focus	Amount Raised until 2005 (US$ millions)	Committed / Used until 2005 (US$ millions)[4]	Disbursed Ratio[5]
Argentina	FFSU	2000	Not used	Sector tax	Public telephones, handicapped, education, health, cultural projects, etc.	Not avail.	Not avail.	N.A.
Bolivia	FNDR	1996	Not used	Sector fees and fines	Public telephones, telecenters and cell phone expansion.	43.5	0.0	0%
Brazil	FUST	2000	Not used	Sector tax	Local communications and other civil and military telecom; health and education.	1,680.8	0.0	0%
Chile	FDT	1982	1995	Budget	Public telephones, telecenters and Internet in schools.	30.0	30.0	100%
Colombia	FCM	1994	1999	Sector tax	Public telephones and telecenters.	448.6	166.0	37%
Costa Rica	No fund	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Cuba	No fund	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Dominican Republic	FONDETEL	1998	2002	Sector tax	Public telephones and telecenters	65.7	10.8	16%
Ecuador	FODETEL	2001	Not used	Sector tax	Telecenters and residential projects in rural and poor peri-urban areas.	1.0	0.0	0%
El Salvador	FINET	1998	Not used	Concessions, Sector fees and fines	Multi-sector (Telecom and Energy)	32.7	0.0	0%
Guatemala	FONDETEL	1996	1998	Concessions & budget	Public telephones.	17.9	7.8	43%
Honduras	No fund	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Mexico	FCST	2002	2004	Budget	Public telephones.	25.3	25.3	100%
Nicaragua	FITEL	2003	2005	Sector tax	Public telephones and telecenters.	4.0	0.8	19%
Panama	No fund	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Paraguay	FSU	1998	2000	Sector tax	Telecom projects in rural and marginal urban areas.	13.0	12.5	96%
Peru	FITEL	1993	2000	Sector tax	Public telephones and telecenters.	143.1	45.1	32%
Uruguay	No fund	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Venezuela	FSU	2000	2005	Sector tax	Telecenters.	113.2	0.0	0%
Total						**2,618.0**	**297.3**	**11%**
Total w/o countries with 0% disbursal ratio						**742.7**	**296.6**	**40%**

1. Date when the fund was given an explicit legal mandate to be established.
2. First date when funding was awarded to an operator.
3. Source of funding for the Fund itself, not for the administration of the Fund.
4. “Sector tax” means the assessment imposed on telecommunications operators. “Budget” means the revenues from government budget allocated by executive or legislative branch.

Table ES.2: Overview of Universal Access Programs in Latin America: Some Notable Achievements

Country	Notable Achievements or Notes
Argentina	3,031 Internet access points established in community centers and libraries.
Brazil	4,400 telecenters serving more than 4 million people. On-going debate within government over FUST goals and use of FUST funds. On January 1, 2006 the government imposed updated investment obligations on all incumbents to install telephones in every community larger than 400 inhabitants. Investment obligations imposed during privatization were extensive and contributed to dramatically improved universal access.
Chile	Public telephones installed in more than 6,059 communities benefiting 2.2 million people. Funds leveraged significant private sector investment and several tender required no public subsidies. Funds are allocated from government budget when specific projects are launched. Unused funds are used for follow-up projects or returned to the general budget.
Colombia	The Compartel program installed rural payphones in more than 9,745 communities benefiting more than 5 million people.
Dominican Republic	1,500 public telephones across the country and 100 Training Centers in private schools located in rural areas.
Ecuador	288 telecenters installed in 266 localities benefiting nearly 100,000 people.
El Salvador	The fund is a telecom and electric fund. All telecom funds have been used for electricity projects. Recent reports indicate some FINET funds used to finance 41 telecenters.
Guatemala	5,502 public phones installed in 1,885 localities benefiting 1.49 million people. Funds that were allocated to FONDETEL have been fully used and allocated (i.e. actual allocation for funds that are available is 100%) Significant amount reallocated for non-telecom use under prior government. Universal fund currently financed by budget and limited for only telephone projects.
Mexico	11,430 telecenters established benefiting approximately 9.35 million people.
Nicaragua	343 or more public telephones installed benefiting 500,000 people. Funds leveraged significant private sector investment. First and only completed tender required a temporary reduction of $0.75 million in the tax imposed on the winning bidder. Second tender is under way.
Panama	A telecenter program was established with financing from multilateral agencies and donors.
Paraguay	480 public telephones (prepaid cards) installed in 240 localities.
Peru	Public telephones installed in more than 4,400 localities benefiting 1.6 million people. 80% of rural population need to travel only 5.6 km to reach a public payphone (down from 56 km). Funds leveraged significant private sector investment.
Venezuela	34 access points installed in 24 localities serving a population of 327,000 (possibly in planning stages).

I. INTRODUCTION

I.1 Background and objectives

Several Latin American countries have been world leaders in implementing universal access and service programs aimed at increasing access to telephones and the Internet in rural and unserved areas. They have accomplished this mainly through the implementation of universal access funds operating with a system of minimum subsidy tenders. The following countries have enacted such programs in legislation: Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Nicaragua, Paraguay, Peru, the Dominican Republic, and Venezuela. However, the fund in Argentina is not functioning at all, and the one in Brazil it is doing so only partially. In Mexico, though no universal access fund has been planned in legislation, a temporary fund has been established to finance social and rural coverage programs mentioned in the 1995 telecommunications law.

Some of the aforementioned funds have been very successful, and have served as examples for other countries around the world. Other methods used to ensure universal access include universal service and access obligations imposed on licensed operators and service providers. Many operators are required to contribute to universal access funds through additional financing methods. Those methods include financing through other government departments and non-governmental organizations (NGOs), and through deliberate cross subsidization of the state-owned monopoly. In most Regulatel countries, local and foreign NGOs also sponsor numerous initiatives.

Thus far, the most prolific universal access programs have been in Chile, Colombia, the Dominican Republic, Guatemala, Peru and Paraguay. These funds have subsidized the installation of nearly 50,000 rural payphones, serving some 30,000 population centers. Colombia, Peru and the Dominican Republic have also used these funds to subsidize nearly 5,000 telecenters, and access to the Internet. Argentina used other sources of funds to build 3,000 telecenters. Brazil installed nearly 400,000 payphones, through universal services obligations imposed on operators since 1998, when the sector was privatized.

Studies of first-generation, public telephone and telecenter focused programs show that they have provided a minimum but essential access in remote communities at affordable prices. Studies have also shown that there is a significant demand and willingness, even in rural areas, to pay for individual telephones, such as cellular, fixed residential or limited mobility residential access lines. Based on these findings, the World Bank recently granted a credit to Bolivia to extend cellular service to rural areas, using an output-based aid (OBA) scheme. Under this scheme, service delivery is delegated to a third party, such as a private company or NGO, under contracts that link the payment of subsidies to the results achieved in targeting beneficiaries[20]. Studies have also shown that many cellular operators in Latin America would be prepared to extend their networks to rural and low-income areas if governments provided appropriate incentives, such as OBA-style subsidies, revised tariffs and the right legal and regulatory framework.

[20] Output-based aid (OBA) approaches are intended to provide a sharper focus on objectives, improve incentives for efficiency and innovation, enhance accountability for the use of public resources, and create opportunities for mobilizing private financing.

An evaluation of the results achieved, the progress to date, and the findings of the World Bank study, has led the 19 members of the Forum of Latin American Telecommunications Regulators (Regulatel – member countries listed in Box I.1) to conclude that a thorough analysis of and reflection on the future direction of universal access programs is warranted at this time.

This study was undertaken due to an agreement between Regulatel, the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and the Public-Private Infrastructure Advisory Facility (PPIAF) of the World Bank. Its goal is to assist members of Regulatel to develop and implement effective, targeted and sustainable universal access programs, including OBA programs, in order to increase private sector investment in telecommunications and information infrastructure in rural and low-income areas. An important outcome from the study is to propose new models for universal access programs and projects.

The study had six specific objectives:

1. Review and assess current and planned universal access programs in terms of their overall impact, satisfaction of demand for the services being provided, and the costs and sustainability of the related investments;
2. Evaluate global best practices of these programs, focusing on those which are most applicable to Latin America;
3. Analyze the demand and supply for telecommunications services in unserved areas, with specific emphasis on services that are in greatest demand, especially cellular telephones, fixed wired and wireless telephones, and Internet access;
4. Develop an analytical framework to assess the current impact, satisfaction of demand, cost-effectiveness, and sustainability of universal access programs and to benchmark, monitor and evaluate these programs over the longer-term;
5. Develop a spreadsheet model to estimate the market efficiency and universal access gaps[21], and recommend a new series of programs to have more impact, to better serve the demand for service, and to obtain higher cost-benefit ratios;
6. Propose new models of universal access programs to meet the identified demand for telecommunications services in unserved areas.

I.2 Project team and work program

An extensive team was assembled for this study. It consisted of the following: (i) the 19 members of Regulatel, each represented by a specialist on universal access (Regulatel member contact point); (ii) 11 local consultants who, along with the Regulatel member representatives, assisted in gathering the necessary qualitative and quantitative information, analyzing existing universal access schemes and developing new models for universal access; (iii) five specialist consultants who designed and implemented the analytical framework and spreadsheet model to assess the universal access gap, one of whom assisted in assessing current and new

[21] The "market efficiency frontier" is the penetration level achievable in a well-functioning competitive market under a stable regulatory environment. The "market efficiency gap" is the difference between the current level of service penetration and the market efficiency frontier. The "access gap" is the difference between the market efficiency frontier and a 100% penetration level. The access gap refers to those situations where a gap between different population groups (urban and rural, high and low income) continues to exist even under efficient market conditions, since a proportion of the population cannot afford the market prices at which the service is offered.

technology to provide access at affordable prices; (iv) experts from the World Bank and the United Nations Economic Commission for Latin America and the Caribbean (ECLAC); (v) the Regulatel Presidency and Secretariat; and (vi) the lead consultant who was responsible for overall coordination of the study.

Several large and small operators, service providers, suppliers, systems integrators, and manufacturers contributed valuable information, and participated in the process of formulating and assessing ideas.

The key milestones in the study included the following:

- Developing the analytical framework and testing a market and access (spreadsheet) gaps model – second quarter 2005;
- Developing and testing of a quantitative and a qualitative survey instrument (questionnaires) – second quarter 2005;
- Hiring 11 local consultants and coordinating their inputs to the quantitative and qualitative survey instruments – second and third quarters 2005;
- Coordinating complementary inputs from Regulatel member contact points – during course of study;
- Meeting with Regulatel correspondants in Lima (January/February 2005) and Mexico (February 2006), to explain study method and procedures and to discuss preliminary results and seek more information;
- Organizing a workshop on universal access in La Paz, Bolivia - April 2005;
- Establishing a special project web site – third quarter 2005;
- Organizing project review meetings at the World Bank in Washington, including one with the participation of operators - December, 2004; January 2005; September 2005; May 2006;
- Presenting initial results to the Regulatel/ European Independent Regulators Group Summit in Sintra, Portugal - November 2005;
- Presenting and discussing the results at an international conference in Lima, Peru, - November 2006.

This report is organized as follows:

- **Chapter I**: Background and objectives of the study;
- **Chapter II**: A brief review of the telecommunications sector in the 19 Regulatel member countries;
- **Chapter III:** Presentation of the analytical framework;
- **Chapter IV**: Results of applying the gaps model;
- **Chapter V**: Overview of universal access programs and initiatives in Latin America according to the four broad approaches adopted for this study;
- **Chapter VI:** The corresponding chapter which presents the results, critical evaluates these programs and initiatives and summarizes the best practices in current universal access fund programs;

- **Chapter VII**: A discussion of innovative strategies for universal access and best practices most applicable to Latin America and a presentation of new models, pilots and key recommendations for universal access projects in Regulatel member countries; and
- **Chapter VIII**: Conclusions and recommendations for future action.

There are **eight annexes**. They are as follows:

1. Summary of recommendations;
2. Analytical framework and gaps (spreadsheet) model;
3. New models and project pilots for universal access in Regulatel member countries;
4. Telecenter models;
5. Technological overview: wireline and wireless broadband access technologies;
6. Traditional financing instruments for ICT projects;
7. Regulatory provisions of interest; and
8. Comparison of monthly charges for broadband Internet access in Regulatel member countries.

Box I.1: Members of Regulatel

Argentina, Comisión Nacional de Comunicaciones (CNC)
Bolivia, Superintendencia de Telecomunicaciones (SITTEL)
Brazil, Agência Nacional de Telecomunicações (ANATEL)
Colombia, Comisión de Regulación de Telecomunicaciones (CRT)
Costa Rica, Autoridad Reguladora de los Servicios Públicos (ARESEP)
Cuba, Ministerio de Informática y las Comunicaciones (MIC)
Chile, Subsecretaría de Telecomunicaciones (SUBTEL)
Ecuador, Comisión Nacional de Telecomunicaciones (CONATEL)
El Salvador, Superintendencia General de Electricidad y Telecomunicaciones (SIGET)
Guatemala, Superintendencia de Telecomunicaciones (SIT)
Honduras, Comisión Nacional de Telecomunicaciones (CONATEL)
Mexico, Comisión Federal de Telecomunicaciones (COFETEL)
Nicaragua, Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)
Panama, Ente Regulador de los Servicios Públicos (ERSP)
Paraguay, Comisión Nacional de Telecomunicaciones (CONATEL)
Peru, Organismo de Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)
Dominican Republic, Instituto Dominicano de Telecomunicaciones (INDOTEL)
Uruguay, Unidad Reguladora de los Servicios de Comunicaciones (URSEC)
Venezuela, Comisión Nacional de Telecomunicaciones (CONATEL)

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II. TELECOMMUNICATIONS IN LATIN AMERICA

II.1 Introduction

In the 1990s, the telecommunications sector in Latin America, like in most of the rest of the world, evolved from one of exclusive provision of both basic and value added services to one of provision of virtually all services (with a few exceptions) in an open market. Large amounts of foreign capital, especially European and North American, attracted by the huge growth potential of the market, entered the region. Investors brought not only money, but also the technical and management know-how to stimulate a moribund sector.

During the initial phase of privatizations in the late 1980s and early 1990s, state-owned monopolies were often replaced by private monopolies, with fixed periods of exclusivity awarded as part of a privatization package. It was only during the second phase of the liberalization process, after these periods of exclusivity had expired, that telecommunications markets were fully opened to competition. By contrast, in Colombia, liberalization preceded privatization. Independent telecommunications regulators were established in most Regulatel member countries during the initial privatization phase. Many Regulatel countries participated in the Uruguay Round trade in services negotiations that ended in February 1997, with 12 of these countries having made basic telecommunications commitments.

Regulatel countries have experienced three waves of privatizations: (i) the first "pragmatic" wave, in Argentina (1990), Chile (1987), Mexico (1990), and Venezuela (1991); (ii) the second, in Bolivia (1995), Peru (1994) and Cuba (1995); and (iii) the third, in Brazil (1998), Panama (1997), El Salvador (1998), Guatemala (1998), and Nicaragua (2001). That left Ecuador, Honduras and Paraguay, along with Colombia, where privatization is still being contemplated.

The following sections review the process of privatization and the introduction of competition into the Regulatel member countries, and their 1997 WTO (Basic telecommunications) commitments. A more detailed summary of each country's legal and regulatory framework - including the entity responsible for setting policy and regulating - and market access policy, can be found in Annex 2.

II.2 Privatization

Difficult economic situations and serious external debt burdens were driving forces behind the privatization and liberalization policies for the public sector in the 1980s. In the telecommunications sector, there were other factors that supported the policy of privatization. The state telecommunications monopolies had been incapable of meeting the demand for services. There were long waiting lists, and it often took years for customers to get connected even in large cities. Box II.1 summarizes these and other factors that precipitated reform in the telecommunications sector in Latin America at that time. Governments also started to realize the growing importance of telecommunications for economic development. Therefore, it was not surprising that telecommunications was the first sector to experiment with privatizations in Latin America. Chile, Argentina, Mexico and Venezuela were the first countries to privatize their state-owned telecommunications monopolies. Other countries followed soon after. The Dominican Republic, where the sector had been privatized in 1930, was an exception.

Box II.1: Factors resulting in privatizations in the 1980s and 1990s in Latin America

- High degree of unsatisfied demand, evidenced in long waiting lists.
- Demand of large users to be allowed to build their own infrastructure and networks where monopolies were unable to satisfy demand.
- Traffic congestion during peak hours.
- Poor quality of service - unreliable, frequent outages, especially during rainy periods, and long delays in repairing failures.
- Many users valued services more than operators were charging for those services.
- Limited territorial coverage. Only a few cities were covered – there were huge pockets of people without even a public telephone. Threre was an absence of any telecommunications infrastructure in most regions.

The model used by most countries to privatize their telecommunications monopolies was to grant concessions for a given period with a limited number of years of exclusivity. The new investors agreed to build-out their networks in a certain time-frame, as stipulated in their concession contract agreements with the government They agreed to have their tariffs for basic services regulated. They also frequently agreed to meet certain build-out and service quality obligations. The consortium that won the bid for a 40% share of CANTV in Venezuela in December 1991, had a set of obligations specified in its concession contract. These included the following: (i) installing and modernizing a specified number of telephone lines; (ii) developing a plan for services in rural areas; (iii) shortening the time for getting dial tone and repairs; (iv) improving call completion rates and operator response times; and (v) reducing the wait time for getting connected to a maximum of five days by 1998[22]. Similarly, in Mexico, the consortium led by Grupo Carso (with Southwestern Bell and France Telecom) that acquired about 20% of the shares of Telmex in December 1990, had a number of network expansion and quality of service improvement obligations. These included increasing the payphone density in the country from 0.8 to 5, per 100 population.

[22] Aileen A. Pisciotta, Privatization of Telecommunications: The Case of Venezuela, in Bjorn Wellenius and Peter A. Stern, Implementing Reforms in the Telecommunications Sector, Lessons from Experience, World Bank Regional and Sector Studies, Washington, 1994, ISBN 0-8213-2606-6.

Box II.2: Telecommunications sector reform in Latin America

Similarities

- Sector reform was centered around the privatization of the state-owned monopoly.
- Privatization involved an international bidding process.
- In most cases, competition was introduced in non-basic services immediately after privatization.
- The new investors were given a limited number of years of exclusivity.
- Most privatizations involved foreign (mainly European and North American) telecommunications operators.
- Ownership was shared among a wide number of national and international, large and small, strategic and financial investors, with one or two strategic investors gaining control.

Differences

- Due to the existing political will, the process was focused and rapid in Argentina, Brazil, Mexico and Venezuela, taking less than two years. Although the process in Chile started earlier than in most of the other countries, it dragged on for 10 years, because of a lack of incentives.
- In Mexico, there was a deliberate policy to increase the value of the company before privatizing it, by introducing a number of improvements. In the other countries, the companies were sold in their existing states, with the new investors having the task of bringing the network and administration up-to-date.
- In Mexico and Venezuela, quantitative build-out and quality-of-service obligations were contained in the companies' concessions, along with a statement of the period of exclusivity. In Argentina, these were contained in the sales contract. In Chile, pricing policies and rules for establishing marginal costs were described in legislation: the price cap formulas used were defined in either the concessions or the sales contracts.
- In Colombia, liberalization was achieved without privatization of state and local government enterprises.

The privatization policies did not receive the same amount of political and popular support in each country. In several countries, there was substantial political and union opposition to replacing a state monopoly with a private one, resulting in delays and, in some cases, even abandonnment of the process. In Uruguay, the privatization of the state-owned telephone monopoly was rejected by a popular referendum. Today, Antel continues to be a state-owned fixed line monopoly. In Costa Rica, ICE is the state owned monopoly. In Colombia, most local companies are owned by their municipalities. Colombia Telecom was partially privatized only in 2006, when Telefonica acquired 50%-plus-one of its shares.

II.3 Introduction of competition

There was significant resistance to the awarding of extended periods of exclusivity to private monopolies. This was in part overcome by a gradually opening-up of markets for value-added services and cellular mobile services. Exclusivity was generally neither requested nor offered for cellular mobile services, because policy-makers and private investors did not foresee the enormous growth potential of this new service. In 1990, the cellular mobile market in the 19 Regulatel member countries was just 2.1%, and Chile and Mexico had the highest penetration rates at 10.6% and 7.7%, respectively. Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Peru, the Dominican Republic and Venezuela made commitments at the conclusion of the negotiations on basic telecommunications (NGBT) in February 1997. These are summarized in Table II.1[23].

Given that these commitments were embodied in an international treaty and have precedence over national laws once ratified by governments, they served as a clear and unambiguous indication of the timetable for opening telecommunications markets, once the period of exclusivity had expired.

Of the 19 Regulatel member countries, only Cuba, Costa Rica, and Uruguay continue to maintain exclusive arrangements for basic fixed telephone services. Uruguay has compet-ition in cellular mobile and value added services, and Costa Rica in value added services.

Basic parameters (penetration rates and number of operators) and the year in which telecomm-unications markets were completely liberalized in the 19 countries are shown in Table II.2.

II.4 Regulators

As mentioned previously, an important aspect of sector reform was the establishment of independent telecommunications regulators, whose initial function was usually to ensure that the newly privatized companies met the obligations in their concession contracts, in return for which they were granted periods of exclusivity[24]. In addition to supervising the privatized companies, they also developed the framework for future competitive environments, including regulations for tariff rebalancing, interconnection, transparent licensing and spectrum assignment schemes, and universal access programs. While there are broad similarities among them, there are important differences with respect to their internal structure, responsibilities, degree of independence, functioning, financing, etc.

These regulators were established as technical, economic, financial, administrative and functionally autonomous bodies. The exceptions are in Cuba and Chile, where they are departments within the ministries responsible for the sector, including policy setting. In Guatemala, Nicaragua and Venezuela, they are autonomous, but report directly to the minister responsible for the sector. In most other countries, they are headed by commissions or boards, with members appointed by the government for fixed periods[25]. In the Dominican Republic, where there is no separate ministry responsible for telecommunications, the head of the commission is a state secretary. In El Salvador, Costa Rica and Panama, these regulators oversee other public services, such as electricity, water, gas and transport. In Argentina, Cuba, Nicaragua and Uruguay, they oversee postal services. In Cuba, they are responsible for technology, informatics, automation and the electronics industry.

Table II.3 summarizes the regulatory and policy-making functions for which each of these regulators is responsible[26]. These include the following: (i) awarding of licenses, (ii) definition of

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23 Source: J. Monedero "Las Telecomunicaciones Latinoamericanas en las negociaciones de la OMC"

24 Whereas in Peru and Venezuela privatization coincided with the establishment of an independent regulator in Argentina, Bolivia, Chile, Cuba and México privatization took place before the regulator was established. All meet the criteria of independence in the WTO's Regulatory Principles Reference Paper.

25 Argentina, Brazil, Colombia, Ecuador, El Salvador, Mexico, Paraguay, Peru, and the Dominican Republic.

26 Source: Regulatel, "Reguladores de telecomunicaciones en América Latina", Cuzco noviembre 2004.

technical plans; (iii) spectrum management; (iv) control and supervision; (v) standardization; (vi) consumer protection; and (vii) international representation.

Table II.1: 1997 WTO commitments of Regulatel member countries

Country	% of foreign ownership permitted	Fixed services	Mobile services	Satellite services	Adopted reference paper
Argentina	100%	- LT, NLDT, ILDT: Nov.2000 - National DTS - Leased circuit services	- Two cellular operators per region - PCS subject to a means test - Paging, trunking and mobile data	- SPCS - FSS excluding geostationary. MFN exemption	Adopted in its entirety
Bolivia	100%	- NLDT, ILDT: Nov.2001 - Private services - Callback prohibited - LT exclusivity for the 16 cooperatives - CUG	- all	- mobile	Partially adopted
Brazil	49% for mobile and satellite services until July 1999	- Voice and data in mod1 1 - Mode 3 not bound until one year after adoption of Telecom Law - CUG and VAS	- Two operators per region (one in band A; the other in band B) 49% foreign ownership limit until 1999 - Paging	- Embratel: has exclusivity for Intelsat and Inmarsat services - Same restrictions as for fixed services	Not adopted.
Chile	100%	- Everything but local voice telephone services	- PCS, paging and mobile data	- all	Adopted in its entirety
Colombia	70%	- LT - Monopoly provision of NLDT and ILDT - Economic means test for all other services - Callback prohibited - Restrictions on routing of international traffic	- Number of operators limited until 1999	- Only geostationary satellites - Same restrictions as for fixed services	Adopted in its entirety with various provisos
Ecuador	100%	- Unbound	- Cellular but not in mode 1	- Unbound	Not adopted.
El Salvador	100%	- All	- All	- Intesat access by signatories	Adopted in its entirety
Guatemala	100%	- all - Restrictions on routing of international traffic	- all	- all	Adopted in its entirety
Mexico	49%	- all - Restrictions on routing of international traffic	- all	- Telmex has exclusivity for Intelsat Inmarsat connections - Various restrictions on use of satellite infrastructure until 2002	Adopted in its entirety
Peru	100%	- Voice telephone service and infrastructure : June 1999 - Callback prohibited - TD, telex fax - connections among CUGs	- all	- all	Adopted in its entirety

Country	% of foreign ownership permitted	Fixed services	Mobile services	Satellite services	Adopted reference paper
		prohibited - Restrictions on routing of international traffic			

Abbreviations

LT	local voice telephone service	VAS	value added service
NLDT	national long distance voice telephone service	MFN	most favorite nation
ILDT	international long distance voice telephone service	Mode 1	cross-border supply
DTS	data transmission services	Mode 2	consumption abroad
SPCS	satellite based personal communications services	Mode 3	commercial presence
FSS	fixed satellite service	Mode 4	presence of natural persons
CUG	closed user group		

Table II.2: Year of full liberalization, penetration rates and number of licensed operators in Regulatel countries

Country	Year fully liberalized	Penetration (lines/100 pop.)			Number of licensed operators				
		Fixed telephone	Mobile telephone (2005)	Internet (2004)	Fixed telephone	Cellular mobile	Domestic long distance	International long distance	ISPs
Argentina	2000	22.8	57.3		2 national; 350 local	4	138		
Bolivia	11/2001	7.0	26.4	0.81	16 regional	3		7	
Brazil		23.5	46.3	10.00	6	Up to 6 per area	> 5	3	10
Chile	1982	22.0	67.8	8.70	9	3	18	18	
Colombia	08/1997	17.1	47.8	8.00	40 TPBCL	3	3	3	15
Costa Rica	n/a	32.1	25.5	0.002	1	1	1	1	2
Cuba	n/a	7.5	1.2	0.13	1	1	1	1	2
Ecuador	04/2001	10.0	40.7		4	3	4	7	4
El Salvador		12.9	47.2	1.70	11	4	4	4	10
Guatemala		14.1	35.1	3.00	19	4		19	
Honduras	12/2005	8.9	25.0	0.13	1	2	1	1	> 6
Mexico	1996	6.9	17.8	0.13	8	4	12	9	381
Nicaragua		18.2	44.3	0.03	1	3	1	1	
Panama		3.8	19.7	0.02	2	2	4	4	14
Paraguay	n/a	13.6	41.9	2.41	1	4	1	1	14
Peru	08/1998	5.2	30.6		5	4	19	19	9
Dominican Rep.		8.1	20.0	8.70		3		3	
Uruguay	n/a	30.9	18.5	9.20	1	3	1	10	22
Venezuela	11/2000	13.5	46.7		5	5	5	4	3

Table II.3: Responsibilities of regulators

Regulator	Responsibilities											
	Policy	Licensing	Technical plans	Spectrum mngmt'	Regulation	Control	User protection	Intl.	Competition	Autonomous	Information society	Broadcasting
CNC- Argentina	-	-	-	yes	-	yes	-	yes	yes	-	yes	yes
SITTEL - Bolivia	-	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ANATEL - Brazil	-	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
SUBTEL - Chile	yes	yes	yes	yes	yes	yes	yes	yes	-	-		yes
CRT - Colombia	-	-	yes	-	yes	-	yes	-	-	yes	-	-
ARESEP – Costa Rica	-	-	-	-	yes	yes	yes	-	-	yes	-	-
MIC - Cuba	yes	yes	yes	yes	yes	yes	yes	yes	-	-	yes	-
CONATEL - Ecuador	yes	yes	-	yes	yes	-	yes	yes	yes	yes	-	yes
SIGET – El Salvador	-	yes	yes	yes	yes	yes	yes	yes	yes	yes	-	-
SIT - Guatemala	-	yes	yes	yes	yes	yes	-	yes	-	yes	-	-
CONATEL - Honduras	-	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes
COFETEL - Mexico	-	-	yes	yes	yes	yes	-	-	-	yes	-	-
TELCOR - Nicaragua	-	yes	yes	yes	yes	yes	yes	yes	-	yes	yes	yes
ERSP - Panama	-	yes	yes	yes	yes	yes	yes	yes	yes	yes	-	yes
CONATEL – Paraguay	-	yes	yes	yes	yes	yes	yes	-	yes	yes	-	yes
OSIPTEL - Peru	-	-	-	-	yes	-	yes	-	yes	yes	yes	yes
INDOTEL – RD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
URSEC - Uruguay	-	yes	yes	yes	yes	yes	yes	yes	yes	-	yes	yes
CONATEL - Venezuela	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

III. ANALYTICAL FRAMEWORK

III.1 Objectives and definitions

This project anticipates the development of an in-depth information and data collection, analysis, and modeling exercise, across the 19 member countries of Regulatel. Its objectives are as follows: (i) to review and assess current and planned universal access programs; (ii) to assess the impact and effectiveness, and the demand and supply, for telecommunications services in unserved and underserved rural and urban areas; (iii) to evaluate the scope of the gaps in access to communications; and (iv) to propose innovative models for meeting the requirements of universal access. To underpin this research, it is necessary to build a coherent analytical framework through which to structure and compare the analysis and findings. This includes defining the scope and limits of the factors being analyzed, and the specific terminology and questions surfacing every time the topic of universal access is raised.

It is important here to distinguish between the concepts of universal access and universal service. While different countries' legislation and regulations define these terms in varying ways, the general concepts, and the definitions that we apply throughout this report, can be summarized as follows:

Universal access to telecommunications implies the reasonable availability of network facilities and services, on either a private or a shared, public basis, to citizens and institutions within a given community. Absolute universal access is achieved when 100% of a designated population has access to a given service. Access, in this case, means that the given service is available through reasonably available and affordable public or community facilities, and those who are willing and able to pay full cost-based prices can obtain individual or household service on demand.

Universal service in telecommunications intends a more absolute condition, in which telecommunications services are delivered ubiquitously to households or individuals throughout an area, and thus are both accessible and affordable, with no practical impediments to subscription and usage. Absolute universal service is achieved when a given telecommunications service is affordable to 100% of a designated population on an individual, household or institutional basis.

The emphasis in this study is on universal access – the expansion of basic telecommunications network facilities to geographic locations and populations that do not yet have access to those networks, either on a public or private basis. We discuss universal service considerations - including affordability and related factors - as further concerns of these policies, but with basic geographic coverage and access as the priority objective.

The following are definitions of other important terms used throughout this report:

A universal access fund is a financial mechanism established to create an extra level of economic incentives for private investment in network expansion and service delivery, while maintaining market conditions. It is defined through a legislative instrument (law, regulation, decree, etc.), which describes its objectives, operation, administration, internal organization, and method of collecting and disbursing funds. Universal access funds fall within the definition of the World Bank's Output Based Aid (OBA) concept. This concept is defined as "the use of explicit, performance-based subsidies to complement or replace user fees involving the contracting out of basic service provision (e.g., infrastructure, health, education) to a third party (such as private companies, NGOs, community-based organizations, and possibly even a public service provider) with subsidy payment tied to the delivery of previously specified outputs (e.g., per network connection, or per kilometer of road constructed or maintained)"[27].

<u>Broadband</u> refers to a high-capacity, two-way link between an end user and access network suppliers capable of supporting applications beyond simple voice and messaging. While there is no common definition of what constitutes broadband in a data communications network, any speed that is higher than that which can be obtained through source encoding and modulating a common voice channel (usually 64 Kbps, using, for example, pulse code modulation), can be considered broadband.

The first questions to ask in the context of a policy and market analysis of this kind must address the basic definitions of "access", in terms of technical and service parameters, and the specific objectives that policy-makers are seeking to achieve through universal access programs. These questions present an analytical challenge from the outset, because the answers imply a set of priorities for access development before the market structure is fully understood. In the context of rapidly changing technological and market conditions, it is important to frame the issue from a forward-looking perspective, i.e., to consider what services are, and will be, most in demand and most realistic for operators to provide on a cost-effective basis.

Table III.1 presents a schematic hierarchy of various types of telecommunications/ICT access, that can be envisioned for different locations and different types of users. In any given location, and for each type of service, there are generally three types of possible access: public, institutional, and private. Public access implies shared community-based facilities, open to all users. Examples include public telecenters, cyber cafés, libraries, and other commercial or non-profit public access points. Institutional access includes connections within public as well as business organizations, which may be utilized by the members or employees of such institutions. Examples include schools and universities, community service groups, and business networks available to employees. Private or individual access implies that each household or individual user can have unique, personal access to a service. Note again, that the availability of access is a supply-side consideration, and not the same thing as actual subscription to and use of a service, which is a function of demand-side factors such as affordability and interest.

The service types in the table represent generally increasing degrees of flexibility and functionality. In most cases, the next level of service development can (and must) be built upon the previous level, although there are exceptions. This range of options has formed the broad basis for the analysis of access conditions and policies in this study, although precise definitions vary greatly from country to country. Chapter VII and Annex 5 discuss the various wireline and wireless technologies available to provide these services.

[27] The prime purpose of the World Bank's OBA approach up to now has been to improve the delivery of and access to basic services, mainly in relatively small, rural Greenfield operations. The World Bank would now like now to scale-up projects from small rural communities to larger rural as well as urban and peri-urban areas.

Not all of these service configurations have been the focus of universal access policies, and the most advanced options may be more appropriate for consideration only after basic access policies have been implemented. However, the schematic allows for a clear perspective on the range, scope, and direction of universal access objectives, especially in the rapidly changing telecommunications and ICT environment.

Table III.1 Hierarchy of various types of telecommunications/ICT access

Service	Public access	Institutional access	Private subscriber
Basic voice telephone	Public pay telephone, simple telecenters	Telephone service connection (single or multiple lines)	Household telephone service connection.
Mobile telephone	Public resale of mobile service (e.g., Chalequeros, Grameen Phone)	Mobile service account(s) for admin-istrators, employees	Individual mobile subscriptions with post- and pre-paid payment plans
Basic dial-up Internet	Telecenters, Internet café, payphone (single or multiple access lines); public IT, training support; local or national ISP	Institutional dial-up account (single or multiple access lines); in-house IT support, PCs; local or national ISP	Home dial-up accounts (and access lines), local commercial PC supply, IT support; local or national ISP
High-speed Internet, data services	Same as above, with high-speed access line enhanced applications, local Web hosting, VOIP option	Institutional high-speed access line; enhanced applications, in-house Web and e-mail server hosting; VOIP option; uploading of local content; institutional data networking	Home high-speed Internet access; enhanced applications, VOIP option (using DSL, cable modem or wireline access technologies)[28]
Mobile data	Public WiFi/WiMAX hot spots	Institutional WiFi/WiMAX, also 2.5G/3G mobile service	Individual 2.5G/3G mobile voice/data service accounts
Broadcasting	Public radio reception, retransmission; local community radio production & broadcast; public TV viewing, recording	Institutional radio and TV reception; local content creation, distribution; commercial advertising	In-home radio & TV reception; requires electricity, local market for equipment, service
Broadband Multimedia	Public/community (telecenters) access to public and private multimedia services, applications (audio, visual, graphic, interactive); public content creation, upload	Institutional access to multimedia services, applications; content creation, upload; interactive networking (e learning, e-health, etc.)	Home-based multimedia access: cable TV, digital audio, etc.; in addition to full-service Internet, VOIP, personal networking, etc.

[28] Table VII.2 (Chapter VII) summarizes the local access technologies deployed to provide high-speed Internet access in each of the Regulatel countries.

III.2 Policy and program analysis

This section outlines the analytical framework used in this study for evaluating universal access policies and programs, in the context of the market gaps perspective and the overall goals for telecommunications and ICT access expressed within each country.

This study analyzes current universal access programs in Latin America in terms of their overall impact, cost-effectiveness, sustainability, and the types of networks and services being provided. There are four general policy approaches that Regulatel countries have used individually and in combination to expand networks, improve telecommunications services, and promote universal access and universal service. These four approaches are as follows:

a. Market liberalization combined with regulatory initiatives, including universal access obligations and special regulations and conditions that favor projects and operations in uneconomic areas. Almost all countries have adopted aspects of this approach;

b. Universal access programs and funds;

c. Other financing methods and project initiatives by national, state and local governments, cooperatives, NGOs, etc.;

d. State-mandated and controlled approaches, using cross subsidies and other financing sources.

In Chapter V, we review how each of these approaches has been adopted in Regulatel countries. In Chapter VI, we present the results, and systematically analyze them in terms of the following key criteria and metrics:

- What have been the general results with respect to access growth and other indicators? The relevant indicators for the results of universal access approaches that have been considered throughout the evaluation include:
  - Effectiveness of programs, in terms of numbers of persons, households, and communities obtaining new access to network coverage, as well as growth in subscriptions and penetration of services;
  - Efficiency of projects in relation to the level of subsidy required (cost-benefit indicators);
  - Sustainability of projects over time, as demonstrated by continued operation, maintenance, and growth after subsidy and other public support is depleted;
  - Impact of projects on larger socio-economic development goals, within communities or in the country as a whole.
- What has worked well, and why? Which programs and policies have produced positive results according to the above metrics? To what can we attribute these successes?
- What are the key features and activities, including specific implementation details, that have produced the most promising results? What terms and conditions have appeared to contribute most to favorable outcomes? Can these be replicated easily? What general lessons can be taken from these experiences?
- What problems have been encountered, and what has caused them? What are examples of projects or programs that have failed to live up to expectations, whether in terms of meeting stated network expansion goals, or through encountering unexpected barriers and difficulties along the way? Are the problems political, bureaucratic, economic, technical, or human in nature?

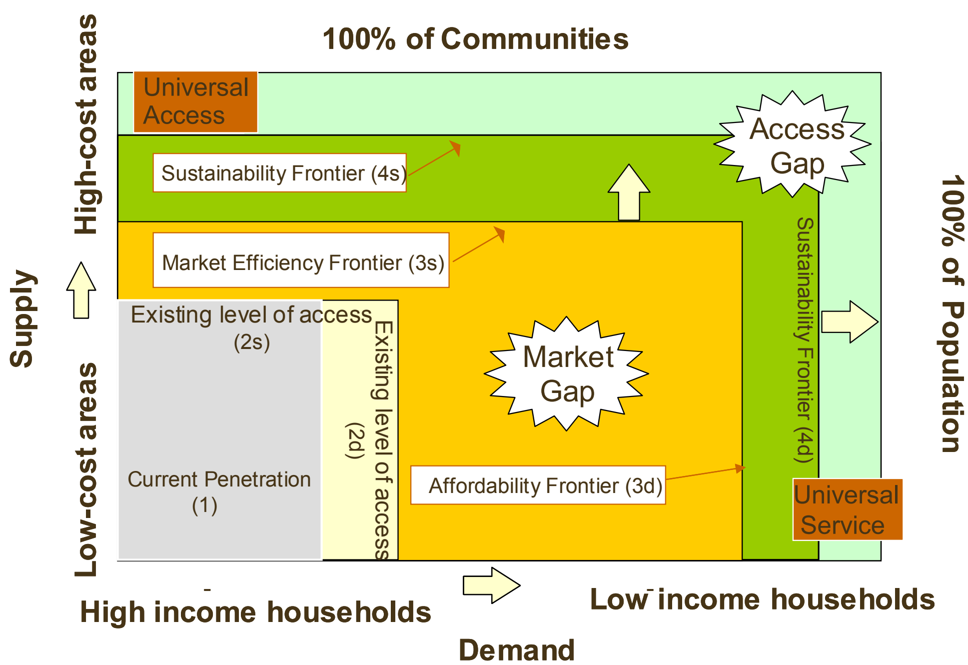
- What responses have been tried to overcome problems or barriers? Have there been successful, or partially successful, strategies for dealing with the setbacks that have occurred? Have there been lessons as to tactics or approaches that should not be repeated, or other key mistakes to be avoided? Are there obvious ways around some of the more basic problems?
- What are the key overall lessons learned, and how can they be applied going forward? Looking at the big picture, what can regulators, investors, governments, and others learn from the experience of universal access programs in Latin America, and what new strategies should they consider in the future?

III.3 "Market gap" and "access gap" concepts

Among the key theoretical and economic foundations for the analysis of this study, and particularly for the spreadsheet model used to assess levels of telecommunications development and impacts of universal access policies, are the concepts of "market efficiency" and "market gaps" and "access gaps". These notions have been gaining wide acceptance within the telecommunications policy and economics field, as the best framework for understanding the interplay of market forces, regulatory decisions, and financial constraints on the development of telecommunications markets, especially among lower income and higher cost areas and populations.

The following diagram illustrates in detail the relationships and terms that define this "gap" theory, with explanations of the key concepts and principles below.

Figure III.1: The Gaps Model



Basic framework: The diagram represents any market, for any telecommunications service. The y-axis is the supply side, and the x-axis is the demand side. The top border represents 100% of communities (i.e., geographic population centers) within the region or country. The right border represents 100% of the population, typically expressed as households. The gray box (1) showing "current penetration" represents the degree of actual "subscribership" (usage of the service in question) at present. The light yellow border (2) represents the existing level of "access" to the service. On the supply axis, access and penetration are the same, as this axis measures geographic availability. On the demand axis, penetration is unlikely to equal availability, as there are households that may have access to service, but may not have purchased it (see below). For example, if a given service were available to 30% of the population, the "current penetration" box would reach 30% along each axis.

As indicated in the diagram, the direction of decreasing supply tends to correlate with higher costs of providing service, while the direction of decreasing demand tends to correlate with lower incomes. There may be exceptions to these general trends. Note that the bulk of this study, and of most research and policy analysis regarding universal access, focuses on the supply-side availability of network and service coverage to geographic areas. However, policy analysts are beginning to pay increasing attention to demand-side questions, affordability, and the notion of true universal "service," at least for some basic services. The study will address these issues as well.

The concept of the market efficiency frontier is central to this theory. It is the critical idea driving market-oriented telecommunications development policy, as well as universal access policies. The concept is that there is some theoretical size of the "efficient" market for any given service that profit-motivated, competitive operators would be prepared to deliver without any subsidy or other outside intervention, as long as artificial (non-economic) barriers to entry and expansion are eliminated. Most telecommunications markets in developing countries are in a stage of transition, from formerly monopoly, state-run operations to more competitive and open markets, in which a variety of investors and entrepreneurs can pursue customers, with different technical and market strategies. In moving toward this market-driven model, most countries' regulatory frameworks and legacy industry structures tend to exhibit residual impediments to the full functioning of market forces. At the same time, the rapidly changing technological and economic conditions of the telecommunications industry ensure that investments and operating decisions and efficiencies are in constant flux, so that nearly any service provider is not likely to be operating in the most cost-effective manner at any given time.

The location of this market efficiency frontier is determined primarily by supply-side factors. Note that the term "location" here is an economic concept, although it does have geographic dimensions. In fact, geographic factors are typically the most prominent determinants of the ultimate limitations on market deployment of services. For most telecommunications networks and services, the location of network access points, in terms of distance from backbone facilities, and topographic conditions such as mountains, jungles and similar geographic factors, are the most significant elements driving capital investment costs. The locations most often lacking in basic network access are the most remote rural areas: those isolated by the landscape and other natural barriers. Other supply-side factors that can strongly influence the economic location of the market efficiency frontier include the following:

- Basic costs of network infrastructure and equipment, including costs that may be associated with the import of foreign-manufactured facilities, and the labor costs for their installation;

- Acquisition and licensing costs for frequency spectrum, support structures, rights–of-way, and similar legal or contractual obligations;
- Impact and availability of other forms of essential infrastructure, such as roads and electricity, to support the construction and operation of telecommunications networks in remote locations;
- Costs and availability of human resource capacity, from technicians and construction workers to salespersons and customer support personnel, needed to promote the effective delivery of services to end-user customers;
- Costs, expertise, and accessibility of software platforms and applications of all kinds, particularly with respect to deployment of more advanced ICT services and capabilities. Both market demand and the effective functioning of services depends upon not only network connectivity, but the provision of useful and reliable features, functions, and information content;
- Tax and tariff policies of the national and local governments with respect to revenues earned from services, and import tariffs and other fees, that directly affect the economic viability of any business model. However, as noted below, it is debatable whether this factor can legitimately be classified as an element of the market efficiency frontier, or whether it in fact represents a non-economic barrier that contributes to the market gap.

<u>Market gap</u>: The concept of the market efficiency frontier leads directly to the companion notion of the market efficiency gap, or simply, market gap. The theory holds that the likely size and scope of a fully "efficient" market for any given service is potentially significantly greater than the present degree of access. The market gap represents the difference between the size of this theoretical perfectly efficient market, and the extent of present real-world market access. As the demand grows, as regulations are streamlined, and investment is able to flow to identifiably attractive market segments, the size of the market gap tends to shrink. The current access line moves toward the market efficiency frontier. The market gap can also become larger. This will occur if supply factors independently reduce costs to deliver services, but the market is impeded from expanding commensurately. Then the market efficiency frontier will expand more than the level of access, which will create a larger market gap.

The size of the market gap is essentially due to non-economic limitations, restrictions, and barriers to the efficient expansion of services by profit-oriented competitive investors and operators. Since in principle all service provision within the gap would be of economic value to one or more suppliers, the fact that market players have not yet entered these areas must generally be a result of non-economic factors. Some of the most notable impediments to this type of market-driven development include the following:

- Barriers to entry and licensing restrictions that prevent or make it excessively difficult for new, especially smaller entrepreneurs to establish operations targeting unserved customer groups and locations;
- Local government restrictions on rights-of-way, disproportionate taxes and fees on infrastructure, business establishment charges and procedures, and other costly disincentives. Taxes can also represent a key impediment to market expansion, especially business income taxes that directly reduce the level of retained revenues for an operator, and therefore, the potential profitability of a project. Other taxes and fees, such as right of way, and towers, may be seen as appropriate economic costs of doing

business, if, for example, they are comparable to tax rates paid by all enterprises in all sectors. But disproportionate taxes on telecommunications operations could be considered non-economic barriers to expansion. Reduced taxes can help form incentives for new investment as well;

- Import duties on foreign equipment that cannot be obtained domestically, which can drive up costs dramatically, especially for smaller operators;
- Difficulties accessing start-up financing from domestic or international sources, due to a variety of factors, including general inefficiencies in capital markets, especially for micro-finance;
- Human resource limitations, such as the lack of trained technicians, management personnel, and others needed to initiate and maintain services, especially in remote areas;
- Demand-side considerations, including customers' inability to access cash or to obtain adequate credit to pay for services.

The most appropriate and effective methods for addressing the market gap should involve reduction and elimination of as many of these types of barriers as possible, so that the market can function more effectively. Using public subsidy funding to help improve the financial incentives of an under-performing, insufficiently competitive market, would tend to distort that market and ultimately hurt the prospects for longer-term competitive growth.

Sustainability frontier The sustainability frontier is beyond the market efficiency frontier, and indicates another theoretical boundary in the potential of market-oriented service development. This frontier – and the area beneath it – represents areas in which telecommunications services could be operated on an economically viable basis, if some degree of initial start-up investment costs could be supported by outside sources. In other words, the services themselves would generate enough revenue, month-to-month and year-to-year, to pay the ongoing operating costs of the network at a reasonable margin of profit. But the initial investment necessary to construct the network and introduce the services could not, in this region of the graph, be justified by that future net revenue stream. Locations, services, and market segments that fall outside of the market efficiency frontier, but within the sustainability frontier, are the most attractive candidates for public subsidy financing, joint ventures, public-private partnerships, and the like, because, in principal, these operations should be able to provide services on a long-term basis with only a one-time intervention to support start-up costs. The amount of such subsidy support required, whether all or part of the capital investment in a particular project, will depend in essence upon how far from the affordability frontier a given population center may be.

Again, note that tax policy can have a significant impact upon the location of the sustainability frontier. Where profit margins are very thin, even if initial capital costs are subsidized, ongoing tax payments can make the difference between viability and unsustainable business prospects.

Access gap: The term "access gap" is often used to define two related sections of the diagram: one within the sustainability frontier and a second one beyond that frontier. Both of these sections are outside the market efficiency frontier and the market gap. Access to telecommunications services cannot be achieved by the market alone in either of these sections. The principal difference between them is that one can sustain itself following one-time capital subsidies, and the other one cannot. Outside of the sustainability frontier, which typically involves the most remote and lowest income regions of countries, the theory indicates that there are locations that could not generate sustainable telecommunications markets regardless of the degree of capital subsidy. Therefore, these locations would require ongoing subsidies to ensure access to services. The section beyond the sustainability frontier is sometimes referred to as the unsustainable access gap. The distinction between the access gap and the market gap is critical to policy development and market analysis, because it separates the areas where the focus of concern should be on elimination of barriers, from the areas where the focus of concern should be on both direct financial intervention and the elimination of barriers. The market efficiency frontiers themselves tend to be moving outward, costs tend to be decreasing, and the benefits of telecommunications technologies and services tend to be increasing. Therefore, the size of the access gaps should generally be diminishing.

Affordability or Adoption frontier: On the demand side of the graph, the frontier that forms the edge of the market gap boundary is sometimes called the affordability frontier. This boundary identifies the limits at which households can afford to pay for market-based services (i.e., with cost-oriented prices). Because this axis represents the *total* potential market population, this frontier designates the limit of affordability of service, primarily based upon income distributions. Alternatively, it can also be understood as an adoption frontier, as customers that could afford to pay for a service, may choose not to "adopt" it, for example if they consider it not to be of sufficient value. This is most likely the case with more advanced services such as Internet and broadband access, whereas basic telephone service (fixed or mobile) is typically regarded as a necessity, and therefore, will be adopted by virtually everyone who can afford it. The gaps beyond the affordability frontier can be addressed through various demand-management policies, including price subsidies and the like, to help promote universal service after universal (or near-universal) access has already been achieved.

Focus of this Report: As mentioned above, the primary focus of this study is upon the supply-side, universal "access" aspect of telecommunications development policy. This is because, in most Regulatel countries, significant market gaps and access gaps still remain. These gaps prevent many populations and geographic regions from obtaining simple access to telephone and Internet services, even on a shared community basis. While the affordability of services for those within reach of networks (and therefore concerns about universal "service") is also an issue, and is becoming a higher priority for many countries, this primary focus upon initial access has generally taken precedence in the policies and initiatives of countries throughout the region. Where appropriate, however, we have also addressed questions of affordability, and how regulators may ultimately shift their focus toward full universal service approaches, as the market and access gaps narrow.

III.4 Regulatel gaps model

Based upon the above theoretical framework, and in accordance with the terms of reference for this study, the consultants undertook to develop an in-depth computer simulation model for estimating the size and location of the market and access frontiers and gaps within the Regulatel telecommunications markets. The purpose was to provide regulators with both an indication of the scope of the existing gaps at a "macro" level, and a tool for further examining and addressing those gaps on a "micro" level. In conducting the "macro" comparative analysis across countries in the region, this study has also sought to illuminate and understand the different gaps that have resulted from different market conditions and telecommunications sector policies.

A complete description of the Regulatel Gaps Model's structure, algorithms, data inputs, and applications is provided in Annex 2. The following discussion summarizes the key elements of the model's development and functions. Chapter IV presents the findings and analysis that resulted from applying the model to Regulatel countries.

Objectives: In sum, we can characterize the questions that the model is attempting to answer as including the following:

- What is the approximate size of the market gaps in terms of geographic coverage or network access for different types of telecommunications services? Specifically, we looked at voice telephone service delivered by mobile networks, basic public Internet access via community telecenters, and access to broadband network connectivity.
- What are the variations in telecommunications network cost structures, revenue opportunities, and market conditions that influence countries' ability to promote Universal Access?
- What amount of subsidy or other funding support would be required to close the true access gap for the different services in each country or region?
- What are the business case options and opportunities for operators, investors, small and medium enterprises, and communities, to establish financially sustainable telecommunic-ations capabilities within different regions and localities?
- What mix of technical capabilities and services is most cost-effective, at the local, regional, and national levels?

Model Structure and Approach: As explained in greater depth in Annex 2, the model consists of several main components, or modules:

- Data Inputs: Detailed data on the current state of the telecommunications market in the given country or region, including geographic and population distribution, and current access levels for all services. This is necessary in order to produce realistic results. In cases where adequate data in the necessary format or level of precision are not available, some estimates or assumptions can be made to obtain approximate results and compare trends. In particular, we included estimates of the distribution of population among towns with less than 5,000 inhabitants in many countries where data for such locations was not available, in order to produce realistic and comparable results across countries.
- Cost Assumptions: Assumptions regarding the ranges of unit costs for the various types of technology and network components involved in establishing access to telecommunications networks and services. These include both capital and operating costs for major network components. Those components include the following: (i) backbone transport; (ii) the local access network; (iii) network management and operating costs - expressed in relation to market size or demand; (iii) interconnection; and (iv) human resource costs for different types of networks and different scales of operations.
- Network Development: Calculations that define the estimated layout of network facilities required to provide service within each defined geographic area, according to the input data and the cost assumption characteristics. This segment in essence creates a hypothetical network - or set of networks - based upon the parameters given, and determines its approximate cost. It also includes variables for the degree of coverage of these networks among total potential market populations, recognizing that even the most extensive network build-outs will not typically reach all citizens, some of whom live in extremely dispersed and sparcely-populated areas.

- Revenue Assumptions: Basic assumptions regarding the level and distribution of potential revenues for each category of service and each user group. Assumptions are generally simplified - based upon allocations of average national income levels - and can be adjusted to test for different degrees of demand.
- Net Revenue Calculations: Calculation of the difference between the total cost and the projected revenues for each service within each geographic area. These net costs (deficits) or net revenues (profits), are expressed in annual, per-location terms (i.e., annual cost per town or site). From this, the model calculates the potential profit or loss to a market-based operator for providing service in each given location. Locations that incur net profits are considered to be within the market gap. Those that incur net losses are considered to be part of the access gap.
- Results: Summaries of the key results, showing the current level of access and the size of the market and access gaps for each region, and for the country as a whole. These access and gap results are expressed as a percentage of the total population (for example: 50% of the population currently has access, the market gap is 30%, and the access gap is 20%). Finally, the model calculates the estimated total subsidy cost that would be required under current conditions to eliminate the access gap (after overcoming the market gap).

The assumptions and algorithms contained in each of these modules have been tested and revised several times during the course of the model's development.

As mentioned earlier , the model as ultimately completed concentrates on examining market structure and access conditions in relation to three categories of networks and services:

- Voice telephone: as represented by cellular mobile service;
- Public Internet access: through community telecenters; and
- Broadband connectivity: as an upgrade of existing networks, using appropriate technology.

The following chapter presents the results and findings, along with an analysis of the applications of the Gaps Model to Regulatel countries.

IV. Regulatel Gaps Model Results and Analysis

IV.1 Overview

This chapter provides an extended discussion of the findings resulting from using the Regulatel Gaps Model to evaluate telecommunications industry conditions in Latin America. As explained in detail in the previous chapter, the model's purpose is as follows: (i) to examine the size and characteristics of the existing gaps in access to telecommunications network coverage, mobile telephone, public Internet, and broadband-based services; and (ii) to examine the potential for further expansion of those networks and services, whether through the market itself or with subsidy funding support. The analysis here offers first, a "macro" comparison of the gap results for all countries for which sufficient market data was provided. Second, it provides "micro" level findings for a selection of countries for which detailed sub-national data were available. Finally, it presents some overall findings and observations about the implications of the modeling exercise for universal access and market policies. This final segment will serve as a springboard for further discussion of these policy issues in the subsequent chapters.

Interpretation of results: Recall that the model examines primarily supply-side conditions with respect to availability and gaps in access to telecommunications networks and services. The results presented here primarily address the geographic coverage of these networks, and their accessibility to potential users within defined population centers (towns, villages, cities, etc.). Specifically, the proportions indicated by the model identify the percentage of inhabitants within given population centers in a country or region, who are within reach of these networks, and could therefore obtain service.[29]

It is important to distinguish between network access and service penetration (or subscribership). Access measures the presence of the network within reasonable reach and adequate quality, so that users may obtain services. Penetration measures actual adoption of the services, whether in terms of individual subscriptions or public usage patterns. It is the first concept - geographic coverage - that is of primary concern in formulating Universal Access policies, since access is a pre-requisite for usage. There are many factors that influence actual penetration patterns, especially price and affordability, as well as flexibility of services, customer awareness, and other market and demographic conditions.

The findings indicated by the model results provide a baseline for understanding the scope of current and potential network and service access. The gaps indicate the size and scope of areas (i.e., towns and villages) where network access is not available, and the underlying economic conditions influencing the market for further expanding those networks. Figure IV.2 presents a graph showing relative penetration levels for current cellular mobile service. In the case of Internet telecenters and broadband network access, penetration figures are more difficult to obtain.

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29 Note that there are invariably other populations in most countries living in dispersed rural areas not affiliated with towns and villages; in general this study did not have any data to include these populations in the analysis, although the model does estimate their levels in calculating current access proportions, as discussed previously.)

IV.2 "Macro" Comparative Analysis of Market Efficiency and Access Gap

The project team and local consultants collected data to generate comparative estimates of the current gaps in access to different telecommunications networks and services, and the resources that would be required to close those gaps. The robustness and reliability of this data varies considerably: the results can only be viewed as tentative and general estimates, and comparisons across countries may not always be appropriate, given the different sources and context of the data provided. Nevertheless, there are useful findings in this initial review.

The following table provides comprehensive summary macro model results for all countries modeled. Further details and explanations are included in the sections that follow.

Table IV.1: Gaps Model country summary results

Summary Country Results

Country	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
Bolivia	68%	71%	$2,568,998,372	67%	69%	$3,155,825,673	34%	36%	$1,510,372,758
Brazil	63%	75%	$27,387,905,988	56%	72%	$10,065,531,371	30%	44%	$10,965,166,261
Chile	72%	85%	$920,427,719	71%	75%	$1,098,339,401	27%	30%	$633,786,404
Colombia	63%	86%	$1,308,748,298	66%	72%	$3,319,005,652	38%	45%	$1,255,932,541
Dominican	55%	83%	$170,943,505	36%	68%	$573,460,102	44%	66%	$149,122,518
Ecuador	58%	73%	$898,179,569	43%	68%	$731,679,204	28%	56%	$631,379,386
Mexico	71%	83%	$3,647,571,211	70%	75%	$5,605,172,056	31%	36%	$2,700,992,654
Nicaragua	57%	64%	$548,395,203	46%	50%	$768,738,690	31%	31%	$312,938,076
Paraguay	68%	68%	$886,779,088	64%	73%	$250,259,179	21%	38%	$383,342,869
Peru	58%	63%	$5,627,102,387	60%	62%	$5,363,022,575	55%	59%	$3,316,728,560
Uruguay	97%	98%	$19,382,092	95%	97%	$6,067,187	77%	80%	$35,654,430
Totals			$43,984,433,431			$30,937,101,089			$21,895,416,457

IV.2.1 Cellular mobile telephone service

Perhaps the most significant results relate to the extent of access to cellular mobile telephone service, because this service has become the de facto option for achieving voice telephone access throughout the region. The following graphs illustrate the degrees of access, and the remaining gaps. Figure IV.1 presents the model results for geographic network access. In essence, this represents the degree of signal_coverage by cellular networks, relative to the population centers of the countries studied. For example, the finding of 68% cellular access in Bolivia, means that approximately 68% of the population of Bolivia lives in towns or villages that have at least some reasonable access to cellular telephone signals.

For comparison, Figure IV.2 shows estimated cellular service penetration in each of these countries, i.e., the proportion of the population that actually subscribes to or utilizes cellular telephone service.

Figure IV.1: Gaps Model Results for Cellular Telephone Access

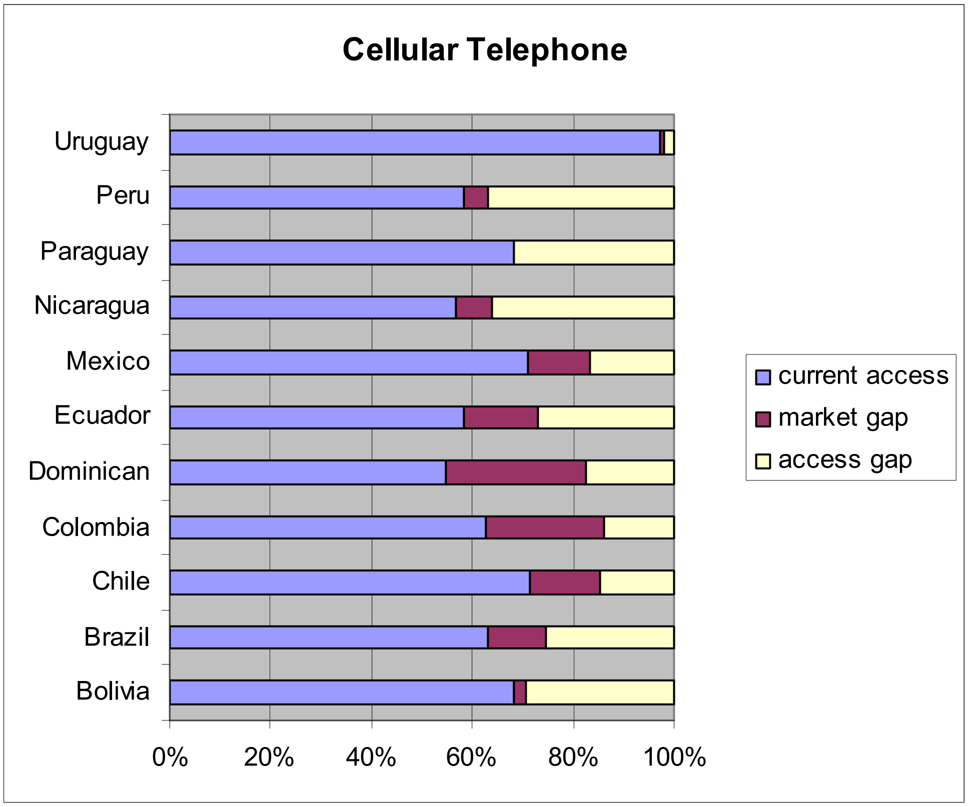
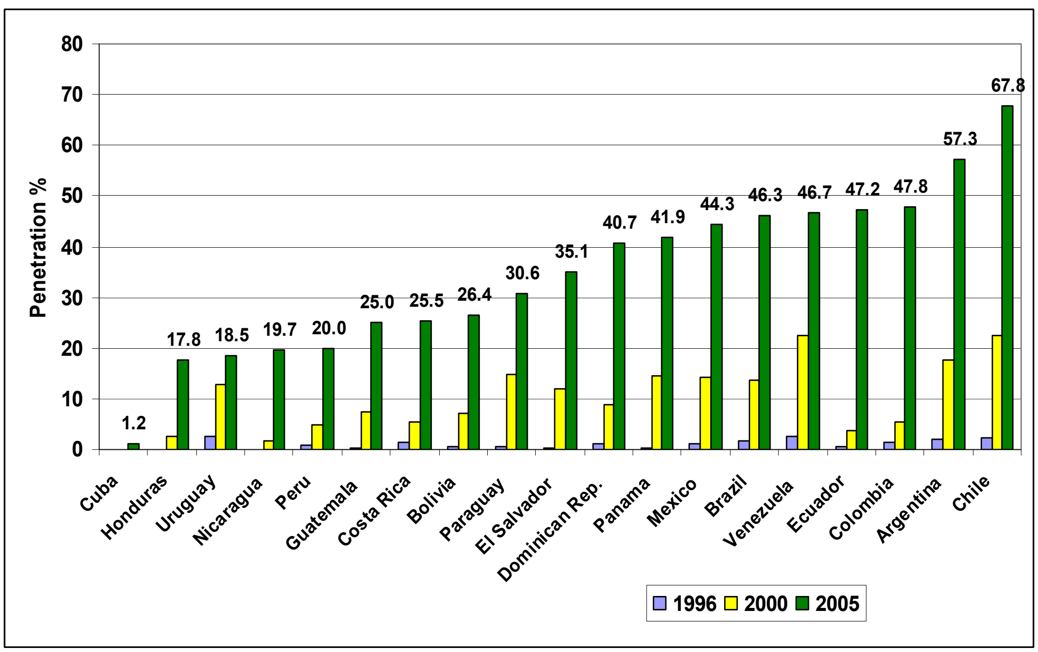


Figure IV.2: Estimated cellular service penetration in Latin America



Cellular mobile networks have expanded rapidly throughout Latin America in recent years, and these trends are reflected in the data (Chapter VI, Figures VI.2, VI.3 and VI.4). On average, over 60% of the combined populations of the 19 countries studied are now covered by cellular network signals. The average penetration rate is 45 cell phone users per 100 population. It is evident from these trends that there are still many areas where prices are unaffordable for large segments of the population. In some cases, the mere availability of cellular network signals may not easily translate into widespread service usage, due, for example, to constraints on access to other resources, including electricity, and to a lack of means to recharge and repair phones and phone cards. Obviously, the largest portion of users are in the urban and peri-urban areas, where penetration may exceed 60% of households. But even in smaller towns and villages, cellular penetration in most of these countries is in the range of at least 10%, and growing steadily.

Nevertheless, the degree of access to cellular voice networks is the primary concern – as access is the pre-requisite for potential usage – and this is what the Gaps model examines. In several of these countries, network signal coverage already encompasses over 70% of their population centers. The lowest access coverage figures in the region are in the Dominican Republic, Ecuador, Peru, and Nicaragua, which exhibit only about 55% to 58% population center coverage. For these and the other countries where significant gaps remain, the model asks: what portion of these areas are likely to be covered by market forces alone, given the underlying economic conditions revealed by the data.

The answers here are encouraging. In many countries, an additional 10% or more of the remaining gap for cellular service access appears to be within the market efficiency frontier, as indicated by the size of the purple yellow portion of bar. In Colombia, another 23% of the country could be efficiently served by market-driven cellular networks. In a few countries, including Paraguay, Bolivia, and Peru, it appears that the market frontier has already been nearly reached.

Many of these cellular networks have only been operating for a few years, and have generally been continuing to expand on their own initiative. There is every reason to expect that cellular coverage will increase in the near term to fill much of these economically viable market gaps. In some cases, further licensing or other regulatory measures to reduce barriers to expansion may be required to reach the market efficiency frontier. The access gaps are in the range of about 20% to 25% in most countries - the populations that they include are typically in the smallest, most isolated towns. About 25% of the town populations in Brazil, and 30% of those in Bolivia, are unlikely to be covered by cellular networks without some form of intervention. The proportions unlikely to be covered in Nicaragua and Peru are even higher - around 35% to 40%. The source of these cellular access gaps is typically the higher costs of deploying both backbone and local transmission facilities in the remote mountainous and jungle regions. These areas have sparse populations with little income, and there are other hindrances that prevent the cost-effective establishment of network services. It is noteworthy that many such areas are included within the market frontier. Still, the model’s estimates show that the potential subsidy cost to reach the last, most remote segments of the populations could be considerable: an aggregate US$43-billion to cover virtually 100% of the unserved access gap throughout the region - more than half of that amount is for Brazil alone. (See the micro-level discussion of selected countries in Section IV.3).

The results shown in Figure IV.1 are approximate, and based upon a variety of assumptions and estimates concerning the input data along with other uncertainties, as explained in Chapter III. Testing these model runs for sensitivity to differing ranges of the inputs and assumptions yields relatively small variations in the overall results. Only with highly unrealistic assumptions regarding higher costs or lower revenues does the net cost to achieve close to 100% access to cellular service increase more than a few percentage points outside of the range indicated in the baseline model results.

This analysis strongly suggests that the liberalization of cellular telephone markets in Latin America has had the expected and desired effect of spreading access to these services quite widely throughout the region without significant need for public financing intervention. Voice telephone service is now realistically within the reach of the majority of the populations of Latin America, at least in terms of network deployment and the basic availability of service. With the continuing rapid expansion of calling party pays (CPP) and pre-paid subscriptions, these services are reaching further and further into lower income strata in particular, and into remote and rural regions, due to the market incentives driving competing cellular operators. Significant access gaps certainly remain, both in terms of network accessibility for isolated areas, and in terms of affordability for the most disadvantaged populations, which often live in such isolated areas. These gaps can be, and are increasingly, the focus of public universal access strategies, which can concentrate resources upon these narrowly defined and targeted constituents, with the confidence that the continued reach of the market, given the opportunity, will take care of the rest.

IV.2.2 Internet and telecenters

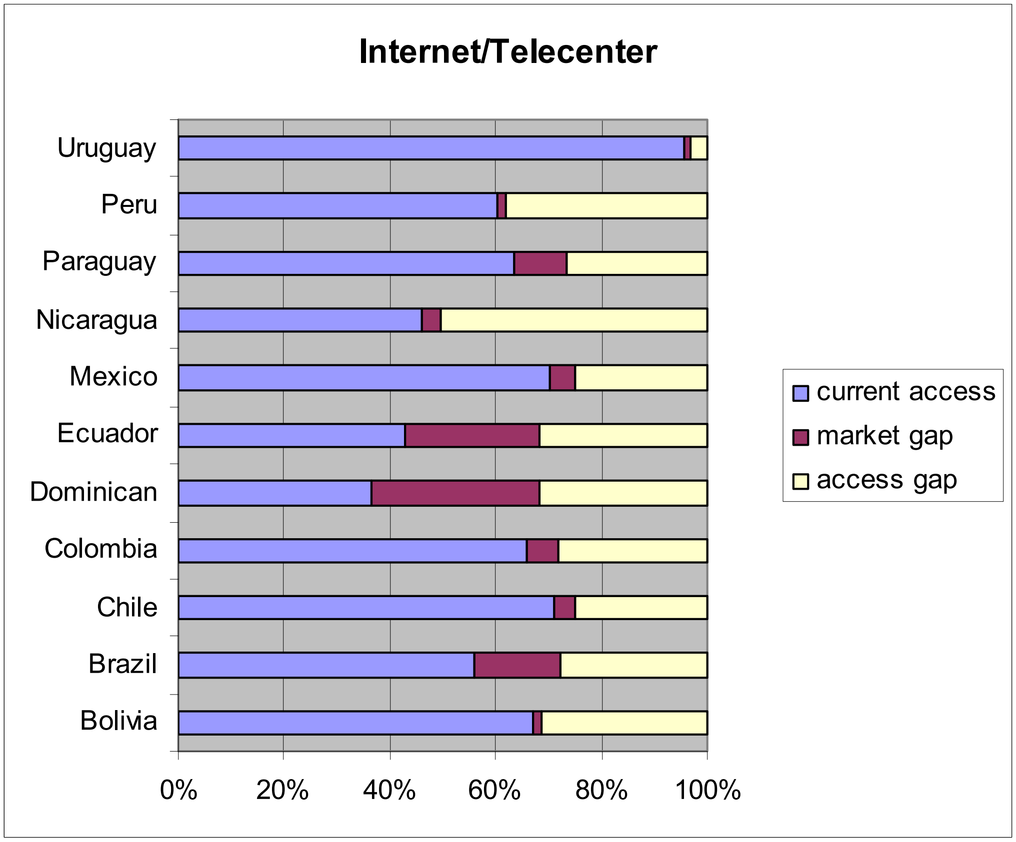
The rapid growth of cellular voice services across Latin America, is beginning to be mirrored by expanding interest in access to Internet connectivity. The market results are reflecting this trend as well.

Here, the definition of access is more ambiguous, as most Internet services still depend upon fixed, wireline-based networks for dial-up connections to end users, although this is changing. Cellular phone service is now most typically an individual, private subscription/pre-paid service. But Internet access for a large proportion of users – probably the majority – is more often a public access phenomenon. Use of computers and Internet connections today is more akin to the role of public pay telephones in an earlier era. Implementation of public pay phones was once the primary emphasis of universal service programs, but that role has now been largely supplanted by private cell phones. In a similar manner, it is quite possible that public Internet access will rapidly migrate toward private, household-based usage models, given trends in technology, costs, and demand. But for the present and immediate future, the model of Internet service for the bulk of potential users, particularly those outside of major urban areas, involves one form or another of public access, from cyber cafés, to telecenters, to connections in schools and universities and the workplace.

This study examines current levels of access both to Internet connectivity in general (i.e., the presence of the network itself), and to publicly available Internet centers, particularly telecenters. There is often little substantial difference between the two measures of Internet access, because the presence of a network allowing Internet connectivity often correlates with the introduction of some type of public access facility.

The baseline results for Internet/telecenter access in the countries studied are shown in Figure IV.3 below:

Figure IV.3: Gaps Model Results for Internet/Telecenter Access



The coverage proportions identified indicate the percentage of persons living in population centers that are (or can be) within reasonable geographic reach of public Internet access. The study asked local researchers and regulatory authorities to identify the proportion of communities, by population, which have access to Internet connections and public telecenters. The current access figures reflect these market input data. As explained in Chapter III.4, adjustments have been made to account for unavailable data on sparsely populated towns. The market and access gap calculations are determined by the model's algorithms.

The degrees of public access to Internet capabilities indicated by these measures vary widely among Regulatel countries, and among different regions within these countries. Uruguay claims nearly complete Internet coverage. The next highest levels of estimated current access are in the range of 65% to 70%, in Chile, Colombia, Mexico, Bolivia, and Paraguay. Yet in most Regulatel countries, there are many regions in which there is extremely limited or no Internet access whatsoever. Nicaragua, the Dominican Republic, Ecuador, and Peru have made the least progress in public Internet availability. As expected, access is greatest in larger cities. In fact, nearly all cities with populations above 100,000 now offer Internet access, a situation that was not so widely the case even a few years ago. In cities of 20,000 to 100,000 inhabitants, Internet access is less common, averaging in the range of 25% to 100%. A much smaller proportion of towns of less than 20,000 inhabitants currently include Internet connectivity or telecenters. These numbers are increasing as well.

The model indicates significant disparities in the scope and potential of market efficiency coverage. For example, both the Dominican Republic and Ecuador could achieve about 68% access to Internet services within the scope of the market's potential, even though current access in both of those countries is currently below 45%. Brazil and Paraguay could achieve 70% to 75% Internet access via the market.

The size of the true access gap for Internet access in most Regulatel countries is quite large, particularly in Nicaragua and Peru, which exhibit gaps of 50% and 38%, respectively. These gaps encompass a large majority of the smallest towns and villages, where public Internet telecenters are not typically available. In most cases, the subsidy cost to fill these gaps is somewhat smaller than for cellular service, with an aggregate estimate of some US$31 billion to reach 100% of the population. However, the full subsidy cost for several countries is greater for Internet service than for cellular telephony. The lower overall total is due largely to the much lower subsidy cost in Brazil for Internet (US$10 billion) than for cellular service (US$27 billion).

These results for Internet and Telecenter access are driven substantially by the underlying assumptions within the model concerning the availability and cost of the technology needed to achieve local Internet access. A system based on a VSAT backbone connected to a WiFi, can be provided for US$40,000 per year in most smaller locations. In order to be sustainable, such a market model needs to generate at least that much in annual revenues, or about US$4,000 per month. To produce a viable business in towns with 5,000 to 10,000 inhabitants, it requires an average net spending, after interconnection charges, of less than US$1.00 per capita per year on public Internet services. In towns with 1,000 inhabitants, the profitability threshold is only US$5.00 net revenue per capita per year, which is usually well within the income allocation assumptions of the model. For these reasons, the model shows very wide market efficiency frontiers for this type of telecenter-based Internet access.

Another factor affecting the viability of Internet connectivity is the prospect of sharing backbone network transmission infrastructure with existing networks, especially cellular networks. For areas that are within adequate reach of those networks, it can be more cost-effective to lease backbone capacity than to use a VSAT connection. To test this option, the model contains a variable for backbone cost calculations, which assigns a range of infrastructure sharing between 0% and 100%. The maximum backbone cost is with a stand-alone connection, i.e., via satellite, where the cost to link to an existing terrestrial backbone would be prohibitively high. But where such capacity sharing would be more efficient, the model utilizes the lower shared cost. Evaluating the results of the two extremes - a 100% shared infrastructure versus satellite connections for Internet service - produces only minor differences in the size and cost of the access gap. This is because in many locations, a default VSAT solution turns out to be more cost-effective than a terrestrial backbone transport. This is often true even if the network can be fully shared, especially if the node is significantly distant from the existing network.

IV.2.3 Broadband

The third major market segment examined by the model is broadband network access. The services with broadband available to end-users are not necessarily distinct from the services under the Internet market segment, but the capacity and quality of transmissions is based upon substantially higher bandwidth. The actual throughput capacity delivered to end-users depends upon a variety of factors, especially the levels of local utilization. In general, the model assumes

a minimum combined capacity (downstream and upstream) of 8 to 32 Mbps, up to 155 Mbps, at the backbone level and combined 4 Mbps at the access level as the standard range for broadband connectivity.

There are a number of important caveats and assumptions involved with the modeling of the actual and potential broadband access markets in Latin America. For the most part, broadband networks and services are quite new and not widespread in the region, especially beyond major urban centers. Even where some degree of broadband deployment is in place, many countries have not collected meaningful data on these facilities, so that inputs regarding current levels of broadband access are either not available or mere estimations. Within a given community, it is generally assumed that if broadband networks are in place, then broadband service is accessible to the entire community, even if this may in reality be an overly simplistic assumption. Thus, an entire city may be identified as having 100% broadband access, even if broadband connectivity is only in place for certain segments of the city. This overly simplified assumption is again a function of the limited scope of available data on broadband deployments.

This model exercise utilized another important set of assumptions involving the type of broadband access technologies that could be deployed in the near future in most markets. Broadband connectivity is typically provided over terrestrial DSL circuits linked to the switched landline telephone network, or over cable TV networks. This is often extremely expensive to deploy outside of high-density settings where such networks are already available. However, key developments in the area of broadband wireless access (BWA) are creating the strong potential to dramatically shift the economics of this segment. For the purposes of modeling forward-looking prospects for broadband access, this study uses consensus industry forecast assumptions about the anticipated costs of these new wireless broadband technologies, rather than costs for traditional DSL or cable-based networks. Cursory study indicates that the latter would be prohibitive for the vast majority of rural and underdeveloped areas for the foreseeable future.

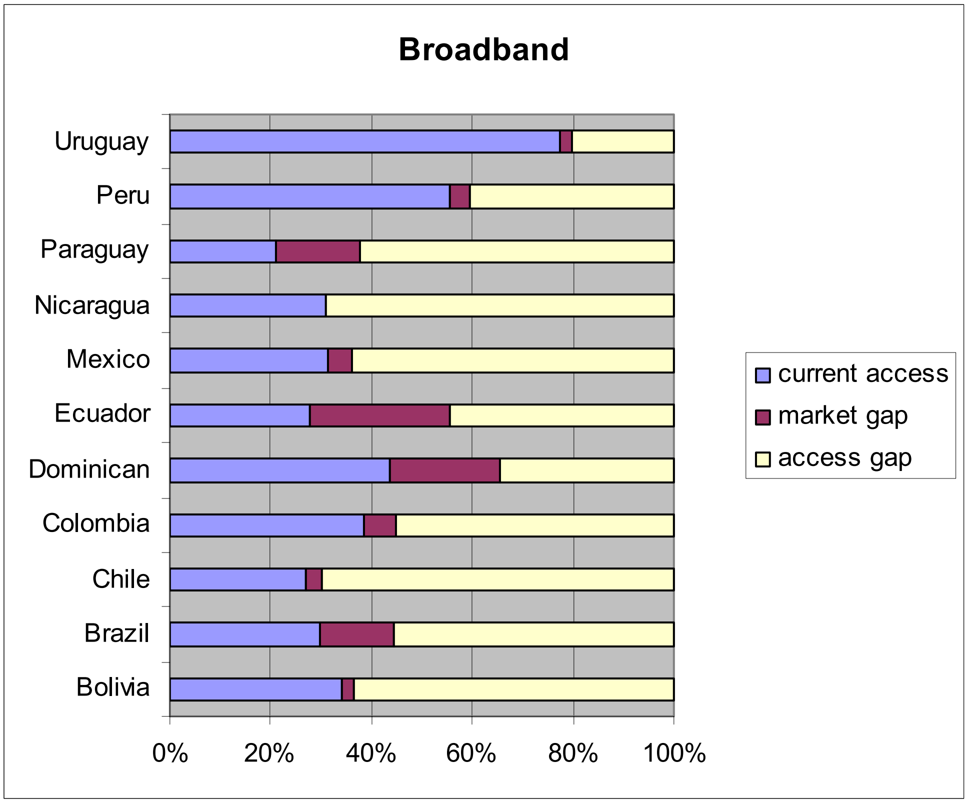
The assumptions, calculations, and results for broadband network access within the Gaps Model are more theoretical than those for cellular telephone and Internet services, because they are based upon newer and relatively untested technology scenarios. Nevertheless, by conducting this exercise with reasonable assumptions about prospective trends in this field, we can establish a view of the potential market opportunities that are opening up, and the locations and characteristics of communities where they may be most viable.

This combination of uncertain inputs and generalized assumptions leads to rather widely varying results from the Model's assessment of broadband markets in Latin America:
The status of broadband markets, actual and potential, is much more uncertain in Latin America, as one would expect given the relatively new technologies and the market interest. In most Regulatel countries, the access gap for broadband is greater than 50% to reach all localities. These results do not indicate actual penetration or usage levels, as that data is not for the most part available.

In a number of Regulatel countries, there are large potential opportunities for market-driven expansion. This type of growth will likely happen as soon as viable pilot projects and public-private undertakings to deploy new broadband access technologies begin to show promise

(Chapter VII). Information concerning these opportunities should be updated as new projects and investments come online throughout the region.

Figure IV.4: Gaps Model Results for Broadband Access



The default approach toward revenue assumptions is that only surplus Internet market revenues will be available to support broadband upgrades. If revenues from other sources become available to add to this base, then the market prospects for broadband services become commensurately more attractive. These additional sources might come in the form of payments from government and institutional customers, or shifts in demand from voice applications toward broadband due to availability of Voice-over-IP service (Chapter IV.4).

IV.3 "Micro" Detail Analysis of Selected Country Results

The usefulness of the Regulatel Gaps Model extends beyond the type of macro comparisons and analysis discussed above. It makes possible a much more detailed assessment of the conditions within individual countries and regions with respect to the location, size, cost, and characteristics of the market and access gaps for telecommunications services. This level of micro-analysis depends upon a substantial level of detailed input data on each district or division within a given country, such as geographic, demographic, and network statistics that may be unique to each location. The study team obtained detailed inputs from five Regulatel countries. This section describes the results of applying the model at the micro level to study the telecommunications sectors and gaps of each of these countries. (Full model runs for all countries studied are provided in electronic form along with this report.)

IV.3.1 Brazil

Brazil, the largest country in Latin America, consists of the capital region plus 26 states, ranging in population from 500,000 to nearly 40,000,000. In this respect, many regions in Brazil are comparable in size and socio-demographic characteristics to several entire countries elsewhere in the region. Therefore, running the Gaps Model at the micro level for each of these larger regions is akin to running it at a macro level for other countries.

Table IV.2 Brazil: Gaps Model summary results

Summary Results **BRAZIL**

Infrastructure shared % **0%**

Region	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**63%**	**75%**	**$27,387,905,988**	**56%**	**72%**	**$10,065,531,371**	**30%**	**44%**	**$10,965,166,261**
ACRE	62%	75%	$87,533,950	51%	70.99%	$33,382,868	22%	44%	$35,841,291
ALAGOAS	60%	75%	$445,086,581	38%	68.71%	$169,742,900	26%	52%	$180,034,500
AMAZONAS	52%	74%	$441,583,193	46%	70.39%	$168,406,811	33%	53%	$178,586,672
AMAPA	61%	74%	$74,896,123	63%	73.27%	$28,563,173	26%	33%	$31,646,113
BAHIA	49%	74%	$2,057,172,189	22%	65.56%	$784,544,824	25%	53%	$831,178,639
CEARA	58%	75%	$1,166,645,978	40%	69.11%	$444,924,381	28%	51%	$472,961,922
Distrito Federal	100%	100%	$0	100%	100.00%	$0	75%	75%	$3,127,451
ESPIRITO SANTO	71%	75%	$509,677,107	60%	73.19%	$186,010,002	25%	43%	$200,631,918
GOIAS	67%	74%	$822,646,790	67%	73.70%	$300,230,340	27%	35%	$335,326,919
MARANHAO	41%	72%	$927,212,131	26%	66.26%	$338,392,147	22%	54%	$356,667,428
MINAS GERAIS	62%	74%	$2,935,377,931	55%	71.60%	$1,071,285,422	25%	48%	$1,143,772,499
MATO GROSSO DO SUL	69%	75%	$340,928,585	68%	74.45%	$124,424,122	28%	39%	$139,121,893
MATO GROSSO	65%	74%	$420,332,610	60%	72.47%	$153,403,142	23%	49%	$163,182,040
PARA	56%	74%	$1,015,944,293	39%	68.83%	$370,775,531	27%	55%	$391,092,440
PARAIBA	51%	72%	$565,013,528	40%	68.18%	$206,205,391	21%	49%	$218,978,542
PERNAMBUCO	58%	74%	$1,299,127,862	44%	69.83%	$474,125,231	28%	49%	$505,999,013
PIAUI	53%	72%	$466,526,912	37%	66.92%	$170,262,055	22%	49%	$180,394,141
PARANA	63%	74%	$1,569,035,692	68%	74.29%	$572,629,863	25%	36%	$638,372,874
RIO DE JANEIRO	72%	75%	$2,389,034,986	68%	74.64%	$871,893,982	42%	48%	$938,284,101
RIO GRANDE DO NORTE	55%	73%	$456,067,889	40%	68.18%	$166,444,966	24%	49%	$177,055,470
RONDONIA	60%	74%	$226,375,644	68%	74.49%	$82,617,275	20%	31%	$93,914,602
RORAIMA	55%	74%	$53,222,095	51%	71.34%	$19,423,752	23%	41%	$21,072,255
RIO GRANDE DO SUL	68%	74%	$1,681,315,974	68%	73.85%	$613,607,288	25%	29%	$703,717,772
SANTA CATARINA	66%	74%	$878,793,697	66%	73.57%	$320,721,521	21%	33%	$359,410,795
SERGIPE	62%	74%	$292,770,981	26%	66.08%	$106,848,689	20%	55%	$112,265,355
SAO PAULO	71%	75%	$6,075,742,971	71%	75.16%	$2,217,382,232	37%	38%	$2,475,960,058
TOCANTINS	53%	70%	$189,840,299	56%	69.43%	$69,283,462	14%	34%	$76,569,559

The cellular telephone market covers 63% of town populations, with a remaining market gap of another 12%. Most individual regions generally mirror these conditions, with cellular coverage in the 60% to 65% range. There are some glaring exceptions: In Bahia, access is 49%, with a market frontier of 74%. In Maranhao, access is 41%, with a market frontier of 72%. Regulators should examine what barriers might be preventing cellular operators from expanding service further into these provinces. The areas that are within the market frontier, but are not currently served, tend to be cities of greater than 20,000 inhabitants. There are around 190 such cities in Brazil currently without cellular network coverage.

The access gap is nearly the same size in all regions, between 25% and 30% of the market. These gaps typically include most towns with less than 1,000 inhabitants. In Tocantins, for example, which has the largest access gap at 30%, there are an estimated 900 such towns, spread throughout an area of some 200,000 square kilometers.

Table IV.3 Brazil: Cell phone market results

Population	Cell Phone Market Results								
	Current Market		Average Net Cost per Town			Gap Results			
Population size	Towns unserved	Pop unserved	Annual Cost	Annual Revenue	Net Annual Cost	Addressable Pop (total)	Uneconomic Pop (total)	Net Annual Deficit	
>500k	0	0	$0	$0	$0	0	0	$0	
100 to 500K	0	0	$0	$0	$0	0	0	$0	
20 to 100K	0	0	$0	$0	$0	0	0	$0	
10 to 20K	6	53,626	$451,810	$635,220	-$183,409	48,264	5,363	$0	
5 to 10K	19	106,236	$259,273	$355,559	-$96,286	95,613	10,624	$0	
1 to 5k	13	47,297	$173,570	$202,929	-$29,359	42,567	4,730	$0	
0.3 to 1K	157	111,072	$83,317	$34,418	$48,899	0	111,072	$7,673,816	
<0.3 K	732	183,086	$70,784	$9,352	$61,433	0	183,086	$44,989,731	
						186,444	314,874	$52,663,546	total

The cellular market results also show the net subsidy cost that would be required under prevailing conditions to eliminate the uneconomic access gap. The total nationally, is about US$27 billion, with widely varying amounts needed for different regions. In Sao Paolo, for example, the subsidy cost to eliminate the access gap would be over US$6 billion, whereas in Amapa it would cost only US$75 million.

The model results for Internet access in Brazil are based on the forward-looking technology and market assumptions discussed above. Pubic Internet access is within reach of 56% of the population centers through telecenters or the equivalent. The market efficiency gap is another 16%, meaning that local Internet access for some 72% of the country is within reach of the market at the community level. There is a strong basis for encouraging and promoting market-based public Internet access throughout the country. However, it would be necessary to test these findings by evaluating the sustainability of small telecenters in various representative settings using affordable technology solutions.

As explained in Chapter V.2.3, the data on current levels of access to broadband networks is based primarily on estimates, but the model can still reasonably project the potential frontiers and gaps. The data indicates that current access is about 30% of the market, and the market frontier is about 44%. This includes all urban areas regardless of their size. The theoretical subsidy cost to achieve universal broadband access would be about US$11 billion. The market frontier for broadband access in Sergipe is 55%. That is the second highest in the country beyond the Federal District, even though Sergipe is one of the smaller provinces overall, and only has an estimated 20% broadband access. The broadband market frontier for Sao Paulo, on the other hand, is 38%, with access at 37%, and it would require over US$2.4 billion in subsidies to close the gap. Upgrading to broadband in this large urban area may not be very cost-effective for current operators. However, the model assumes that no new revenue streams are directly generated by broadband upgrades - that users will spend essentially the same amount, in the aggregate, for Internet access whether it is for broadband or narrowband service. This assumption is appropriate for determining the threshold size of the market in most areas, especially those where incomes are relatively low, and little or no Internet service is currently available. In those areas, broadband can only be justified by the surplus demand beyond that for basic Internet connectivity. However, in wealthier urban areas such as Sao Paulo additional demand for broadband level Internet is likely to materialize among higher income strata, where such service would be affordable as a luxury beyond basic connections. The model does not seek to measure this type of luxury demand, and no data was collected on this aspect of the higher-end market. Therefore, the model undoubtedly underestimates the true market opportunity in these wealthier areas. The more immediately useful findings are those in other provinces with lower incomes, where significant additional demand for broadband is unlikely.

IV.3.2 Bolivia

There are nine departments in Bolivia, ranging in population from 52,000 to over 3,000,000, with similarly wide variations in population densities and other demographic conditions. Bolivia's telephone industry has always stood out from the rest of Latin America, in that 13 different local cooperatives, some of which are extremely small, have provided local services in conjunction with the national operator, Entel. All departments provided detailed data on telephone access. The statistics for fixed vs. mobile or Internet access and broadband access are only estimates. Nevertheless, these disaggregated inputs allow reasonable approximations of the present state of the market, and of the market and access gaps for the different service categories. An important component of the input data indicates the presence of over 27,000 very small villages in Bolivia, that have populations below 300 persons. Taking into account the requirements to install facilities in each of these small villages, tends to drive up costs and decrease the scope of the market efficiency frontier significantly. Therefore, we ran an alternative scenario of the model, which excluded these smallest villages. This yielded quite different results. Both sets of results are shown in the chart below:

Table IV.4 Bolivia: Gaps Model summary results

Summary Results **BOLIVIA**

Infrastructure shared % **0%**

Region	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**68%**	**71%**	**$2,568,998,372**	**67.0%**	**69%**	**$3,155,825,673**	**34%**	**36%**	**$1,510,372,758**
BENI	70%	73%	$208,823,900	68.5%	71.78%	$92,397,323	13%	13%	$84,369,966
CHUQUISACA	45%	46%	$203,164,951	43.9%	45.32%	$396,049,951	18%	22%	$123,164,488
COCHABAMBA	68%	76%	$174,110,873	66.8%	68.82%	$420,598,410	31%	36%	$132,626,309
LA PAZ	71%	72%	$502,996,112	70.2%	71.07%	$753,927,195	46%	49%	$338,205,946
ORURO	65%	70%	$232,628,990	64.1%	65.34%	$399,881,380	26%	30%	$129,210,253
PANDO	47%	47%	$90,120,740	46.0%	46.03%	$41,874,204	10%	10%	$35,106,243
POTOSI	38%	39%	$499,711,842	36.9%	38.42%	$712,058,949	12%	12%	$298,824,683
SANTA CRUZ	82%	84%	$511,608,387	80.0%	82.42%	$244,684,846	43%	43%	$292,820,998
TARIJA	72%	72%	$145,832,578	70.9%	70.91%	$94,353,415	24%	24%	$76,043,872

Alternative results excluding smallest towns (< 300):

Region	Cellular Current Access	Cellular Market Frontier	Cellular Access Gap Capital Cost	Telecenter Current Access	Telecenter Market Frontier	Telecenter Access Gap Capital Cost	Broadband Current Access	Broadband Market Frontier	Broadband Access Gap Capital Cost
National	**89%**	**90%**	**$283,355,391**	**87.5%**	**89%**	**$103,964,882**	**45%**	**45%**	**$245,477,963**
BENI	88%	88%	$34,499,048	85.6%	89.69%	$4,519,125	16%	16%	$11,693,530
CHUQUISACA	78%	80%	$28,173,132	76.9%	79.40%	$12,757,345	32%	32%	$17,636,626
COCHABAMBA	88%	91%	$32,748,453	86.6%	89.31%	$17,294,253	41%	41%	$44,706,130
LA PAZ	91%	92%	$61,919,265	89.7%	90.83%	$29,228,520	60%	60%	$55,163,610
ORURO	92%	92%	$9,583,943	90.8%	92.64%	$3,188,521	37%	37%	$7,996,287
PANDO	85%	85%	$8,283,372	84.1%	84.07%	$641,214	18%	18%	$1,750,603
POTOSI	79%	79%	$34,206,939	77.7%	77.71%	$11,669,090	26%	26%	$22,161,302
SANTA CRUZ	91%	91%	$61,647,998	89.0%	91.76%	$19,174,763	48%	48%	$69,120,270
TARIJA	89%	89%	$12,293,242	88.2%	88.18%	$5,492,051	30%	30%	$15,249,605

The results show that if the data for the villages of 300 inhabitants or less are excluded, the costs are much lower and the prospects for universal access appear significantly more realistic. As a practical matter, many small towns are likely to be within nearby distance of larger towns, so that their populations will often gain some degree of access in any case through adjacent communities.

Including the towns with less than 300 inhabitants in the analysis, the model indicates that current cellular telephone access is 68%, the market frontier is 71%, and it would cost some US$2.5 billion in net subsidy to close the gap. Excluding those towns, the model indicates that current access is 89%, the market frontier is 90%, and the subsidy cost to close the gap would be US$283 million. The differences are most pronounced in the departments with the lowest current penetration, especially Chuquisaca and Potosi. In those two departments, current access is below 50%, and so is the market frontier. About half of the populations of those two departments live in towns of 300 or fewer inhabitants. Excluding the towns of 300 or fewer inhabitants, the market frontier jumps to nearly 80%. The net cost to extend coverage to the entire department, including towns of 300 or fewer inhabitants, would be about US$200 million for Chuquisaca and US$500 million in Potosi. It would require a micro-study of those departments specifically, however, to determine to what extent strategically placed network deployments might allow coverage of many or most of these isolated small towns on the most cost-effective basis.

In Bolivia nationally, the current access for public Internet service is 67%, the market frontier is 69%, and it would require a subsidy cost of US$104 million to close the gap. When towns with less than 300 inhabitants are excluded, the current access increases to 87%, the market frontier extends to 89%, and the subsidy jumps up to US$3 billion. What characteristics of the Internet market segment drive these results for Bolivia? In essence, it is the size and number of small towns in the regions, even when the sub-300 towns are removed from the analysis. It is not financially practical for the market to establish sustainable telecenters in most towns with populations even up to 1,000, given the level of fixed costs in comparison with the low revenue potential. In a more in-depth market analysis, either an entrepreneur or regulator might examine to what extent centralized telecenters might be of value to groups of towns together, and therefore financially viable as at least an interim step toward further expansion, but that is beyond the scope of this study.

In Bolivia, as in Brazil, we have only general estimates on current levels of broadband service, although anecdotally such service is available at least in La Paz and Santa Cruz, but not much elsewhere. The model does not find more than a handful of areas in which the expansion of broadband access would be commercially viable under prevailing and forecast conditions. The factors affecting these results for urban areas are essentially the same as for Brazil, but the market potential for the entire country appears to be much less attractive. This is probably a conservative assessment, as there are likely pockets outside the cities where growing Internet demand could generate sufficient revenues to justify upgrades to affordable (wireless based) broadband connections. Excluding towns with less than 300 inhabitants, the estimated net subsidy cost to upgrade the entire country to broadband capacity is US$245 million. Including those towns, the estimated net subsidy cost is over US$1.5 billion.

IV.3.3 Colombia

Perhaps the most disaggregated micro level data obtained during this project is from Colombia, representing detailed provincial information from all 32 departments. Among the largest of these departments are Cudinamarca and Valle, with total populations of 9,300,000 and 4,5000,000, respectively. Among the smallest are Guainia and Vaupes, which contain fewer than 50,000 persons, and have population densities of less than one person per square kilometer.

Colombia has already achieved significantly high levels of access to both cellular network coverage (63%) and public Internet services (66%). This is particularly true among population centers above 1,000 persons. Columbia has an estimated 38% access to broadband networks.

Table IV.5 Colombia: Gaps Model summary results

Summary Results **COLOMBIA**

Infrastructure shared % **0%**

Region	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**63%**	**86%**	**$1,308,748,298**	**66%**	**72%**	**$3,319,005,652**	**38%**	**45%**	**$1,255,932,541**
AMAZONAS	56%	71%	$14,588,785	55%	69.01%	$5,731,969	0%	0%	$5,437,753
ANTIOQUIA	60%	83%	$112,200,911	57%	63.25%	$419,920,236	38%	47%	$146,687,831
ARAUCA	44%	73%	$37,071,956	70%	75.14%	$20,212,336	13%	16%	$18,771,998
ATLANTICO	72%	97%	$0	72%	75.44%	$162,629,453	56%	60%	$7,762,792
BOLIVAR	64%	84%	$48,369,301	66%	72.40%	$161,807,803	33%	42%	$60,896,992
BOYACA	56%	82%	$49,990,240	59%	71.48%	$103,930,403	24%	51%	$52,375,389
CALDAS	59%	83%	$4,825,051	71%	75.36%	$85,010,620	24%	28%	$19,128,545
CAQUETA	46%	74%	$66,807,213	68%	74.66%	$33,622,575	25%	25%	$32,444,685
CASANARE	43%	73%	$44,724,861	60%	64.40%	$23,561,768	13%	13%	$23,225,131
CAUCA	41%	73%	$75,514,200	63%	69.27%	$101,226,203	13%	14%	$70,390,751
CESAR	65%	75%	$60,479,803	69%	75.02%	$77,503,833	26%	26%	$53,674,711
CHOCO	29%	72%	$62,474,900	39%	60.19%	$34,094,506	19%	19%	$30,682,011
CORDOBA	65%	84%	$60,496,533	71%	75.24%	$102,231,636	14%	18%	$64,292,677
CUNDINAMARCA	70%	97%	$0	71%	75.28%	$661,564,928	58%	63%	$58,939,215
GUAINIA	61%	61%	$13,486,090	60%	70.17%	$3,075,481	0%	0%	$3,080,910
GUAVIARE	38%	73%	$21,889,370	37%	40.60%	$9,693,066	0%	0%	$9,447,529
HUILA	55%	83%	$48,977,667	65%	72.07%	$72,726,467	27%	36%	$48,910,050
LA GUAJIRA	70%	76%	$68,925,328	68%	74.66%	$39,041,224	29%	32%	$32,985,482
MAGDALENA	62%	83%	$52,087,164	55%	63.61%	$110,323,672	15%	23%	$57,851,655
META	59%	74%	$104,792,233	67%	74.14%	$56,017,200	35%	35%	$50,753,179
NARINO	47%	82%	$79,607,905	52%	68.40%	$130,189,997	12%	20%	$82,334,397
NORTE DE SANTANDER	60%	83%	$46,910,762	61%	70.81%	$108,240,894	46%	52%	$50,828,353
PUTUMAYO	26%	72%	$48,896,742	56%	60.67%	$27,274,020	0%	2%	$26,317,326
QUINDIO	68%	97%	$0	71%	75.28%	$42,810,691	45%	50%	$4,267,891
RISARALDA	66%	97%	$0	72%	75.54%	$71,819,648	51%	55%	$9,603,731
SAN ANDRES	70%	97%	$0	69%	74.96%	$5,704,485	65%	72%	$96,114
SANTANDER	64%	83%	$65,593,381	67%	73.88%	$152,480,088	47%	55%	$71,314,267
SUCRE	64%	96%	$0	70%	74.98%	$61,815,719	25%	34%	$10,809,095
TOLIMA	59%	83%	$26,506,971	69%	74.72%	$97,086,310	25%	32%	$36,386,638
VALLE	71%	84%	$79,414,754	72%	75.48%	$328,768,201	49%	54%	$108,460,914
VAUPES	63%	68%	$2,081,629	63%	67.15%	$2,031,919	0%	0%	$1,553,650
VICHADA	15%	70%	$12,034,549	15%	27.82%	$6,858,301	0%	0%	$6,220,876

The current situation regarding penetration in Colombia is quite different from Brazil, with average cellular subscription at about 23%. The market frontier for cellular telephone access in Colombia is fully 86%. Nevertheless, the estimated net subsidy cost to achieve full coverage of all towns is over US$1.3 billion. This is because the remaining 14% of locations are made up of thousands of towns and villages, which are widely dispersed across the different provinces. For example, the current access and the market frontier in the Amazonas province is 56%. The populations without access consist of some 18,000 persons spread across about 54 towns, in an area covering 46,000 square kilometers. (Note that the three largest towns are within the market frontier.) The net annual cost to bring cell phone service to just one of these towns is in the range of US$50,000 to US$80,000, and the overall one-time subsidy to deliver service to all of them would be about US$4 million. The following table shows the model's internal calculations for Amazonas for the build-out of cellular service:

Table IV.6 Amazonas: Cell phone market results

Region: AMAZONAS

Population centres	Cell Phone Market Results							
	Current Market		Average Net Cost per Town			Gap Results		
Population size	Towns unserved	Pop unserved	Annual Cost	Annual Revenue	Net Annual Cost	Addressable Pop (total)	Uneconomic Pop (total)	Net Annual Deficit
>500k	0	0	$0	$0	$0	0	0	$0
100 to 500K	0	0	$0	$0	$0	0	0	$0
20 to 100K	0	0	$0	$0	$0	0	0	$0
10 to 20K	0	0	$0	$0	$0	0	0	$0
5 to 10K	2	8,065	$528,909	$678,671	-$149,762	7,259	807	$0
1 to 5k	1	3,001	$363,925	$402,806	-$38,881	2,701	300	$0
0.3 to 1K	10	7,049	$122,852	$68,318	$54,534	0	7,049	$543,100
<0.3 K	44	11,096	$98,023	$18,660	$79,363	0	11,096	$3,503,971
						9,960	19,251	$4,047,071 total

Caqueta, Guainia, Guaviare, and other provinces with highly dispersed and remote population centers present similar results. The policy-makers for these locations must determine the priority social and economic value of helping to extend the national mobile networks to these last outposts, as opposed to other possible subsidy and development choices.

In Colombia, 66% of communities already have public access to the Internet, apparently at the district or sub-regional level (presumably through dial-up connections). Further extension to about 72% access would be economically viable. The remaining access gap of 38% would require subsidies in the overall range of US$3.3 billion.

The data provided for Colombia do include estimates of the current levels of access to broadband networks, with total coverage currently at about 38%. This includes all larger cities, as well as some moderate-sized cities, but virtually no smaller towns and villages. Note that this access finding is far larger than actual present broadband service penetration or subscription levels, which are apparently in the range of only 2%. As explained above, community-based access to broadband networks is merely the starting point for service penetration, and we can assume that broadband take-up will expand over time in those areas where networks have become available, particularly as retail prices decline. Current access levels are somewhat below the market frontier of around 45%. Some further extension of broadband access would be commercially attractive, but more than half the market is not yet economically viable for broadband deployment, even assuming forward-looking technologies. Again, this result is driven by the conservative assumption that no additional revenue streams would be available for broadband, given the fact that basic Internet access is already portrayed as nearly universal. As the market evolves, especially in urban areas, it may well be that additional demand for high-speed services will change the equation.

IV.3.4 Mexico

The study utilizes detailed data for all 31 states in Mexico concerning deployment of cellular mobile networks and public Internet telecenters - current broadband access data could only be estimated. The data provided were at the level of municipals, rather than individual towns and villages, but these inputs have been extrapolated to estimate the population and network distribution in smaller towns throughout the country. Cellular coverage and public Internet access are widely available throughout the country, reaching about 70% of the population.

Table IV.7 Mexico: Gaps Model summary results

Summary Results **MEXICO**

Infrastructure shared % 0%

Region	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**71%**	**83%**	**$3,647,571,211**	**70%**	**75%**	**$5,605,172,056**	**31%**	**36%**	**$2,700,992,654**
Aguascalientes	72%	84%	$4,426,061	72%	76%	$67,085,884	41%	45%	$14,692,395
Baja California	73%	76%	$221,641,012	72%	76%	$180,880,136	48%	48%	$131,652,247
Baja California Sur	73%	76%	$62,607,988	72%	76%	$30,836,058	30%	30%	$28,216,615
Campeche	72%	76%	$94,238,873	71%	75%	$50,226,573	27%	28%	$45,738,539
Chiapas	71%	84%	$181,730,299	70%	75%	$285,125,386	21%	30%	$186,599,430
Chihuahua	71%	76%	$416,094,759	70%	75%	$222,005,933	36%	38%	$196,769,015
Coahuila	72%	76%	$309,568,359	72%	75%	$167,114,549	37%	38%	$148,423,106
Colima	72%	84%	$8,940,567	71%	75%	$39,220,531	25%	29%	$13,088,818
Durango	71%	76%	$197,745,608	71%	75%	$105,345,933	26%	28%	$97,489,292
Guanajuato	73%	84%	$21,291,131	72%	76%	$331,220,319	34%	37%	$72,660,567
Guerrero	67%	76%	$168,357,083	59%	73%	$223,950,599	27%	37%	$150,497,096
Hidalgo	69%	84%	$28,964,475	69%	75%	$160,807,385	13%	21%	$50,326,012
Jalisco	71%	84%	$162,376,441	71%	75%	$459,732,954	35%	40%	$192,820,546
Mexico	72%	97%	$0	72%	76%	$906,375,087	37%	41%	$53,477,418
Michoacan de Ocampo	71%	84%	$132,240,944	70%	75%	$289,835,793	25%	37%	$141,249,002
Morelos	72%	97%	$0	67%	71%	$108,983,244	24%	29%	$11,837,192
Nayarit	72%	76%	$85,070,235	72%	76%	$66,915,412	22%	23%	$52,869,488
Nuevo Leon	72%	84%	$156,542,242	71%	75%	$278,816,895	40%	44%	$160,154,679
Oaxaca	64%	70%	$284,074,621	63%	69%	$255,209,105	16%	16%	$183,077,438
Puebla	68%	84%	$21,950,998	68%	74%	$360,470,877	25%	41%	$77,441,873
Queretaro	72%	84%	$15,253,357	72%	76%	$100,697,272	35%	39%	$27,945,621
Quintanaroo	73%	76%	$116,546,668	72%	76%	$63,626,890	30%	30%	$56,421,603
San Luis Potosi	71%	76%	$186,782,403	71%	75%	$167,208,357	28%	29%	$123,393,310
Sinaloa	73%	76%	$165,829,714	72%	76%	$184,478,079	36%	39%	$129,094,104
Sonora	71%	76%	$303,220,949	70%	75%	$161,216,923	34%	36%	$143,328,488
Tabasco	73%	84%	$51,892,359	72%	76%	$137,572,898	34%	38%	$60,162,285
Tamaulipas	72%	76%	$250,184,064	71%	75%	$200,212,984	31%	32%	$151,566,475
Tlaxcala	66%	83%	$46,899,900	66%	74%	$47,880,653	13%	22%	$60,659,867
Veracruz	71%	76%	$768,604,976	69%	69%	$558,491,555	22%	22%	$388,110,755
Yucatan	67%	83%	$117,498,773	66%	73%	$106,887,210	30%	39%	$92,982,509
Zacatecas	69%	84%	$86,695,366	69%	75%	$81,141,714	20%	27%	$81,079,102

The market frontier for cellular access is about 83%, with 17% of the market - mostly smaller towns - falling outside the market gap. The region with the lowest current access is Oaxaca, with 64% cellular coverage, a market frontier of 70%, and a subsidy cost of nearly US$300 million to serve the remaining areas. Closing the gap in other regions would also be quite expensive: US$768 million in Veracruz, US$300 million in Sonora and Coahuila, and US$416 million in Chihuahua.

The Internet access in Mexico is 70%, and the market frontier is 75%. Oaxaca is again the lowest current access, at 63%. Total subsidies required to establish public Internet access throughout the country would be in the range of US$5.6 billion.

Current access to broadband networks was estimated to be only 31%, with a market frontier of 46%. The estimated subsidy cost to close the gap is high – about US$100 million to US$150 million or more for most states. Again, evolution of this market may change those conditions in the near future.

IV.3.5 Chile

There are 12 regions in Chile, ranging in size from 92,000 to 6 million inhabitants. The input data for each region, like for Mexico, was at the level of Communes, rather than individual towns. The data has been extrapolated to cover estimated population distribution among smaller towns, and estimated network and service coverage as well. The current access data for broadband is estimated based on the service penetration in the fast growing Chilean broadband market.

Table IV.8 Chile: Gaps Model summary results

Summary Results CHILE

Infrastructure shared % 0%

Region	Cellular Telephone			Telecenter/Internet			Broadband		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**72%**	**85%**	**$920,427,719**	**71%**	**75%**	**$1,098,339,401**	**27%**	**30%**	**$633,786,404**
I REGION	71%	76%	$65,063,369	71%	75%	$30,995,385	32%	32%	$32,957,629
II REGION	72%	76%	$92,180,396	71%	75%	$37,303,973	32%	32%	$45,244,609
III REGION	71%	76%	$49,282,588	70%	75%	$19,206,551	24%	24%	$25,430,820
IV REGION	72%	76%	$85,682,235	71%	75%	$44,320,209	28%	28%	$48,938,605
V REGION	71%	84%	$29,567,132	70%	75%	$115,705,871	24%	34%	$40,477,090
VI REGION	71%	76%	$42,471,367	70%	75%	$60,973,817	19%	25%	$45,787,025
VII REGION	70%	76%	$99,770,196	70%	75%	$66,660,625	21%	24%	$62,816,709
VIII REGION	71%	76%	$99,760,203	71%	75%	$142,844,312	25%	27%	$110,842,246
IX REGION	71%	76%	$105,497,617	70%	75%	$67,500,245	20%	22%	$66,085,887
X REGION	70%	76%	$151,438,812	70%	75%	$78,775,552	21%	24%	$91,283,003
XI REGION	66%	66%	$50,206,175	65%	65%	$7,345,299	15%	15%	$11,445,241
XII REGION	71%	71%	$49,507,630	71%	74%	$11,389,845	31%	31%	$14,058,072
XIII REGION (RM)	73%	97%	$0	72%	76%	$415,317,718	31%	35%	$38,419,468

Both the cellular and the Internet markets have reached about 71% to 72% coverage, with a market frontier of 85% for cellular, and 75% for Internet. The cost to expand to the final 15% of the cellular market is about US$920 million, suggesting that these unserved areas are indeed extremely remote and costly. Similarly, the 25% of the country lacking public Internet access would require over US$1.0 billion in subsidy to close the gap. The estimated results for broadband indicate a current access of only 27%, and a market frontier of only 30%. The same caveats apply to Chile as to the other countries with respect to broadband opportunities: it is important to recognize that there is still considerable room for continued growth in the broadband market within those municipalities where such networks are already available.

IV.4 Analysis of findings and implications for policy-makers

At the outset, we must again acknowledge the effectiveness of market access policies in generating investment and growth throughout the region, especially for cellular mobile telephone services. As has been increasingly acknowledged in telecommunications development circles, cellular telephones have become the new basic service of choice. In less than a decade, levels of availability, affordability, and convenience for cellular telephones have far exceeded what traditional fixed-line telephones were able to achieve in nearly a century. The main emphasis of universal access policies concerned with voice telephony – indeed even those aiming to shift toward universal voice service – should reflect these market realities. Policy-makers should avoid investing scarce resources in fixed network deployments, where mobile services can, and often already do, serve the market with little or no subsidy.

The work of the cellular market is not yet complete - most countries have yet to see their mobile networks extend all the way to the market frontier. This may be due to lingering entry and investment barriers, or the fact that network build-outs are proceeding at their own pace, and take a certain amount of time to reach all segments, with the least profitable inevitably saved for last. In either case, the focus of policy should be on further enabling market forces to seek out and reach these unserved areas. Policy-makers should avoid distorting or artificially propping up these markets with such things as unneeded subsidies. Public funding initiatives aimed at helping to accelerate universal access to voice telephony need to be carefully tailored to avoid pre-empting market forces, as long as operators are available and willing to expand toward the frontier on their own. The policy concerns regarding the true access gaps involve not only identifying and quantifying these gaps on a case-by-case basis, but determining what socio-economic criteria and priorities should drive allocation of public resources to fill those gaps. The net cost to reach the last unserved, uneconomical segments of the population with mobile or other networks can be extremely high. It is wise to consider the cost-benefit tradeoffs of financing such investments, as opposed to alternative uses of the same limited funding resources.

As in the case of cellular access, the market should be able to do much of the work to close the gap in Internet access, without significant subsidy incentives. Internet access could be financially viable for large segments of many Regulatel countries. The market frontier for Internet service may be far beyond present levels of access, even toward nearly universal access itself. For those countries that have not yet seen growth patterns in Internet services comparable to the cellular market, there is strong evidence to suggest that those patterns will eventually take hold, given appropriate incentives and opportunities for market forces to do their work.

The Internet business model that is utilized in this analysis does not depend upon connectivity to the traditional national networks, but instead allows for independent access via VSAT and local telecenters wherever this appears most cost-effective. It may be that much of the existing market gap for this Internet access is attributable to barriers to the establishment of such stand-alone networks. We have found several instances of successful networks built along these lines (Chapter VII and Annex 3). But these approaches are only just beginning to receive favorable support in many countries, both among policy-makers and the business community. The network architecture involved in this scenario also allows for public voice access via the telecenters. Therefore, in some instances where cellular access may be unaffordable, the Internet solution would also provide the voice telephony solution. In other locations, both types of networks can be economically attractive, so that the two services can complement each other, thereby giving consumers additional options. This analysis is in keeping with the qualitative results discussed in the chapters that follow, concerning the need to highlight and encourage development of small, localized telecommunications operations that do not require control by large national operators. Moreover, the incentives required to encourage expansion of these options do not depend so much upon lucrative financial resources as on market entry opportunities and a receptive regulatory regime.

Finally, the model's review of the broadband market, while it depends upon less reliable data and more forward-looking assumptions, nevertheless supports a conclusion that broadband connectivity is very much within the range of options for telecommunications development across much of Latin America. Recall that one of the key assumptions influencing the model's estimates of the market and access gaps for broadband networks in particular is the fact that it does not directly attribute "new" revenues to such networks, because users' incomes are assumed to be allocated to services rather than technologies. This is, however, a conservative assumption for several reasons. First, for higher income users, improved transmission capacity will indeed be likely to generate higher revenues, although, since these customers tend to be mainly in urban areas, this effect by itself may not have much influence upon expansion of broadband access to more remote regions. Additional important factors, however, could be more decisive. One of these is the capability of broadband networks to deliver VoIP service at very low prices, in addition to traditional Internet services. Including such service in the analysis would have the effect of transferring a considerable slice of what are now voice revenues toward the Internet, and specifically the broadband market category. While there would undoubtedly be losses to the voice telephone industry, the gains for the broadband segment could be significantly greater, and the resulting business climate for broadband connectivity, even in smaller, more remote locations, would be potentially very substantial. Similarly, broadband networks could also benefit from revenue contributions from other customer sources, such as local governments, schools, and businesses. Particularly where wireless access technologies can be deployed, each of these groups can potentially utilize the network without incurring additional infrastructure costs, and where there is adequate high-speed capacity, this type of demand, and hence revenues, could be quite significant.

In this respect, the model results probably establish a low-end, conservative boundary for what the telecommunications markets in Latin America can continue to achieve through economic and regulatory incentives, and new technological and service configurations. It suggests that there is considerable room for market-based growth, and even more with strategically targeted subsidies, and that perhaps the most promising medium to longer-term approach in many locations will be the provision of integrated services over broadband access networks.

V. UNIVERSAL ACCESS PROGRAMS IN LATIN AMERICA

V.1 Introduction

Latin American governments and regulators have pursued a wide variety of approaches to promote expansion of access to telecommunications networks and services. Most have followed multiple policies at the national and local levels, but often with a central set of initiatives, whose primary focus has been on an official universal access program of one kind or another. This chapter presents an overview of these key approaches, and summarizes the main features and characteristics of the different mechanisms. Chapter VI critically evaluates the results that these programs have achieved.

Section III.2 described four general approaches toward universal access policies and programs that the 19 Regulatel countries have utilized, namely: (i) Market liberalization combined with regulatory initiatives (almost all countries have adopted aspects of this approach); (ii) Universal access fund programs (12 countries out of which 10 are functioning); (iii) Other financing methods and project initiatives by national, state and local governments, cooperatives, NGOs, etc. (13 countries); and (iv) State-mandated and controlled approaches using cross-subsidies and other financing sources (3 countries).

Table V.1 and the sections that follow describe how various Regulatel countries have adopted these four approaches.

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Argentina	**Decreto 764/2000**, which introduces a fully liberalized licensing regime; **Res. 161/2005,** which promotes the use of the 450 MHz band for local access.	**Fondo Fiduciaro del Servcio Universal (FFSU)** was approved as part of the Decree 764/00 (Reglamento General de Servicio Universal, or RGSU). It exists in legislation, but has never been established.	**Programa Nacional para la Sociedad de la Información** (1999–2000), for 3,000 telecentres; Initiatives of local cooperatives.	
Bolivia	**Ley de Telecomunicaciones** (Ley No. 1632 de 5 de julio de 1995), **Plan para la Apertura del Mercado en el Sector de Telecomunicaciones** (Decreto Supremo No. 26.005), along with a number of enabling regulations that liberalize the telecommunications market. Upon privatization, various targets imposed on ENTEL and new local operators. These included the following: (i) free telephones (for local calls) in schools and social assistance centers; (ii) installation, operation and maintenance of one telephone line and one public access terminal in localities with less than 350 inhabitants. These are primarily located in schools, social assistance centers, and other places easily accessible to the community.	**Fondo de Acceso y Servicio Universal (FASU),** a sector specific universal access fund, was proposed but never approved by parliament; **Fondo Nacional de Desarrollo Regional (FNDR)** gets funding from the sector (frequency assignments, penalties, etc.), but is not a sector specific universal access fund.	Top-down projects: **Servcio Nacional de Telecomunicaciones Rurales (SENATER)** – 1979, 1998 **Fondo Nacional de Desarrllo (FNDR);** **Proyecto SITTEL;** **Proyecto IDTR;** Other governmental and non-governmental bottom-up initiatives e.g. **AOPEB, ICO, FINRURAL, ACLO, AGRECOL, APCOB, AYNI, CECAP, CEPROBOL, CIDOB, CIOEC.**	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Brazil	Lei nº 9.472, de 16 de julho de 1997 - **Lei Geral de Telecomunicações** - LGT; Decreto 2534 - Aprova o **Plano Geral de Outorgas de Serviço de Telecomunicações prestado em Regime Público,** and a number of other Decrees and Resolutions to open the telecommunications market. Universal access obligations, defined in Presidential Decree 2.592 of 15.05.98 (**Plano Geral de Metas para a Universalização** or **PGMU**), and ANATEL Resolution 30 of 29.06.98 (**Plano Geral de Metas de Qualidade** or **PGMQ**), imposed on the 6 operators whose concessions were awarded under the public regime.	Ley 9,998 of 17.08.00 (**Ley de Fundo de Universalização do Serviço de Telecomunicações** or **FUST**), and Communications Ministry's Decree 3,624 of 05.10.00, establishes a universal access fund (FUST). So far, FUST has collected money, but not disbursed any.	Federal, State and Local Government initiatives e.g. Federal Communication Ministry's **GESAC Program,** with over 4,000 installed telecenters in public locations and schools in 27 states, targeting people from the C, D and E social classes in urban, rural, native and border communities; (ii) the State of Sao Paulo's **Acessa Program,** which has deployed more than 200 telecenters and Internet access booths in communities throughout the State, also serving mainly the C, D and E social classes.	
Chile	**La Ley General de Telecomunicaciones** (Ley N°18.168) del 2 de octubre de 1982, and various subsequent modifications by decrees in 1987 and 1994.	**Fondo de Desarrollo de Telecomunicaciones (FDT)** created by Ley General de Telecomunicaciones; Ley 18.168 de 02/10/82 (Titulo IV), which describes its administration, objective (increase telecom coverage in low-income areas), type of projects (public telephones, telecenters, sound broadcasting, etc.), financing (National Treasury), and procedures.	**Política Nacional de Infocentros** **Agenda Digital**	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Colombia	Principal pieces of legislation in the gradual opening of the telecommunications market: **Ley de Telecomunicaciones** (Ley 72 de 1989); **Estatuto de las Telecomunicaciones** (Decreto 1900 de 1990); **Ley de Telefonía Celular** (Ley 37 de 1993); **Ley de Servicios Públicos Domiciliarios** (Ley 142 de 1994); **Res. 86/1997 por la cual se reglamenta el proceso de concesión de licencias para el establecimiento de operadores de servicio de Telefonía Publica Básica Conmutada de Larga Distancia (TPBCLD); Res. 87/1997 por la cual se reglamenta en integral los servicios de Telefonía Publica Básica Conmutada (TPBC) en Colombia**; **Ley de Servicios Personales de Comunicación PCS** (Ley 555 de 2000), **Decreto por el cual se dictan nuevas disposiciones para la prestación del servicio de larga distancia** (Decreto 2926 de 2005). **Ley 142/94** (Domiciliary Public Services) establishes a regime of subsidies and contributions for local domiciliary telephone service between high and low income users; higher income users (stratus 5, 6, and commercial) subsidize telephone service of low income users (stratus 1,2, and 3) by up to 20% of their telephone bills.	Ley 142/94 establishes the Telecommunications Fund (**Fondo de Comunicaciones or FCM**), and requires it to invest in social telephone programs in low income rural and urban areas. Conpes (Consejo Nacional de Política Económica y Social) 3032 (**Programa Compartel de Telefonia Social**) established **Compartel** in 1999, and defined the initial program for the period of 1999–2000. Rules for development of social telephony programs and regulations for the functioning of the Telecommunications Fund are established in Decree 899 of 1999. Its nature and objectives are defined in Decree 1130/1999. **Compartel** projects are financed out of the **FCM**. Other projects such as Agenda de Conectividad (www.agenda.gov.co), Programa Comunidad para Emisores Indigenas, and Programa Computadores pasa Educar (www.computadoresparaeducar.gov.co) are also financed out of the **FCM,** but separately from **Compartel**.		

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Costa Rica	There is currently no telecommunications law. A law is in preparation.	None.	**Programa Comunicación sin Fronteras** community telecenters project to promote the use of ICTs; **PRONIE** project to provide computer training in 532 schools; **LINCOS** community telecenters project; Infoagro agricultural information network project.	Universal access initiatives of monopoly state-owned operator, ICE, and its VAS subsidiary, RACSA
Cuba	There is currently no telecommunications law. Build-out and network improvement obligations have been imposed on the partially privatized monopoly, ETECSA, in its concession contract.	None.		Universal access initiatives of the Ministry of Informatics and Communications.
Ecuador	**Ley Especial de Telecomunicaciones Reformada** (Ley 2000-4) and **Reglamento General a Ley Especial de Telecomunicaciones Reformada** (Decreto Ejecutivo No. 1790, de 23 de agosto del 2001), and a number of enabling regulations fully liberalize the telecommuniccations market. Universal access obligations have been imposed on 7 national fixed line and 3 mobile operators in their concession contracts.	CONATEL Resolution No.-380-17 (05.09.00) confirms the state's responsibility to provide universal access and services; CONATEL Resolution No. 394-18 (28.09.00) defines the scope, objectives, administration, financing, and operation, of the **Fondo para el Desarrollo de las Telecomunicaciones en Areas Rurales y Urbano Marginales (FODETEL).**		

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
El Salvador	**Ley General de Telecomunicaciones** (Decreto Legislativo No. 142 del 6 de noviembre de 1997, Diario Oficial N° 218, Tomo 337 del 21 de noviembre de 1997); **Reformas a la Ley General de Telecomunicaciones** (Decretos Legislativos N°387 y N°518 del 29 de noviembre del 2004); **Reglamento de la Ley General de Telecomunicaciones** (Decreto Ejecutivo N° 64 del 15 de mayo de 1998, Diario Oficial N° 88, tomo 339 del 15 de mayo de 1998, fully liberalize sector.	**Fondo de Inversion en electricidad y Telefonía (FINET)** created by Decree 960 of 1997.	**Infocentros** (telecenters) financed by **FANTEL (Fondo Nacional de Telecomunicaciones),** whose funds come from the sale of the state telecommunications company; **Conéctate** e-learning initiative of the Ministries of Education and of Technology; **Centros Recursos para Aprendizaje (CRA)** of the Ministry of Education; Other projects included in **Plan Puebla Panama.**	
Guatemala	**Ley General de Telecomunicaciones (1996)** liberalizes the market.	**Fondo para el Desarrollo de la Telefonia (FONDETEL)** created by the 1996 Ley General de Telecomunicaciones.	**Contacto** project of **AGEXPRONT**, the association of non-traditional product exporters and USAID, to support small and medium exporting enterprises; **PRONACOM** initiative of several ministries; **Last Mile Initiative (LMI)** of USAID and its partners, Planeta en Linea, AGEXPRONT, and Unitel/Metrovia to establish pre-WiMAX based local access networks in 5 pilot locations.	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Honduras	**Ley Marco del Sector de Telecomunicaciones (LMT)**,1995 deregulates sector.		**Telecentros Comunitarios Polivalentes (TCP)** Project financed jointly by the World Bank, the OAS and Ministry of Science and Technology; **Telefonia para todos (TpT),** a private sector initiative without subsidies that focuses only on commercially viable areas; **Aloo.com** (free e-mail access through telephone lines) projects of the Institute for Connectivity in the Americas (ICA); **Centros de Conocimiento, Comunicación y Capacitación** Internet and telephone access (source of funds and administration unknown).	Telefonia para todos initiative (Executive Decree 138-2003, by which the state owned fixed line monopoly (until 25.12.05) HONDUTEL extended fixed telephone service in the country.
Mexico	**Ley Federal de Telecomunicaciones, LFT**, 1995, opens sector. At privatization in 1990, expansion and quality-of-service obligations imposed on Telmex in its concession contract, in effect until 1995.	No universal access fund foreseen in the legislation. However, the **Fondo de Cobertura Social de Telecomunicaciones (FCST)** was established on a temporary basis to fund "social and rural coverage programs" mentioned in the 1995 Telecommunications Law. The FCST is managed by a technical committee through the Secretary of Transport and Communications.	**Programa de Telefonia Rural** e-Mexico's **Centros Comunitarios Digitales (CCD)** initiative; Various other programs of local governments, NGOs and foundations including: **Centros de Tecnología Educativa, Centros de Saber, Tyldes** Projects to connect schools; the **Internet en mi Bilioteca** Project, the **Plazas Comuniarias** adult education program, etc.	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Nicaragua	**Ley General de Telecomunicaciones y Servcios Postales (Ley 200)**, 1995.	**Fondo de Inversión de Telecomunicaciones (FITEL)** established by Executive Decree 84-2003 (03.12.2003).	**PROCOMPE** telecenters project for SME financed by the World Bank; **SIA-MAGFOR** agricultural information project; **Cyberescuelas 2.0** Project, to facilitate access to ICTs in rural schools, financed by USAID, the Fundación Nicaragüense–Americana, Telefonica and other operators and private companies; **Gestion Territorial La Sabanas,** financed by the European Commission and a number of Spanish government agencies, private enterprises, and NGOs.	
Panama	The following are the three key pieces of legislation that liberalized the telecommunications market in Panama: **Ley 31** de 8 de febrero de 1996 (Por la cual se dictan normas para la regulación de las telecomunicaciones en la República Panamá); **Decreto Ejecutivo No. 73** de 9 de abril de 1997 (por el cual se reglamenta la Ley No.31 de 8 de febrero de 1996, por la cual se dictan normas para la regulación de las telecomunicaciones en la República de Panamá); and **Ley No. 24** de 30 de junio de 1999 (por la cual se regulan los servicios públicos de radio y televisión y se dictan otras disposiciones). According to these laws, the State is responsible for providing telecommunications services in difficult and uneconomic areas. Obligations are contained in C&WP's concession contract (Metas 18 y 19).		The **Infoplazas** telecenters initiative, which has financial and technical support from the Inter-American Development Bank (IADB), the Fundación Infoplazas de la Secretaria Nacional de Ciencia Tecnología (SENACYT), other government departments, local and municipal governments, NGOs, civil groups and private enterprises.	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Paraguay	According to the Telecommunications Law Ley 642/95), all telecommunications services except point-to-point switched telephone are liberalized (Art. 21). Universal access goals are achieved through subsidies awarded to telecommunications companies from the universal access fund. There are no universal access obligations imposed on operators.	**Fondo de Servicios Universales (FSU)** established by Law 642/95, the telecommunications law; FSU regulated by Reglamento del Fondo de Servicios Universales (Res. 132/1999 (06.05.99) modified by Res. 34/2002 (07.01.02).		

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Peru	Several pieces of legislation define the framework for a fully liberalized telecommunications market in Peru. These include : **Texto Único Ordenado de la Ley de Telecomunicaciones** (Decreto Supremo N° 013-93-TCC) del 6/5/93; **Texto Único Ordenado del Reglamento General de la Ley de Telecomunicaciones**, Decreto Supremo Nº 027-2004-MTC, del 09/07/04; Reglamento General de la Ley de Telecomunicaciones del 18/2/94 (D.S. 06-94 TCC) y sus modificaciones de 26/3/98, 13/8/98, 21/199, 21/1/99, y 30/6/02; Ley 26.285 **Ley de Desmonopolización Progresiva de los Servicios Públicos de Telecomunicaciones** del 14/1/94 **Lineamiento de Apertura del Mercado** del 5/8/98. The telecommunications market was opened fully on August 1, 1998, when exclusivity for fixed telephone and long distance carrier services expired. Universal access and other obligations were imposed on Telefonica at privatization in 1994, including the deployment of a number of public telephones throughout the country.	**Fondo de Inversión de Telecomunicaciones (FITEL)** established by the 1993 Telecommunications Act (Texto Único Ordenado de la Ley de Telecomunicaciones (Decreto Supremo N° 013-93-TCC) del 6/5/93).	Various projects sponsored by NGOs; Telefónica del Peru's **Llaqt@red** telecenter project.	
Dominican Republic	The telecommunications market was liberalized through the Telecommunications Law (**Ley de Telecomunicaciones No. 153-98**). There are no universal access obligations imposed on operators.	**Fondo de Desarrollo de las Telecomunicaciones (FDT)** established by INDOTEL Resolution No. 17-01 of 23.03.01; basis contained in **Ley de Telecomunicaciones No. 153-98.**	Various projects, including Internet in public libraries and cultural centers, e-government, digital cities, e learning, e-health and **LINCOS** projects sponsored by Despacho de la Primera Dama de la Republica (Depridam), and other government departments.	

Table V.1 Approaches to Universal Access Policies and Programs in Latin America

Country	a. Market liberalization combined with regulatory initiatives	b. Universal access fund programs	c. Other financing methods and project initiatives	d. State-mandated and controlled approaches
Uruguay	There is no telecommunications law. However, a number of laws establish a framework for fair competition, including **Ley 17,243** (Art. 13-15), **Ley 17,296** (Art. 157-158), and **Ley 17,556**. **Decree 86/001** of 02.02.01 establishes an anti-monopoly commission within the Ministry of Finance and Economics. There are no universal access obligations imposed on operators.			Universal access initiatives of monopoly state owned operator, Antel.
Venezuela	**Ley Orgánica de Telecomunicaciones (Ley 36,970 del 2 de julio de 2000)** provides the framework for an open telecommunications market in Venezuela. The telecommunications market was completely opened on Novenber 27, 2000. CANTV had a number of build-out and quality improvement obligations imposed on it in 1991, when it was privatized. These included the installation of 355,000 new lines and the modernization of 75,000 old lines each year until 2000, and the establishment of a development plan for basic services in rural areas with less than 5,000 inhabitants.	**El Fondo de Servicio Universal (FSU)** established in Art. 54 of the 2000 Ley Orgánica de Telecomunicaciones. **Reglamento de la Ley Orgánica de Telecomunicaciones Sobre el Servicio Universal de Telecomunicaciones,** 2003, gives details of the functioning of the universal services fund.		

V.2 Market liberalization and regulatory initiatives

V.2.1 Overview

As of the end of 2005, when Honduras ended state-owned HONDUTEL's fixed line exclusivity, all Regulatel member countries except Costa Rica, Cuba and Uruguay had completely opened their telecommunications markets (Table II.1). With the exception of Cuba, all of these countries had already introduced policies that facilitated multiple competing operators and service providers in all sub-sectors, including mobile, as a way to increase access. Currently, most have at least three mobile operators. Honduras still has only two. Brazil and Paraguay have five or six mobile operators in some areas. This has contributed to the relatively high mobile penetration rates in these countries (Table V.2).

Guatemala has relied on market liberalization combined with the establishment of a universal access fund. Telegua, the operator in Guatemala, is now owned by a consortium headed by Telmex. The government did not impose any universal access obligations on Telegua when it was privatized in 1998. The government has relied mainly on a very liberal regime and a universal access fund to provide access in rural and remote areas (see below). Entering the market is relatively easy for all services - there is no restriction on the number of operators and service providers that can enter the market[30]. In most cases, it is sufficient to register.

In most other Regulatel countries, competitive market entry has also driven expansion of access in both fixed line and mobile services, and increasingly in Internet access services. Mobile telephone service growth, and its potential for even further market-based expansion, has been the most visible and successful consequence of liberalized markets. Access to mobile network coverage already surpasses 70% of the population in most Latin American countries, and the market gap for these services is typically quite small wherever there is open competition (Chapter IV.2.1).

As explained in detail in Chapter II, when governments privatized their state telecommunications monopolies they often imposed build-out and service quality obligations on them in return for giving them a limited period of exclusivity. Often these obligations included expansion of the network into remote, rural and underserved areas. In some Regulatel countries, these obligations ended when the period of exclusivity ended; in others they have been renewed and also applied to some or all new entrants. Build-out and service quality obligations have thus become one of several approaches that policy-makers and regulators in Regulatel countries have used to achieve their universal access goals in conjunction with market liberalization.

[30] There are 13 fixed line operators, four mobile operators, 17 international long distance operators and service providers, five data transmission operators and about 20 ISPs.

Table V.2: Cellular mobile market in Latin America

Country	No. of operators	Standards employed	Penetration %		CAGR
			1996	2005	
Argentina	4 in each of 3 areas	AMPS/TDMA, CDMA, GSM	1.9	57.3	53.1
Bolivia	4 national	GSM, TDMA	0.4	26.4	66.8
Brazil	Up to 6 per area (10 areas)	GSM, TDMA, CDMA	1.6	46.3	52.5
Chile	3	GSM, CDMA	2.2	67.8	53.4
Colombia	3	GSM, CDMA	1.3	47.8	56.5
Costa Rica	1	GSM	1.4	25.5	44.1
Cuba	1 (2 companies were merged into one)	GSM, AMPS/TDMA	0.0	1.2	64.7
Dominican Republic	4	CDMA/GSM	1.1	40.7	57.2
Ecuador	3 national	CDMA/GSM	0.5	47.2	76.1
El Salvador	4	CDMA/GSM	0.4	35.1	74.8
Guatemala	4	CDMA/GSM	0.4	25.0	66.5
Honduras	2	GSM	0.0	17.8	115.9
Mexico	2 operate in all 32 states; 1 in 28 and 1 in 17	GSM, CDMA	1.1	44.3	59.2
Nicaragua	3	GSM, CDMA	0.1	19.7	89.1
Panama	2	GSM, CDMA	0.3	41.9	88.6
Paraguay	6 (one, COPACO, is not operating)	AMPS/TDMA, GSM	0.7	30.6	61.5
Peru	3	GSM, CDMA	0.8	20.0	48.6
Uruguay	3 national	GSM, CDMA*, TDMA*	2.5	18.5	28.5
Venezuela	2 national; 3 regional	GSM, CDMA	2.6	46.7	43.8

Source ITU WTI 2005 and other * in the process of being phased out

V.2.2 Experiences with universal access obligations

Brazil, Bolivia, Panama, Mexico and Cuba have relied in large measure on universal access obligations imposed on incumbent and new operators licensed under a market reform policy. They have usually done so in conjunction with one or several of the other three approaches to promoting universal access.

In Brazil, universal access obligations were imposed on the Telebras system before it was privatized in 1998[31]. Today these obligations are imposed only on the six operators whose concessions were awarded under the public regime[32] (Box V.1). Other operators, who are in the

[31] By way of Presidential Decree 2.592 of 15.05.98 (Plano Geral de Metas para a Universalização (PGMU)) and ANATEL Resolution 30 of 29.06.98 (Plano Geral de Metas de Qualidade (PGMQ)).

[32] The six operators in the public regime are Telemar (Region I), Brasil Telecom (Region II), Telefonica (Region III), Embratel (Region IV), CTBC (Sector 34) and SERCOMTEL (Sector 20). The first four of these were created out of the privatization of Telebras.

private regime, which includes all other service providers except VAS, radio and television, have no universal access obligations. However, like operators in the public regime, they have to contribute 1% of their net operational revenues to FUST, the universal access fund.

Box V.1: The public and private regimes in the Brazilian telecommunications sector

According to the General Telecommunication Law of 1997 (LGT n° 9472 of July16, 1997), telecommunications services can generally be provided either under the public or private regimes. The former are considered fundamental to the country, such that if no private firm is willing to provide them the state would have to do so. Today only fixed telephone (STFC = PSTN) services are provided under the public regime. These are provided by private firms with concession contracts given for a fixed period of time. All other services [Mirror STFC, SMP (PCS), SLE (private networks), SME (trucking), SCM (multimedia including transport network, SRTT (audiovisual signal transmission, data communications, and dedicated circuit services), MMDS, SMGS, DTH (satellite), etc.] are provided under the private regime. They are authorized by an act of government. Services in the public regime are subject to tariff regulation, a fixed term contract, and revertability; that is, if the government terminates the concession it must pay the concession holder the equivalent of the value of the unamortized assets of the company. In addition, if the government changes the conditions of the contract, the operator is entitled to compensation as, for example, of an increase in allowable tariffs.

Services in the private regime do not have regulated prices, fixed terms, or reversion privilege. While the operating licenses have no fixed term, the frequency authorizations, which these operators (SMP, SME, etc) might need, have to be obtained under the public "concession" regime. These are generally fixed for 20 years (15 years for SMP) and renewable only once. A special category of concession applies to the Band A and B (800 MHz) mobile (SMC) services. These are issued under Law on Public Concessions 8987/95, which preceded the GTL of 1997. The new PCS (Band D and E) licenses are being provided under the private regime and are therefore not price regulated. Value added services are not considered to be telecommunications services and therefore fall outside the scope of the public and private services regimes. This is also the case for radio and TV licenses.

The universal access obligations defined in the PGMU ended on December 31, 2005. At that time, ANATEL negotiated a new set of obligations with these six operators, in conjunction with the renewal of their STFC (public) concessions. These include:

- Offering individual fixed line subscribers a prepaid regime, that allows them to manage their telephone service according to their budgets, and to receive calls and to access the Internet (Acesso Individual Classe Especial or AICE). Telefonica's prepaid scheme is described in Chapter VII;
- Installation of telephone cabins, each with four payphones (Telefones de Uso Público or TUP) and four public access terminals (Terminais de Acesso Público or TAP). These cabins allow access to the Internet, text messaging, etc., in all towns of at least 50,000 persons within the operators' concession areas;
- Providing access for rural cooperatives (Unidade de Atendimento de Cooperativa or UAC);

- Making virtual (soft) telephones available;
- Providing fixed telephone service to all persons in localities with more than 300 inhabitants within one week of receiving a request;
- Providing a public telephone service in any locality with more than 100 inhabitants within one week of receiving a request;
- Adapting 2% of public telephones for use by the handicapped, or approximately one public phone for each group of 750 people.

All STFC operators must also contribute 1% of their operating revenues as regulatory fees[33].

In Peru, universal service obligations were imposed on the incumbent, Teléfonica del Peru, upon privatization in 1994[34]. Telefonica was obliged to install over 3,000 rural payphones throughout the country. In addition, they had to meet precise standards regarding quality-of-service, reporting requirements, financial contribution to the Universal Access Fund (1% of billed and received invoices), and the operation of OSIPTEL (0.5% of billed and received invoices).

In Bolivia, the 1995 Telecommunications Law[35] foresaw expansion of rural coverage through the following means:

- Universal access obligations related to rural and other areas to be defined by SITTEL, and quality-of-service obligations, are included in four of 16 operators' concessions. Those four operators are, ENTEL, the privatized long distance operator, and COMTECO, COTEL, and COTAS, the three regional cooperatives. These obligations were in effect until 2000. They required expansion of local telephone networks into adjacent rural areas, installing a fixed telephone line within 15 days of receiving a request, and providing service to specified localities in the areas served by some of the larger of the 16 local cooperatives and ENTEL. New targets have been in effect since 2000. For new local operators, these targets include expansion of their networks into local and rural areas, installation of free telephones for local calls in schools and social assistance centers. This is in addition to build-out targets. For new long distance operators, these targets include the installation, operation and maintenance of one telephone line and one public access terminal in localities with less than

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33 ANATEL's operation is normally funded out of FISTEL (Fundo de Fiscalização dos Serviços de Telecomunicações) created in 1966 and transferred to the exclusive administration of ANATEL by virtue of the LGT (Art. 50). FISTEL is funded through a 1 % levy on all operators' (in the public and private regimes) operating revenues, spectrum usage fees, fines, installation and operating inspection fees, indemnifications, etc. (Art. 51.2 of the LGT). However, ANATEL must submit its annual budget to the Ministry of Communications, which then submits it to the Ministry of Planning and Budget as part of its own overall budget (Art 49 of the LGT). In practice, ANATEL has been receiving only a part of the funds made available to FISTEL, and over which it should normally have exclusive administrative control according to the law. In reality it appears that, like with FUST, the government has been using the difference between what it collects and what it actually allows ANATEL to spend to bolster its savings ratios to satisfy requirements of international commercial and development lending institutions.

34 These included, inter alia, the following obligations: (i) to contribute to FITEL and to the running of OSIPTEL; (ii) to maintain continuity of service in areas served previously by the state monopoly, unless otherwise permitted by OSIPTEL; (iii) to apply international best practices in leasing circuits; (iv) to install public telephones; (v) to maintain an acceptable level of quality-of-service (mean time between failure, completed calls, etc.); (vi) to reduce wait times from three months in 1998 to 10 days by 2001; (vii) to permit inspections by OSIPTEL; (viii) to protect data and user information; (ix) to implement an acceptable accounting system; (x) to provide an acceptable customer service; (xi) to provide OSIPTEL with requested information; (xii) to respect tariff, interconnection and other regulation; and (xiii) to respect competition rules. See Clauses 6, 8 and 9 of Telefonica del Peru's Concession Contract. Not all the contracted obligations were met by Telefonica, which was fined as a result.

35 Article 7 requires concession contracts to contain obligations with respect to rural communications. Article 27 requires operators to operate, maintain and expand rural services in accordance with their contractual obligations. Article 35 states that expansion and quality-of-service targets are to be defined in concession contracts. Article 133 introduces the concept of Extended Rural Areas, whereby a local operator has to provide service in neighboring rural areas.

350 people. These are to be located primarily in schools, social assistance centers and other places easily accessible to the community. This is in addition to build-out targets. For new public telephone operators, these targets include the installation, operation and maintenance of free public telephones for local calls in public access ways in peri-urban areas. Again, this is in addition to their build-out targets.

- The establishment of the Fondo Nacional de Desarrollo Regional (FNDR), a special fund for non-profitable projects of social interest in rural areas. FNDR was to be financed out of license (spectrum and operating) fees, fines, license transfer fees, etc., and managed by the Government, not the regulator. These projects were implemented through the Programa Nacional de las Telecomunicacines Rurales (PRONTER), created in 2002, but later abandoned.
- A national ICT strategy developed under the Agencia para el Desarrollo de la Sociedad de la Información en Bolivia (ADSIB)

Panama, like Bolivia, does not have a universal access fund. Cable & Wireless Panama (C&WP) was the incumbent operator. The new concession contract that C&WP signed in April 1997 contained universal access obligations, including an obligation to provide local basic telephone services at fixed (universal access) rates[36]. Additional specific objectives were contained in Targets 18 and 19 of C&WP's concession contract. Target 18 required C&WP to install a public telephone in 670 rural localities, and Target 19 obliged C&WP to maintain public telephones in 121 other localities by 2002[37]. None of the other 65 concession holders have universal access obligations.

In Mexico, the 1995 Federal Telecommunications Law specified the need to implement programs to provide social and rural coverage, but did not establish a universal access fund. Before the 1995 law was even conceived let alone adopted, Telmex signed a concession contract in which they agreed to meet certain universal service obligations. These were to be carried out from the time of Telmex's privatization in December 1990 through 1995, when Mexico originally planned to liberalize the market. These obligations were as follows: (i) expand the network (number of lines) at a rate of at least 12% per year; (ii) install telephone lines in population centers of 500 people or more; (iii) increase public payphone density from 0.8 to 5 per 1000 population; and (iv) reduce wait times for new subscribers from six months to one month. The market was not actually liberalized until 1997.

In Cuba, ETECSA, the partially privatized fixed and mobile monopoly is required to meet the following obligations: (i) increase the number of fixed and mobile lines, to achieve a total of 1,125,000 by 2008; (ii) build an alternate national backbone network using fiber optic technology by 2007, and digitalize 90% of the network by 2008; (iii) install 50,000 payphones using non-convertible pesos; (iv) offer service in all population centers with more than 300 people; and (v) guarantee connection to the Internet to anyone with a fixed telephone.

36 Clause 40 and Annex E of contract which deal with tariffs. The following tariffs are stipulated in Annex E: Monthly line rental charge = US$ 6; local calling rate = US$ 0.03/min.

37 There were other quality of service (as opposed to expansion) targets.

V.3 Universal Access Funds

V.3.1 Introduction

The highly publicized and successful universal access programs in Chile, Peru, Guatemala, Paraguay, the Dominican Republic, and Colombia have become standards worldwide for the design and implementation of mechanisms for channeling targeted subsidies toward universal access objectives. The first universal access fund in Latin America was established in Colombia in 1976. This was followed by funds in Chile in 1995, Paraguay, El Salvador and Guatemala in 1997, the Dominican Republic in 1998, Peru and Brazil in 2000, Mexico in 2002, and Nicaragua in 2004. Panama, amongst others, is contemplating the implementation of a similar program.

In total, 12 of the 19 Regulatel countries (Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Nicaragua, Paraguay, Peru, the Dominican Republic and Venezuela) have adopted some version this universal access fund approach as a core element of their telecommunications policies. However, not all of these funds are fully operational as of yet. Argentina has not established its Fondo Fiduciario del Servicio Universal (FFSU). In Brazil, there has been controversy over how best to spend the large amounts of cash that have been accumulating currently at the rate of R$600 million/year (US$250 million/year) in the Fundo de Universalização do Serviço de Telecomunicações (FUST). In Mexico, no universal access fund was foreseen in the 1995 telecommunications law. However, a temporary fund for "social and rural coverage", mentioned in the 1995 act, has been established. It receives its funding from the State's Consolidated Revenue Fund. Bolivia had planned to establish a universal access fund, Fondo de Acceso y Servicio Universal, but parliament was compelled to reject the proposed legislation, because of a strong lobby by operators. So instead, Bolivia has a regional development fund (Fondo Nacional de Desarrollo Rural or FNDR), that has received money from frequency assignment fees, penalties and the like. Thus far, very little of the accumulated money has been spent. In El Salvador, the fund serves both the electric and telecommunication sectors.

The main characteristics of these funds are discussed in the following sections. More details on each of the existing 14 universal access fund programs in Regulatel member countries can be found in Table V.3.

V.3.2 Characteristics of universal access fund programs

The basic organizational and operational concepts of these funds are similar in most Regulatel countries. But there are significant differences with respect to their legislative underpinning, their administration, their source of funds, and their criteria for selecting projects. And there are differences in the types of operators implementing these projects and the conditions and obligations that are imposed on them.

a. Legislative underpinning

Most universal access fund programs in Latin America have their legal underpinnings in the given country's basic telecommunications law. This is true of Chile, Guatemala, Paraguay, and Peru. In Brazil and El Salvador, these funds have been established through specific legislation and clarified in implementing regulations.

In Colombia the Telecommunications Fund (FCM) was established in 1976, but it could not be used, because no rules or regulations were created for the use of the money. It was only in 1999 that a new separate decree created the current universal access program, Compartel, with adequate provisions on funds management[38]. Compartel is funded out of the FCM.

In Argentina, the universal access fund, Fondo Fiduciario de Servicio Universal (FFSU), was established in 2000, by the same decree that fully liberalized the telecommunications sector[39].

In Nicaragua, the Fondo de Inversion de Telecomunicaciones (FITEL) was established by an executive decree in December 2003[40]. Its functions are specified in the enabling regulations for the law, which established the regulator. Those functions are as follows: (i) to promote universal access in rural areas where investment is costlier than in high density areas; (ii) to promote social and economic development in those rural areas; (iii) to increase private sector participation in promoting telecommunications services, and (iv) to increase participation in the definition of their needs for telecommunications services by the people who will eventually benefit from them[41]. Interestingly, the FITEL's provisions do not contemplate using it to subsidize universal access projects.

The telecommunications acts of Chile, Peru and Venezuela present good examples of legislation in which the key parameters are covered in the primary sector legislation and the details are left to the implementing regulations. The primary sector legislation deals with objectives, functioning, administration, types of projects eligible for funding, source of funds, and procedure for awarding of subsidies. The implementing regulations deal with tariffs, interconnection charges and conditions, quality-of-service requirements, and so forth. This is a very effective way to set-up these programs. There is a strong correlation between the success of a universal access program and the precision with which the basic parameters are defined in the legislation, and how well and transparently the fund is administered. The right combination of legislation and regulations ensures that there is a sufficient degree of flexibility to adjust the program, when evolving circumstances require it.

Whether or not universal access or universal service is defined in a country's legislation does not appear to have had a significant bearing on how successful or unsuccessful these programs have been. Neither concept is defined in the legislation of Chile or Guatemala. In Peru, only universal access is defined, and then only in broad terms[42]. Both are defined in the legislation of Colombia[43].

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[38] Decreto 1130 defines the nature (Special administrative unit, legal personality, attached to the Ministry of Communications), objectives (finance universal access projects), and functions of the Telecommunications Fund. Decreto 899 regulates the functions of the Telecommunications Fund, and defines policies with respect to the development of Social Telephony.

[39] Reglamento General del Servicio Universal (RGSU), Anexo 3 del Decreto Nº 764/2000, el cual establece la liberalización total del mercado de telecomunicaciones en la República Argentina a partir del 9 de noviembre de 2000.

[40] Decreto 84-2003, Constitución, Administración y Funcionamiento del Fondo de Inversión de Telecomunicaciones y Servicios Postales, Gaceta Oficial 03.12.03,

[41] Reglamento de la Ley Orgánica del Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR), Gaceta Oficial, 07.12.04,

[42] Defined in the implementing regulations [Texto Único Ordenado del Reglamento General de la Ley de Telecomunicaciones, Decreto Supremo Nº 027-2004-MTC, del 09/07/04, Art. 9] as "*Access in the national territory to an ensemble of essential public telecommunication services i.e. those which are available to a majority of users and being provided by public service telecommunications operators*."

[43] Universal Service is defined as "Generalized access for households to basic telecommunication services, initially telephone services and eventually other services, technological advances and resources permitting". [Resolución CRT 575/2002]. See above, for definition of Universal Access.

In universal access legislation, the objectives of the funds have been stated in terms of how convenient it is for people to access basic telephone services (and Internet service, in the case of Brazil) in low-income areas. In Brazil and Paraguay, the stated objectives also include promoting access for education, health, culture, emergency services and security.

The objectives become the measurement by which the success of a universal access program is determined. In Peru, the objectives of the FITEL I, II, III, and IV Programs (2000–2004), have been to bring a public telephone to within 5 km of anyone anywhere in the country. In Colombia, the objectives of the Compartel program (1999–2002), have been to provide a public telephone - and subsequently Internet access - to anyone within 5 km of the more than 22,000 localities with more than 150 people. In Bolivia, the objective of a SITTEL-initiated, but never implemented project, had been to put a telephone within 2 km of anyone living in rural areas (maximum 24 minutes walking distance).

In Venezuela the general objectives of the universal services (as opposed to universal access) program, defined in the Telecommunications Law, are to promote national integration, maximize access to information, support the development of educational and health services, and to reduce the inequality in access to telecommunications services[44]. Priority areas of action defined in this law are to ensure the following: (i) that everyone has access to a fixed telephone, and that all subscribers should obtain a free printed telephone directory; (ii) that there should be a sufficient number of public telephones in public spaces; (iii) that everyone should have access to the Internet; and (iv) that there should be provisions to facilitate handicapped access to telephones.

In Nicaragua, universal access is defined as public access to a set of essential telecommunications services, namely, those that are made available to a majority of users by telecommunications operators, independent of the technology used.

b. Administration of universal access programs and funds

Three important criteria for the administration of universal access funds are as follows:

- Their administration should be independent of political influence and pressure, which dominant operators and service providers may and often do exert;
- The process for application of funds should be transparent;
- There should be a place for the public and stakeholders to participate in the definition of programs, and in the selection process of projects to be funded.

The following section examines how some funds in Latin America fare in this respect.

Universal access funds in the following Regulatel countries are administered by the same body that regulates telecommunications: Brazil, Chile, Paraguay, Peru, the Dominican Republic, Nicaragua and Venezuela. Those in Colombia and Guatemala are administed by the government department responsible for the sector. The functions of the fund are integrated completely into the regulatory body in Brazil, Paraguay, and Peru, but the funds are treated separately from the other financial resources of the regulator. In these cases, administration of the fund is

[44] Art. 49, Ley Orgánica de Telecomunicaciones, Gaceta Oficial No. 36.970 de lunes 12 de junio de 2000 and Art. 3 of Reglamento de la Ley Orgánica de Telecomunicaciones Sobre el Servicio Universal de Telecomunicaciones.

independent to the same extent as is the regulator. In Chile and Guatemala, the funds are administered by an independent council or board; Consejo de Desarrollo de las Telecomunicaciones in Chile, and the Consejo de Administracion de Fondetel in Guatemala. In Peru, FITEL is administered by the same Executive Council that administers the other regulatory functions of OSIPTEL, but it is administered separately. The Executive Council is an independent body, but its universal access projects have to be approved by the Ministry of Transport and Communications, which is the government department responsible for the sector. In Chile and Guatemala, the council that administers the Fund, has complete autonomy to manage the Fund. The council in Chile consists of four ministers, three outside experts, and a representative of the ministry responsible for the sector. The council in Guatemala consists of four members, two of whom are appointed by the president, and two by the minister. In Argentina, the Reglamento General del Servicio Universal (RGSU) anticipates that the fund will be administered by a council (Consejo de Administración) made up of 10 members. The chairman of the council will be appointed by the Ministry of Economy, which is responsible for the sector; one member will be appointed by the Ministry of Defense; one by the telecommunications regulator (CNC); two by the large operators; one by the independent operators; three by the provinces; and one by the consumers' association.

In Venezuela a board called Junta de Evaluación y Seguimiento de Proyectos administers the universal services fund (FSU). The board's president is the head of CONATEL, the telecommunications regulator. Its other members are representatives of the Ministry of Infrastructure, the Ministry of Planning and Development, the Ministry of Production and Commerce, and a representative from the operators who contribute to the fund. CONATEL is responsible for determining which areas are eligible for these projects, defining them, selecting operators and other agents to implement them, and overseeing follow-up and control[45].

Only in Brazil is there provision for public consultation, along with the requirement that the executive power must approve these programs on the general direction and goals of FUST, the universal access fund.

All of these funds provide for a degree of transparency in their administration, and in the process of identifying and awarding projects. Usually this is done through annual public reports and information on the administrators' website, in addition to reports to the government. In Brazil, the public reports are made quarterly. One of most transparent funds, FITEL in Peru, publishes the process of selecting projects on its website.

c. Source of funds

In most Regulatel countries, it is the sector itself, that contributes to the fund. Generally, this is carried out through a contribution obligation imposed on some or all telecommunications operators, and sometimes on service providers. Usually this is calculated as a percentage of their gross or net revenues.

In Colombia and Peru all licensed telecommunications operators - but not all service providers - are required to contribute a percentage of their net operating incomes to the fund. In Colombia, the contribution consists of the sector's net income, minus out-payments to other operators. Specifically, it is 3% of net revenues from fixed telephone, VAS, trunking, etc., plus 4% of net

[45] Art. 56, Ley Orgánica de Telecomunicaciones, Gaceta Oficial No. 36.970 de lunes 12 de junio de 2000

postal revenues, and 5% of gross revenues of national and international long distance and cellular mobile services. In Peru and Ecuador, the contribution is based on the revenues billed and received by the operators. In Peru, it is 1% of gross revenues billed and received.

In Venezuela all operators must to contribute 1% of their gross incomes[46]. In Brazil, only the six operators in the public regime must contribute. Specifically, their contribution is 1% of gross operational revenues resulting from provision of telecommunications services in the public and private regimes, excluding certain taxes. In El Salvador and Guatemala, the contribution comes from a combination of license and concession fees, spectrum usage fees, regulator administrative fees and fines (Chapter V.2.2).

In Argentina the Reglamento General del Servicio Universal (RGSU) foresees a contribution of 1% of total telecommunications related revenues net of taxes for all operators providing local fixed telephone services or Internet, whose teledensity in any basic telephone service area is greater than 15%. A "pay or play" option is included in the RGSU whereby operators can contribute either by payment to the fund, or in kind in the form of network installations. The fund administrator can determine the value of universal access installations offered through the "play" option, because some of these will have been awarded through a minimum subsidy auctions.

In the Dominican Republic a 2% direct levy on users' telephone and cable TV bills[47] finances the Fondo de Telecomunicaciones (FDT). In Paraguay, operators contribute 40% of their business (commercial) taxes. In Bolivia, it is anticipated that the proposed fund will be financed by a 3.5% contribution of operators' net income. The intention in Bolivia, is that a rural development fund, Fondo Nacional de Desarrollo Rural (FNDR), will finance infrastructure, services and institutional development projects, including those in the telecommunications sector in rural areas. FNDR has received money from frequency license fees and fines, but like FUST in Brazil, has never actually funded any projects. In Mexico, the temporary Fondo de Cobertura Social de Telecomunicaciones is funded by the National Treasury. The same is true of the Fondo de Desarrollo de Telecomunicaciones in Chile. The National Treasury was also the initial source of funds in El Salvador.

The fund in Nicaragua, FITEL, belongs to the regulator, TELCOR, and receives 20% of TELCOR's revenues, which come from license, concession and authorization fees. The amounts are transferred into the FITEL account each month.

Chapter VI specifies the amounts of money that have accumulated in these funds, and analyzes how effectively those funds have been disbursed.

d. Methods for disbursing funds

In some cases, the winning bidder receives the funds in one lump sum after completion of the installation. The risk with this method is that the administrator may lose a considerable degree of control over the project. In other cases, the winning bidder does not receive the funds until well after the project has become operational.

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[46] Art. 151, Ley Orgánica de Telecomunicaciones, Gaceta Oficial No. 36.970 de lunes 12 de junio de 2000

[47] An interesting variation to this can be found in Jamaica where effective June 1, 2005 a US$ 0.03 levy has been imposed on all incoming international traffic terminating on the fixed network and US$ 0.02 on all incoming international traffic terminating on mobile networks. A Universal Services Fund (run by a corporation) has been established to fund primarily e-learning projects. Both Jamaica and the Dominican Republic have very high incoming international traffic levels especially from the USA where many of their citizens live. In any case, operators usually pass these charges on to their customers.

In El Salvador and Guatemala the subsidies are paid out after completion of the work for capital projects, and biannually for operational type projects. In Chile and Paraguay the subsidies are paid out in two installments. In Chile, the first installment is paid out when the project is ready for service (generally about one year after the award is granted), and the second is paid out one year later. In the meantime, the operator must finance the entire cost of the project, plus guarantees (2%–3% of the project's overall value). In Paraguay the first installment is paid out within 30 days of signing of the contract, and the second is paid out once the fund administrator, CONATEL, confirms that all installations are operating and services are provided.

In Peru the payout scheme depends upon the particular project and contract. Generally, subsidies are paid out over a four to five year period for projects costing more than US$1 million. In one case, subsidies were spread out over a five year period, with 35% paid at contract signature, 15% while the project was being implemented, and 50% at the end. In Venezuela the universal access operator defines the payout schedule as part of its bid offer[48]. It is worth noting that, in the cases where subsidy payments are delayed, operators seeking private capital financing from banks and other sources can often use the fact that a subsidy has actually been awarded and will be paid out in the future, as a guarantee.

e. Types of projects and criteria for their selection

The emphasis so far in a large majority of the universal access fund programs has been the installation of rural public telephones and community telecenters. This has been the case in Peru, Guatemala, Colombia, Chile, the Dominican Republic and Paraguay. In later phases, funding has also been applied toward access to the Internet, especially in schools and other public institutions such as hospitals, local governments and, in Colombia, military garrisons. In Paraguay, social programs in support of education, health, security and the promotion of culture are also eligible for funding. Universal access funds were used to establish a national 911 emergency calling system in Paraguay. In Venezuela, a 2006 project will connect 288 civil registers and 219 notaries with the Ministry of Justice in Caracas, in order to increase transparency and reduce the likelihood of legal documents being falsified through digitization.

Peru is planning to implement the following initiatives: (i) residential telephone connections in nearly 100 localities, with up to 24 connections per locality; (ii) high speed Internet access in schools, public institutions and other locations in nearly 3,000 localities; and (iii) broadband applications and platforms for rural areas, including ISPs, application service providers, streaming and webcasting, tele-education, tele-health and e-government. They are currently funting some small bottom-up pilot projects. These will provide a variety of voice, data and even mobile services to a whole community or geographical area.

Different countries follow different criteria for the identification and selection of priority locations to finance projects under universal access funds. In the Dominican Republic, a formula was introduced to measure the relative degrees of poverty, isolation, and infrastructure of communities, granting highest priority to the most disadvantaged areas for the placement of initial basic telephone services. In the case of more advanced technologies, other considerations enter into the selection of locations, such as the presence of public institutions, and the potential for economic development to arise from the use of such facilities in the near term.

[48] Art. 52 of Reglamento de la Ley Orgánica de Telecomunicaciones Sobre el Servicio Universal de Telecomunicaciones, 2003

The Venezuelan universal services regulations define a set of criteria, which CONATEL then uses to establish a list of geographic areas and services that will be subject to universal service obligations. There are three categories of criteria, which are as follows: (i) projects that promote national integration; (ii) projects for the handicapped and those with special social needs; and (iii) projects that reduce the inequalities in access.

The list of these projects is published each year in the Official Gazette and on the regulator's web site[49].

In Colombia social telephony and telecenter projects are organized through the universal access program, Compartel. In addition, the Telecommunications Fund (FCM) has financed other projects, including the development of Colombia's connectivity agenda (Agenda de Conectividad), radio stations for indigenous people (Programa Comunidad para Emisores Indigenas), and a Computers for Education program (Programa Computadores pasa Educar).

f. Operators that use funds, and the nature of conditions and obligations imposed upon them

Operators who receive subsidies from these funds include the incumbents, large and small new entrants, and smaller local and regional operators. In Peru two new rural operators, Gilat-to-Home (GTH) and Rural Telecom (RT), have entered the market by bidding for and receiving minimum subsidies. Both companies provide access through rural payphones connected via VSAT terminals to a satellite network. GTH has 5,737 rural stations; RT has 866. In Chile there were no universal services obligations imposed on either of the two major rural operators, CTR (SR Telecom) and the incumbent CTC (Telefonica). Both entered through the minimum subsidy auctions organized by the Fondo de Desarrollo de las Telecomunicaciones, as did Megacom and Geneva, which are smaller rural operators, each with less than 1% of the market. The following new rural operators have also entered through minimum subsidy auctions: (i) Gilat-to-Home, Union Temporal, Comsat and Internet - in Colombia; (ii) Sersat, Prearg, Hidroc and Eurotec - in Guatemala; (iii) Bec Telecom - in the Dominican Republic; and (iv) Nucleo, Telecel, Impsat, Loma Plata, and Electroimport - in Paraguay.

In Venezuela all licensed operators and service providers are eligible to participate in universal service project tenders. They must first be qualified on technical grounds, namely, their ability to meet all the requirements described in the call for tender documents. The requirements comprise geographical coverage, services to be provided, socioeconomic situation of area to be served, length of obligation, minimum quality-of-service expected, maximum and minimum tariffs, etc. The qualified operator requesting the lowest subsidy is selected. CONATEL defines each project and its costs, in order to establish a maximum subsidy amount (this information is not published). CONATEL may also assign projects directly without a tender, if the tender process does not result in the selection of an operator[50].

[49] Art. 18, Reglamento de la Ley Orgánica de Telecomunicaciones Sobre el Servicio Universal de Telecomunicaciones, 2003

[50] Art. 33-57, Reglamento de la Ley Orgánica de Telecomunicaciones Sobre el Servicio Universal de Telecomunicaciones, 2003.

g. <u>License terms and conditions of fund subsidized projects</u>

Fund-subsidized projects in Regulatel countries tend to have similar terms and conditions. These include specification of the following: (i) the municipalities, population centers and rural areas to be covered; (ii) quality-of-service parameters, such as the maximum delay time before which service must be provided, opening hours, the minimum number of lines that must be working at any time, and the mean time to repair a fault; (iii) the tariffs for a limited number of services; and (iv) in certain cases, the technology to be used.

In Peru the prices for calls within a province are regulated. In Chile only prices for regional calls are regulated, and these are subject to a fixed adjustment formula. The prices of all other services that the rural operators provide, including long distance calls, are not regulated. In Colombia, Chile and Peru, the technology to be deployed is not specified, but it is specified in Guatemala. In many Regulatel countries, rural operators who obtain subsidies are subject to the same general obligations and conditions that are imposed on all operators and service providers. In Peru, Valtron, a small new regional operator that is getting funding for a pilot project in the Province of Huarochori, will have to pay license and spectrum usage fees and import duties on telecommunications equipment, according to the same formula and conditions as any other operator.

Table V.3 summarizes these main characteristics of Regulatel members' universal access funds.

Table V.3 Characteristics of universal access funds in Latin America

Country	Fund name	Enabling legislation	Est.	How funded	By whom and how administered				Program definition/Disbursement method	Project types
					Telecom regulator	Other	Nature of adm.	How adm. is financed		
Argentina	Fondo Fiduciario del Servicio Universal (FFSU)	Reglemento.General Servicio Universal (RGSU) = Decree 764/2000	Not constituted	1% of operators' net income net of taxes with possibility of "pay or play"			Administration Council with its chairperson appointed by Ministry of Economy.	Not determined	List of projects to be established biannually/ Minimum subsidy	Public long distance telephones in areas without service; local public telephones; handicapped; education; health; cultural projects; etc.
Bolivia	Fondo Nacional de Desarrollo Regional (FNDR)	Art.28 Ley Telecom.	2002*	Frequency license fees, fines and other		Director de Telecomu-nicaciones	Government department	Government budget		Programa Pronter for municipal governments
Brazil	Fundo de Universalizacao do Servicio de Telecomunicacoes (FUST)	Lei 9.998 (LGT) of 17.08.2000 regulated by Decree 3.624 of 5.10.2000	2000	1% of (private and public) operators' gross operating revenues less taxes, social security and other contributions	Anatel		Ministry of communications defines policy, direction and priorities of FUST and defines programs and projects; Anatel implements projects and proposes program to Ministry	Budget of Anatel	No FUST funds have so far been disbursed	Local communications + other civil and military telecom. And for health and education
Chile	FDT	Ley 18.168 Ley 19.724 DS 353	1995	National Treasury	Subtel		Consejo de Administración de las Telecomunicaciones	Budget of Subtel	Minimum subsidy	Payphones Telecenters

Table V.3 Characteristics of universal access funds in Latin America

Country	Fund name	Enabling legislation	Est.	How funded	By whom and how administered				Program definition/Disbursement method	Project types
					Telecom regulator	Other	Nature of adm.	How adm. is financed		
Colombia	FCM	Ley 142/94 (Literal 74.3)	1994	% of net revenues from fixed telephone, VAS, trunking, etc., 4% of net postal revenues and 5% of gross revenues of national and international long distance and cellular mobile services			A director who is a civil servant in the Ministry of Communications	Budget of Ministry of Communications		
	Compartel[51]	Conpes 3032 de 1999	1999	from FCM		Compartel, independent entity within Ministry of Communications	A manager appointed by the Ministry of Communications and FONADE	Budget of Ministry of Communications	Program defined by Conpes (top down)/Minimum subsidy	Payphones Telecenters
Costa Rica	none	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Cuba	none	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Ecuador	FODETEL	CONATEL Res. 380-17 of 05.09.00	2000	1% of all operators' annual billed and received revenues	SENATEL		Administrative Council	Out of the fund	Plan established by FODETEL/with and without tenders	Community telecenters and residential projects in rural and poor peri-urban areas
El Salvador	FINET	Decree 960 of 1997	1997	98% of telecommunications and electricity concession; spectrum license fees; fines				Out of Fund; cannot exceed 10% of subsidies and investments of Fund	FINET	
Guatemala	FONDETEL	Ley General de Telecomunicaciones, 1996	1997	70% of spectrum license fees until 2003		Ministry of Infrastructure, Communications & Housing		Budget of Ministry	Ministry (FONDETEL)/min. subsidy	
Honduras	none	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable

[51] In reality Compartel is a program (not a fund) financed by the universal access fund, FCM

Table V.3 Characteristics of universal access funds in Latin America

Country	Fund name	Enabling legislation	Est.	How funded	By whom and how administered				Program definition/Disbursement method	Project types
					Telecom regulator	Other	Nature of adm.	How adm. is financed		
Mexico	FCST	Art.50 y 51 Ley Federal de Telecom.	2002	National Treasury		Comité Técnico del Fondo de Cobertura Social	Committee representing various ministries	Secretaria de Comunicaciones y Transporte	Technical Committee/Minimum subsidy	
Nicaragua	FITEL	Decreto 84-2003; Reglamento de la Ley Orgánica de TELCOR (07.12.04)	2004	20% of TELCOR's budget	TELCOR		Reports to Director General of TELCOR but is independently run with its own budget and accounts	Budget of TELCOR	Projects are proposed by anyone (community, NGOs, operators, local governments, etc.). FITEL evaluates and decides.	Promote private sector participation in universal access projects
Panama	none	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Paraguay	FSU	Ley 642/95 de Telecom.	1999	40% of operators' commercial operating taxes	CONATEL (FODETEL)		Administration Council of FODETEL	CONATEL's budget	FODETEL/ auction and CONATEL decision	Telecoms projects in rural and marginal urban areas
Peru	FITEL	Ley de Telecomunicaciones de 1993	2000	1% of all operators' gross billed and received incomes; Other possible sources	OSIPTEL			OSIPTEL's budget	FITEL/minimum subsidy and directly awarded for pilot projects	Payphones Community access projects Pilot projects
Republica Dominicana	FDT	Ley 153-98	1998	2% of operators' bills	INDOTEL		Executive Council of INDOTEL	INDOTEL's budget	Proposed projects	
Uruguay	none	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Venezuela	FSU	Ley Orgánica de Telecomunicaciones Ley 36.970 de 12.06.00 (Art. 54)	2000	All licensed telecommunications operators must contribute 1% of their gross incomes to the Fund.		Junta de Evaluacion y Seguimiento de Proyectos	Council headed by the Director general of Conatel and with representatives of various ministries and the operators.	Out of resources of the FSU	CONATEL; min. subsidy tender	Telecenters Projects of a socioeconomic nature

* abandoned

V.4 Other financing initiatives

A number of other universal access programs have been introduced in ways other than through the country's universal access fund or universal access obligations being imposed on operators. These programs have been introduced through the financing initiatives of national and local governments, NGOs, local associations, other civil society and public interest groups, or sometimes the private sector. Many have had positive results, and are worthy of study and potential emulation. Often these projects have their origins directly within the communities or with interest groups that eventually stand to benefit from the connectivity.

One of the earliest examples of this type of initiative was implemented in Bolivia. Since 1979, the Bolivian Ministry of Transportation and Communications has been operating a national rural telecommunications service (Servicio Nacional de Telecomunicaciones Rurales or SENATER). It consists of a network of 347 HF radio stations in rural areas in 88 of 111 provinces (in all nine departments). An operator in each station helps attend to customers (Figures V.1 and V.2). The services offered are radio-to-radio at pre-booked times, radio-to-fixed telephone, telegram, and radiogram services. These services continue to be in demand even if the quality is not always good, because the subsidized prices are accessible to low-income users.

Figure V.1 : Servicio Nacional de Telecomunicaciones Rurales (SENATER), HF radio station in Potosi, Bolivia

Many of the more recent projects are focused on agriculture and fish farming. These projects have the objective of promoting the development and use of ICT in this sector. They do so by educating, facilitating exchange of information, providing market and other information, strengthening the productive capacity, and promoting exports and diversification of product markets for the indigenous and other farmers in these largely agricultural regions. These objectives have been attained through a variety of actions, including the installation of community telecenters, information centers and connections to the Internet, education programs for farmers and students, and services of translation into local tongues. They have also frequently resulted in introducing ICT into the education systems.

Figure V.2: Customer making a booking at the SENATER, HF radio station in Potosi, Bolivia

Bolivia has several projects of this type. The Programa de Infraestructura Descentralizada para la Transformación Rural (IDTR) was a top-down initiative. Its objective was to provide electricity and access to ICTs, including expansion of cellular coverage, for 15,000 rural households, micro-enterprises, schools and health centers. About 40% of the financing was local/private, and 60% from a World Bank loan. The program was not successful, as is shown in the Chapter VI. However, Bolivia has many successful programs that were bottom-up initiatives. These include:

- The Red de Centros de Información Agroecológicos Project of the Bolivian Ecological Producers Association (Asociación de Organizaciones de Productores Ecológicos de Bolivia or AOPEB). Its objectives are to establish an information access service for rural and indigenous communities, to promote the production of organic agricultural products and provide training and technical advice.

- The *Sistema de Información Campesina-Indígena* Project of the Fundación Acción Cultural Loyola (ACLO). It helps develop the agricultural productive capacity of farmers and indigenous people in several municipalities in the Department of Chuquisaca. It includes product markets information. The Sopachuy wireless mesh network described in Chapter VII, is part of this project.

- The *Proyecto Sistemas de Información y Monitoreo Agrícola en los Valles Cruceños of the* Instituto de Capacitación del Oriente (ICO). The objective of this project is to promote the building of community telecenters in Vallegrande Province, in the Department of Santa Cruz.

- The *Apoyo para Campesinos Indígenas del Oriente Boliviano* (APCOB) project. It promotes and facilitates the exchange of agricultural information among the Chiquitana indigenous communities in Concepción, San Javier and Lomerío. It does so via AM and FM radio and access to the Internet in community telecenters. It also provides multicultural and multiethnic education, training, counseling and basic municipal government services.

- The installation of satellite links in 60 local offices of FINRURAL (Asociación de Instituciones Financieras para el Desarrollo Rural) to facilitate and speed up the process of awarding micro-credits in these rural localities;
- A project sponsored by the Coordinadora de Integración de Organizaciones Económicas Campesinas de Bolivia (CIOEC). It helps small agricultural and sea food producers access information on possible governmental and non-governmental funding sources, as well as markets for their products;
- The *Adolescentes y al Proyecto Aprender Creando* project of the Fundación AYNI. It helps to introduce ICTs into schools in the department of Oruro.

AOPEB, ACLO, ICO, and APCOB are part of a "shared satellite connectivity" model. These local organizations implemented this model in 2003, jointly with the International Institute for Communication and Development (IICD), an NGO based in the Netherlands. It is currently running on a trial basis in 11 communities in the Departments of Santa Cruz, Chuquisaca and La Paz. Under this shared model, local government agencies, schools, hospitals, agricultural and other associations and even small privately run businesses, share a VSAT link, with one of them (in this case an agricultural association) contracting a VSAT based Internet access service from a satellite services provider (ISP). The participating local organizations are all linked to the community VSAT terminal through a wireless WiFi mesh network (See Section VII and Annex 3). They all share the investment and operation costs. FINRURAL and IICD along with its local partners *Apoyo para Campesinos Indígenas del Oriente Boliviano, Fundación Acción Cultural Loyola, Instituto de Capacitación del Oriente, and Asociación de Organizaciones de Productores Ecológicos de Bolivia*, organized a tender to obtain bandwidth from a single satellite service provider for all of FINRURAL's 60 and IICD's 11 connection points. Originally, they were able to negotiate prices of US$350-US$450/month for a 512 Kbps (downlink)/128 Kpbs (uplink) circuit. Following new negotiations in 2005, this was reduced to US$200–250/month.

Two-week training courses in VSAT installation, maintenance and administration of the information centers, were organized at the beginning of the implementation phase. Later, in Santa Cruz, there was a technical seminar on connectivity in the community to exchange experiences among the different partner organizations.

This IICD project is part of a broader 15 project "ICT for Development" *Ticbolivia* program (www.ticbolivia.net) which has installed information centers and school laboratories in all departments of Bolivia. The Ticbolivia program has provided radio programming, websites and printed information for farmers, indigenous people, teachers and students. The program was founded by local grass-root organizations and NGOs who joined their efforts to search for more effective technical and organizational models for rural connectivity. It resulted from the following realizations among the partners: (i) the poor quality, high prices, and lack of access for telephony and Internet were a key limitation to effective and sustainable implementation of ICT for development; and (ii) despite multiple efforts of the government to implement rural universal access schemes and to deregulate the sector, access to information and communications facilities outside the main urban centers remained largely absent.

IICD's contribution is its support of pilot projects in the following locations: (i) the municipalities of Sopachuy, El Villa, Alcalá, and Presto in the Department of Chuquisaca; (ii) the municipalities of

Lomeria, Concepción, San Javier, Valle Grande, Comarape and Mairana in the Department of Santa Cruz; and (iii) the municipality of Carnavi in the province of Carnavi, Department of La Paz.

In Costa Rica, government ministries and agencies have set up computer laboratories in schools, comprehensive community based telecenters, and an information system for the agriculture and fishing sectors (Sistema de Información del Sector Agropecuario Costarricense, or Infoagro).[52]

In other Regulatel countries, similar financing initiatives have involved establishing and operating different types of telecenters. Several of these are described in detail in Section VII.7 and Annex 4 of this report. They include:

- The privately financed, established, owned and operated "cabinas publicas" in Peru, inspired from a model created by the Red Cientifica de Peru (RCP) in 1993. These are self-sustaining, do not require subsidies and have been widely emulated.

- The 3,031 Internet access points installed throughout Argentina in 1999 and 2000 under the Argentina@Internet.todos program (later changed to Programa Nacional para la Sociedad de la Información, or PSI). These were installed at an estimated cost of US$60 million. They were financed in part from Argentina's share of the proceeds from the privatization of Intelsat, and in part from fines imposed on Telefonica and Telecom, paid mainly in the form of equipment. This program made Argentina an early telecenter leader in the region. Each of the 1,281 public telecenters (Centros Tecnológicos Comunitarios, or CTC), was equipped with five computers plus software. Each of the 1,750 public libraries was equipped with two computers. These centers were all installed within a period of a year and a half.

- The Secretaria de Comunicaciones initiated this program. The Secretaria gave a number of education, non-profit and public sector agencies responsibility to operate and administer the telecenters. The International Telecommunication Union was responsible for administration during the installation phase.

- In an agreement with the telecenter administrators the Secretaría committed to handing over functioning telecenters to the selected administrators. The Secretaría also accepted responsibility for the following: (i) web page design; (ii) training of local coordinators; (iii) providing support in the operation and administration of each telecenter; (iv) developing control and evaluation procedures; and (v) assuming the cost of telephone and Internet access.

- The selected administrator committed to the following: (i) providing an appropriate site with adequate comfort and toilet facilities; (ii) offering free Internet service; (iii)

[52] Infoagro is the umbrella information and communication system for the Costa Rican agriculture sector that facilitates the information flow and knowledge generation to improve its competitiveness, especially for small and medium sized producers. It is a nationwide system of public nature, which relies on an ICT network supported by local information and communication centers hosted by public entities and producers and other private organizations. It was established in the late 1990s by the Ministry of Agriculture in response to a lack of available information to producers in rural areas in Costa Rica on prices, markets, services, technology, business organization, soil fertility, etc. Its objective was to promote the use of information technologies at different levels of the agricultural production chain and to support the decision-making process of both producers and the public bodies involved in the sector.

ensuring that the center was properly staffed, with both technical and pedagogical people; (iv) providing adequate service to the public, and publishing the center's working hours; (v) providing the Secretaria with any information it required; and (vi) freeing the Secretaria from any liabilities imputed to the center.

- The LINCOS (Little Intelligent Community) self-contained community telecenters inspired by a model created at MIT's Media Lab. These are installed and operated in rural communities, with the financial support of the Entebbe Foundation in Costa Rica, and the President's Office in the Dominican Republic. They offer not only telephone and Internet access, but also banking, postal services, computer training. They also include a low power community radio station;

- The Infoplazas telecenters in Panama. These are installed and operated with financial and technical support of the Inter-American Development Bank (IADB), the Fundación Infoplazas de la Secretaria Nacional de Ciencia Tecnología (SENACYT), other government departments, local and municipal governments, NGOs, civil groups and private enterprises.

- The following three telecenter programs in Brazil: (i) The Federal Communication Ministry's GESAC Program, with over 4,000 installed telecenters in public locations and schools in 27 states targeting people from the C, D and E (lower) social classes in urban, rural, native and borders communities; (ii) The State of Sao Paulo's Acessa Program, which has deployed more than 200 telecenters and Internet access booths in urban and rural communities throughout the State also serving mainly the C, D and E social classes; (iii) The Pirai (Rio de Janeiro State) Digital Project with telecenters in public places schools and public libraries coordinated by the City of Pirai, which has a network covering the whole city, using WiFi technology.

V.5 State controlled mandates

In the decades prior to 1990, the traditional structure of the telecommunications sector throughout most of Latin America was state-owned and operated monopoly telephone utilities, which had exclusive responsibility for building networks and delivering services. Government-dictated priorities and budget allocations usually determined decisions on investment and expansion, such as which customers, services, and locations to serve.. Most Regulatel countries have since then privatized their state monopolies and liberalized their telecommunications markets (Chapter II). However, Costa Rica, Honduras, Uruguay, and Cuba, have to a certain degree continued to emphasize the state's primary role in the oversight and operation of the telecommunications sector[53]. Nevertheless, with the exception of Cuba, this role has been conducted in conjunction with other governmental and non-governmental financing approaches.

In Costa Rica and Uruguay, initiatives for providing universal access come not from the government or the telecommunications regulator but from the administration of the monopoly operator acting on its own initiative. In Costa Rica, the operator is ICE, and in Uruguay, it is ANTEL,. The initiatives have included installing public payphones, extending coverage of the fixed telephone network into the entire territory, and ensuring that basic telecommunications services

[53] En Paraguay, the state continues to maintain ownership of COPACO, the fixed line operator. There is competition in all market segments except fixed line public switched telephone. (See Ley No. 642/95 Art. 21).

are affordable. In Uruguay, ANTEL has also implemented various information society and ICT projects either on its own or in coordination with the Ministries of Education, Public Administration, Labor and Social Security, local governments, the private sector, and civil society. The projects include telecenters, education centers, and a comprehensive e-government program. In Costa Rica, RACSA, the value added services subsidiary of ICE, has established free telecenters in post offices throughout the country.

In Honduras, where the state owned HONDUTEL enjoyed a monopoly until the end of 2005, the government's 2003 "Telefonia para Todos" initiative had as its objective to add 200,000 new fixed telephone lines to the then 300,000 by the end of 2005[54].

In Cuba, universal access objectives and connectivity are being pursued through a combination of obligations imposed on Empresa de Telecommunications de Cuba S. A. (ETECSA), the partially privatized monopoly telephone company (see above), and initiatives of the Ministry of Informatics and Communications (Ministerio de Informática y Comunicaciones). The latter include the following: (i) establishing training centers, called Joven Club de Computación y Electrónica (JCCE), that offer free IT (computers and electronics) instruction to anyone of any age who requests it; (ii) putting computers in all schools and universities; and (iii) implementing a comprehensive e-government program, emphasizing health, culture, and social security.

The next chapter reviews the results achieved, does a critical evaluation of each of these approaches in terms of what has worked well and why, evaluates some of the problems encountered and responses to overcome these, and the lessons learned, The next chapter also contains a number of recommendations for the way forward.

[54] Decreto Ejecutivo PCM 138-2003.

VI. UNIVERSAL ACCESS PROGRAMS: RESULTS ACHIEVED, EST PRACTICES AND CRITICAL EVALUATION

VI.1 Introduction

This chapter presents the results achieved in Regulatel countries of the four main approaches to universal access presented in Chapter V. It includes a discussion of the key factors for success, the major problems, and a critical analysis and comparison of the effectiveness of each approach. Chapter VI presents best practices with regard to universal access fund programs, based upon the extensive experience in Regulatel member countries with these programs. In our analysis, we address the following general questions and provide specific examples:

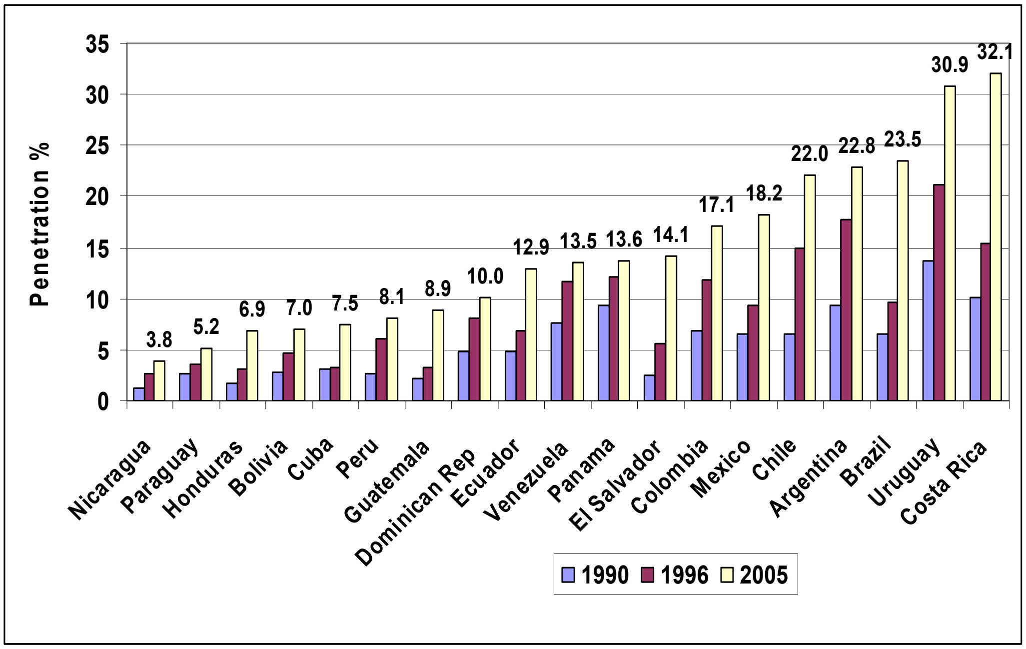
- What have been the general results, in terms of access growth and other indicators?
- What has worked well, and why?
- What are the key features and activities, including specific implementation details that have produced the most promising results?
- What problems have been encountered, and what has caused them?
- What responses have been tried to overcome problems or barriers?
- What are the key overall lessons learned, and how can they be applied going forward?

In light of the sheer variety and diversity of telecommunications policies and practices throughout the region, it is not surprising that many have yielded promising results. In Addition, even where similar approaches have been emphasized, numerous facets of each policy and practice are inevitably unique to the individual country or area. Our objective is to highlight broad trends and encouraging developments that can provide valuable insight for policymakers and regulators, and stimulate new ideas across Latin America and elsewhere in the world.

The analysis here also refers to the findings of the Gaps Model discussed in Chapter IV, as a basis for evaluating the degree of progress that liberalization initiatives have achieved, and what remains to be accomplished.

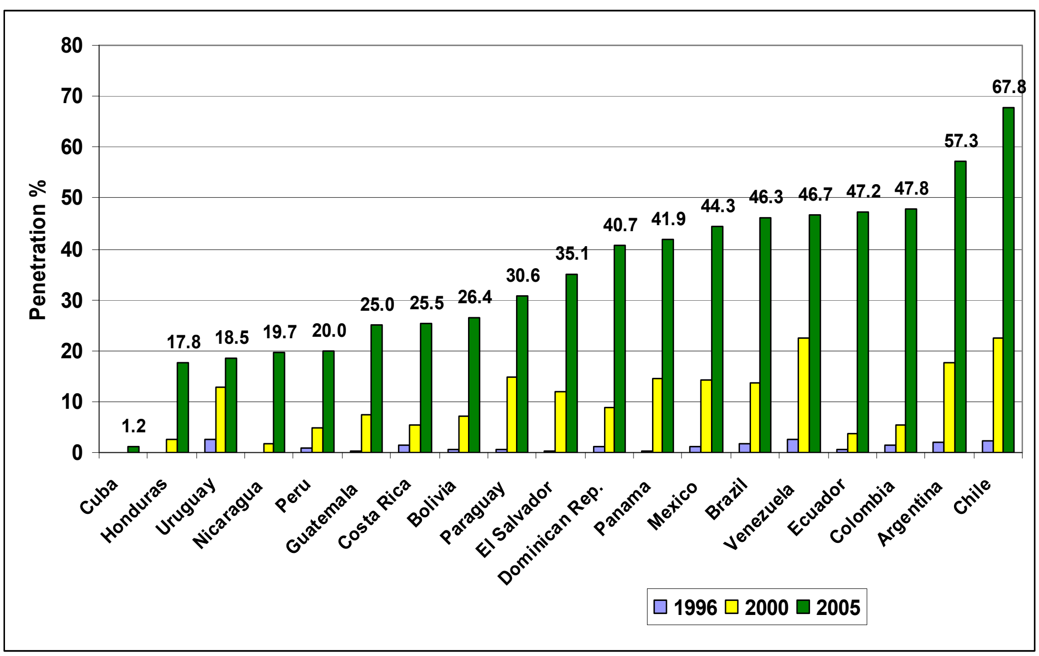
While there remain disparities among the 19 Regulatel countries, liberalization of their telecommunications markets since the early to mid 1990s has resulted in remarkable increases in both fixed line and mobile penetration rates (Figures VI.1 - VI.4).

Figure VI.1: Fixed line penetration (1990, 1996, 2005)



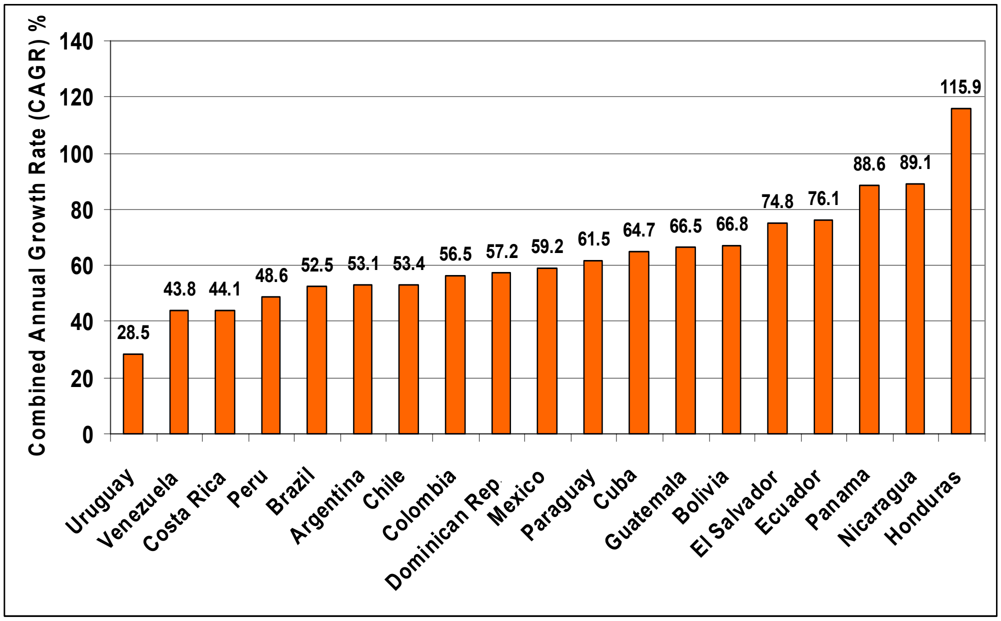
Source ITU WTI 2005

Figure VI.2 : Mobile penetration (1996, 2000, 2005)



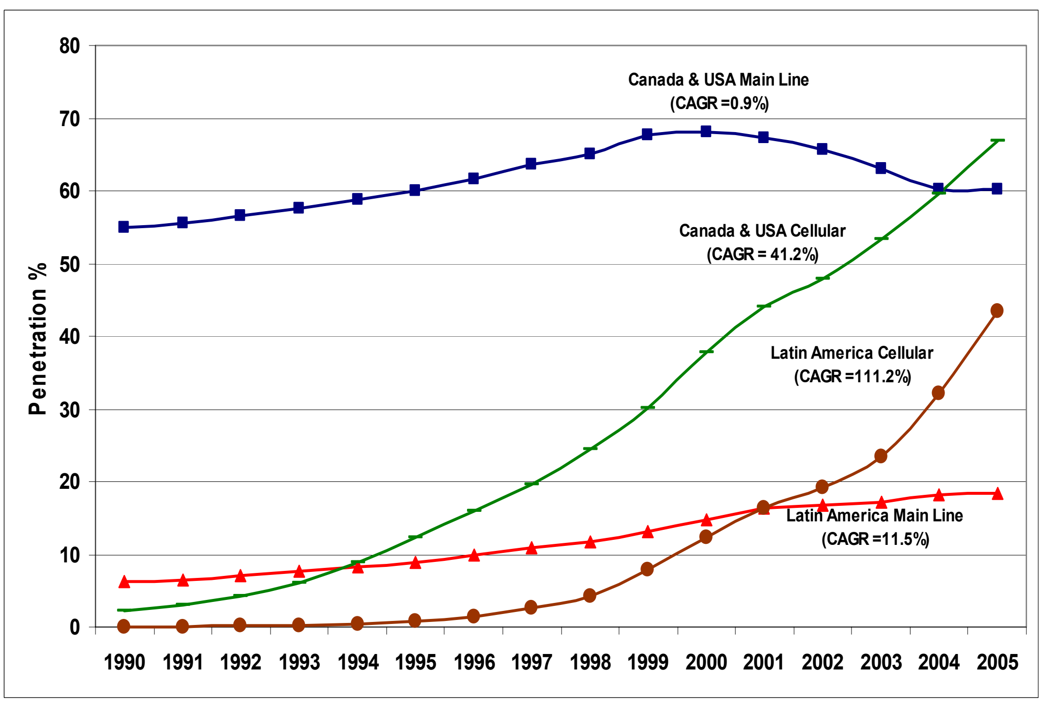
Source ITU WTI 2005

Figure VI.3: Latin America: Combined annual growth rate (CAGR) for cellular mobile between 1996 and 2005



Source ITU WTI 2005

Figure VI.4: Growth of main line and mobile penetration rates in North America (Canada & US) and Latin America between 1990 and 1995



Source ITU WTI 2005

VI.2 Market liberalization and regulatory initiatives

VI.2.1 Introduction

The liberalization of most telecommunications markets throughout Latin America has created a tremendous impetus for network growth and expansion of access to broad new segments of the population. However, this is still an incompleted process in most countries. The changing technological and market landscape continues to present new challenges to policy makers and regulators in their efforts to further open and expand markets, and to find ways to close the remaining market efficiency gaps.

VI.2.2 Results achieved

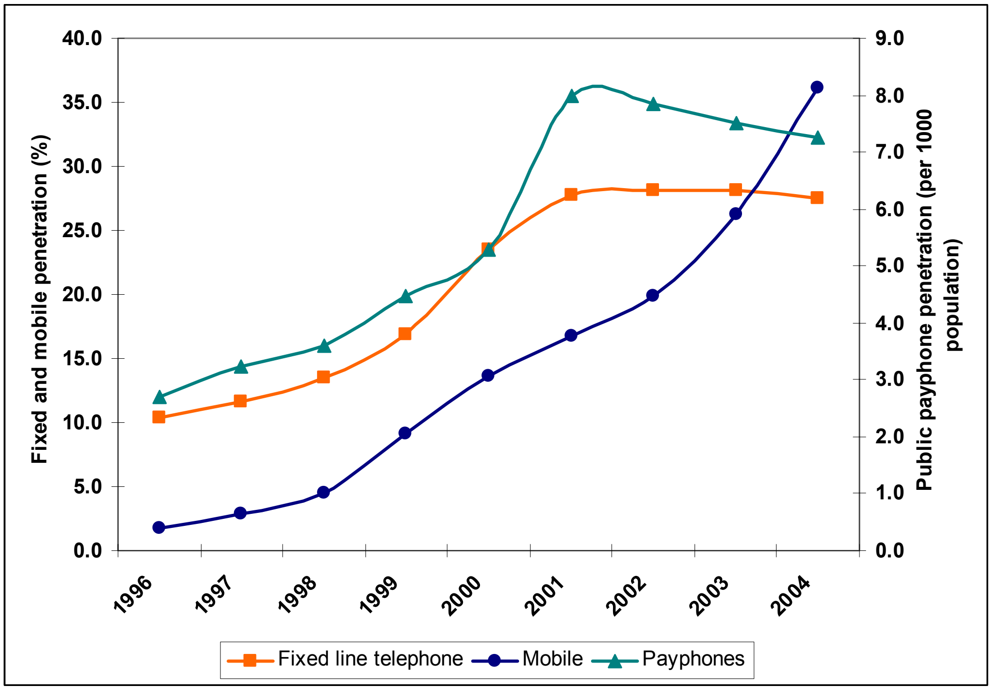
The following elaborates upon some of the results achieved in Regulatel countries through a combination of market liberalization and regulatory initiatives, as well as through universal access obligations.

Along with Uruguay and Costa Rica (for fixed), and Chile and Mexico (for mobile), Brazil has attained the highest fixed and mobile penetration rates among Regulatel countries. In the absence of a fully functioning universal access fund (FUST), Brazil has added 11.4 million new telephone lines and nearly 400,000 new payphones since the sector was liberalized during the latter part of the 1990s. Brazil has achieved this through a combination of implementing liberalization measures and imposing obligations on the six operators who have concessions in the public regime[55]. By the end of 2005, a population of 157.5 million (86%) living in 44,000 out of about 50,000 population centers had access to a residential telephone or a payphone. This includes 3 million people living in 27,000 localities with less than 300 inhabitants. Mobile penetration increased from 1.75% in 1996 to over 36% in 2004 (Figure VI.5), in a competitive environment where there are at least four operators in most of the 10 regions into which Brazil has been divided for this service. As a result, the market gap for access to mobile voice service is a mere 4%, according to the Gaps Model analysis.

In Peru growth of fixed and mobile penetration after 1995 is almost entirely due to the liberalization of the telecommunications market (Figure VI.6). This growth has, been very much restricted to urban areas. Expansion of the network and access in rural and poorer peri-urban areas has been and continues to be dependent on projects funded by FITEL (see below) and the obligations imposed on the incumbent, Telefonica del Peru (TdP). Because of those obligations, TdP installed and continues to operate and maintain 3,000 rural payphones (approximately one-third of the rural total). This is consistent with the Gaps Model findings, which indicate that there is little if any significant market efficiency gap for mobile voice or Internet services, evidently due to the sparse population distribution and costly terrain in much of rural Peru. The market has in essence reached just about as far as it can, at least with available technologies under prevailing conditions. The access gap is what remains to be closed (Figures IV.2.1 and IV.2.2).

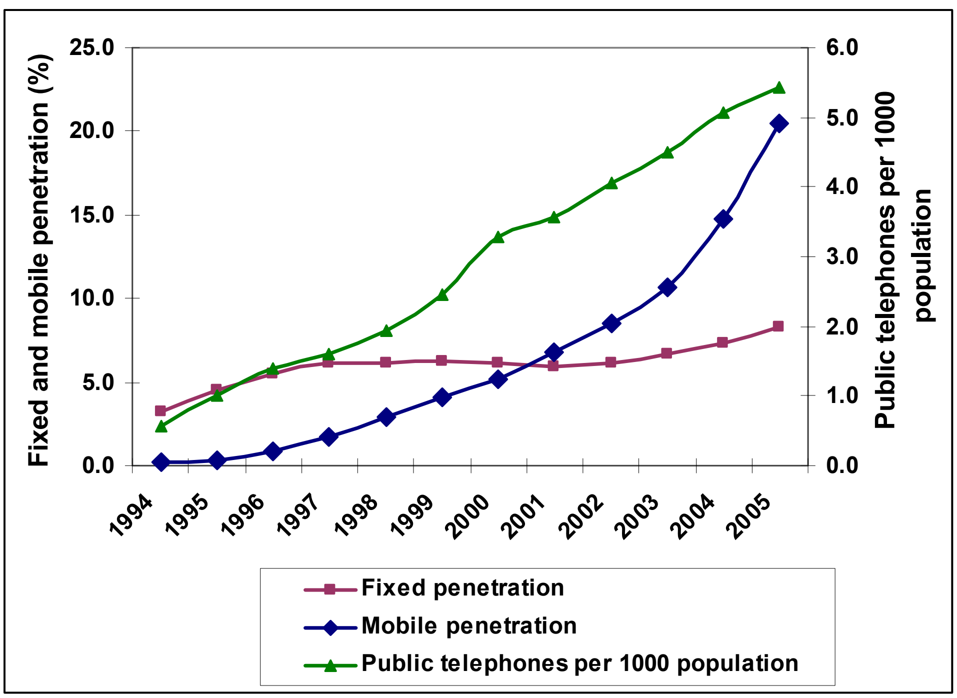
[55] The difference between the public and private licensing regime in Brazil is described in Section V.2.2

Figure VI.5: Brazil: Growth of fixed, mobile and payphone penetration



Source: ANATEL

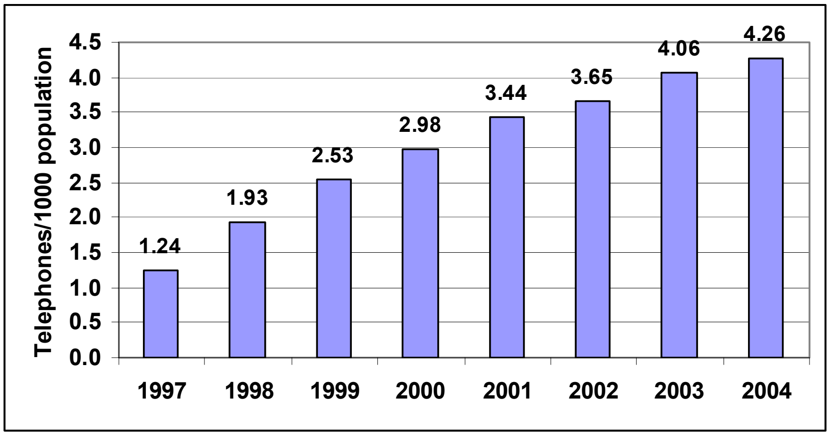
Figure VI.6: Peru: Evolution of fixed, mobile and public telephone penetration rates since liberalization of the telecommunications market



Source OSIPTEL

in Bolivia, the results have been similar. There is no universal access fund in Bolivia, but obligations are imposed on operators in their licensing. The fixed line penetration rates in rural areas increased from 1.24% in 1997 to 4.26% at the end of 2004 (Figure VI.7). The overall fixed line penetration has doubled to 6.5% since 1995, when the incumbent long distance operator, ENTEL, was privatized and the sector was reformed.

Figure VI.7: Bolivia: Number of telephones (residential and public) in rural areas



Source: Grover Barja

So far, however, this policy has almost exclusively benefited the 43 urban localities with more than 10,000 inhabitants, and the 1,553 larger rural localities with 351 to 10,000 inhabitants, where most fixed and mobile subscribers are found. At the end of 2004, there were only 265 fixed or mobile lines in the remaining 27,773 localities with less than 350 inhabitants, which accounted for nearly 27% of the population. There were no lines at all in the 25,222 rural communities with less than 200 inhabitants (Table VI.1). Again, this is consistent with the Gaps Model findings, which indicate that the remaining market efficiency gap in Bolivia for both mobile voice and Internet access is only about 8% of the market, while the access gap is about 14% (Figure IV.2.1).

Table VI.1 Bolivia: Number of localities and lines (fixed and mobile) in services at end 2004

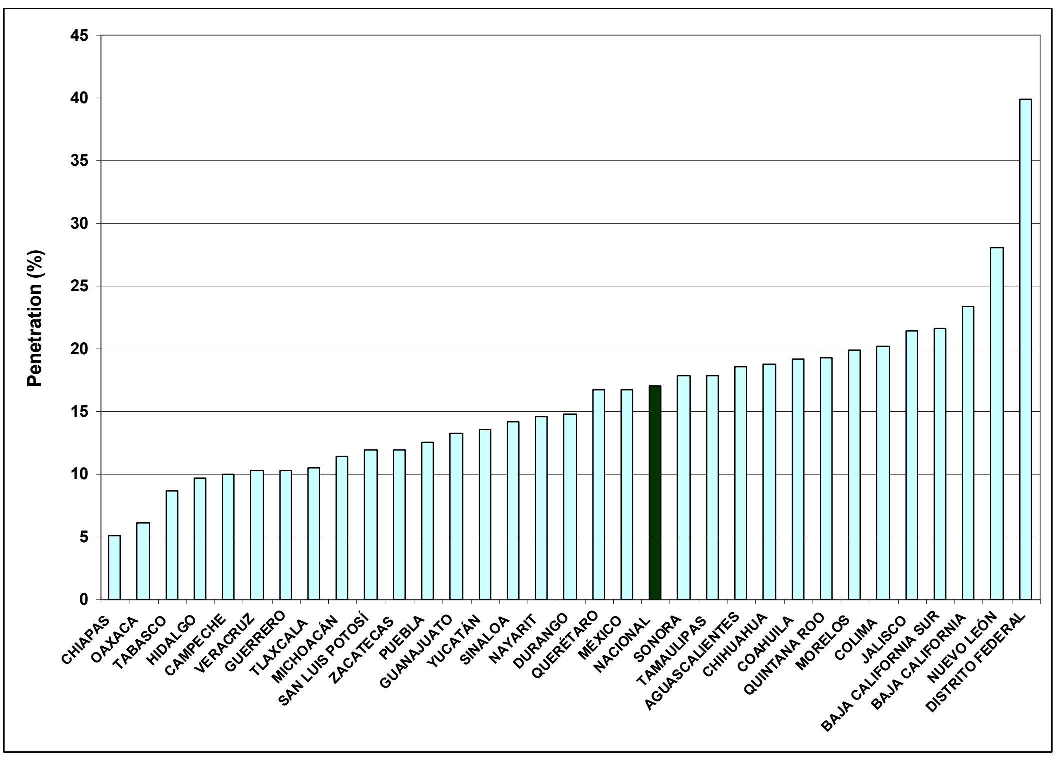
Size of locality	Number of localities	Number of inhabitants	Number of fixed and mobile lines in service	Penetration (%)
Urban areas with more than 10,000 inhabitants	43	4.715.484	2.020.727	42.85
Rural with less than 10,000 but more than 351 inhabitants	1.553	1.339.173	13.277	0.99
Rural with less than 350 but more than 201 inhabitants	2.551	665.879	265	0.04
Rural with less than 200 inhabitants	25.222	1.553.789	0	0
TOTAL	**29.369**	**8.274.325**	**2.325.716**	**26.99**

Source: Superintendencia de Telecomunicaciones

The incumbent operator in Panama, Cable & Wireless Panama (C&WP), was obligated to install payphones in 670 rural communities, and to maintain the payphones in 121 other localities. In total, C&WP installed 11,153 public telephones, of which 1,262 are in rural areas.

In Mexico, it turned out that the obligations on the incumbent, which terminated in 1995, were not particularly burdensome because it made commercial sense for Telmex to meet them. The fixed line penetration rate in a market dominated by the incumbent, grew from 9.4% in 1995 to 18.2% in 2005, which is about the average growth for all Regulatel member countries. Although 55% of all households now have access to a fixed telephone, regional disparities within the country continue to be significant, with the poorest states having penetration rates that are only one-third of the national average (Figure VI.8). Mobile penetration has exceeded 44%, and 95% of the territory is covered. While the gaps for mobile voice access are very small - 2% market gap, 1% access gap - these gaps tend to include nearly all population centers with less than 5,000 inhabitants. Although in many cases the market should in principle have incentives to serve these population centers, their relatively small size likely makes them unattractive to most investors.

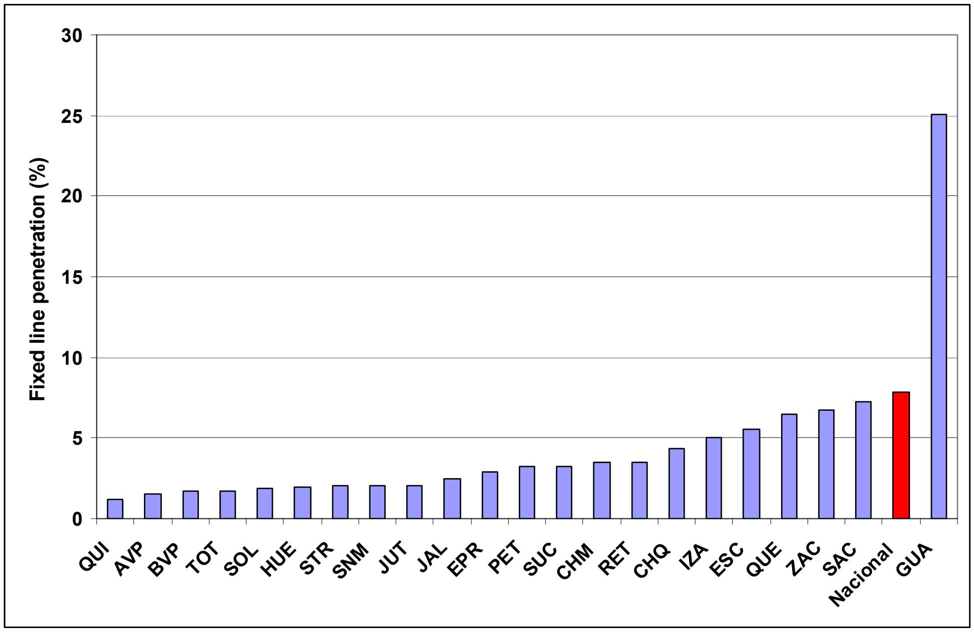
Figure VI.8: Mexico: Fixed line penetration in Mexico's Departments



Source: COFETEL

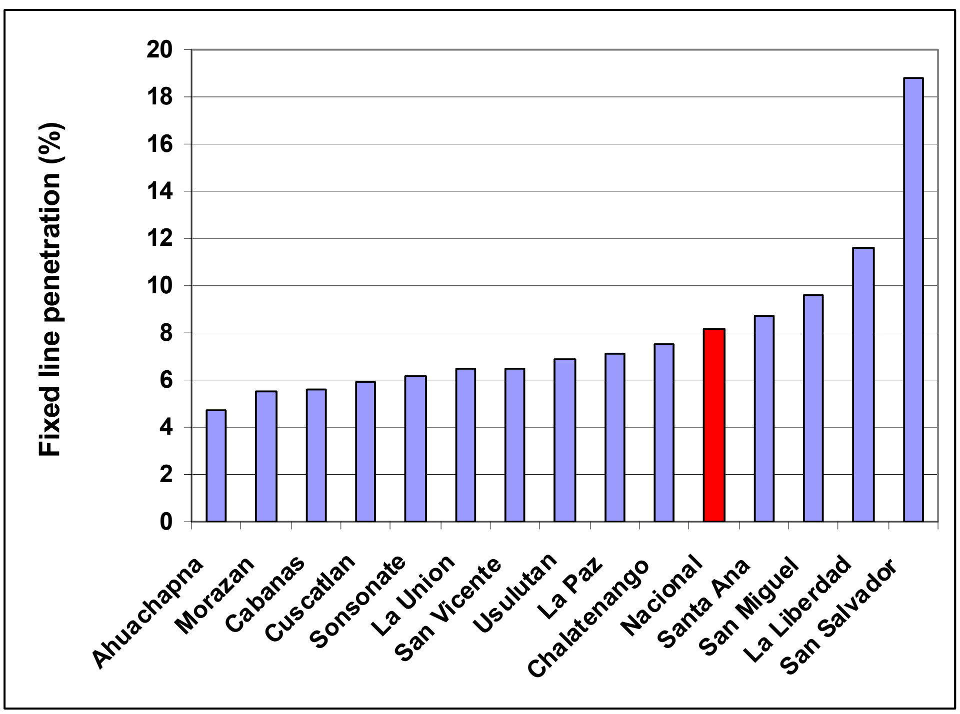
The situation is different in Guatemala and El Salvador. Both have very liberal regimes, and while they have succeeded in increasing fixed and mobile penetration rates, they have not succeeded in decreasing regional disparities. In Guatemala, only one of 22 departments, Guatemala City, with a fixed line penetration of 25%, is above the national average of 7.26% (2.87% in 1995). Several departments have penetration rates of less than 2%. In El Salvador, 10 of 14 departments are below the national average (Figures VI.9 and VI.10).

Figure VI.9: Guatemala: Fixed line penetration by department (2003)



Source: Apoyo Consultaría

Figure VI.10: El Salvador: Fixed line penetration by department (2003)



Source: SIGET

Another way to measure the impact of liberalization is by the price that consumers have to pay for broadband Internet access or general Internet access via digital subscriber line (DSL), cable modem, or broadband wireless access (BWA). Annex 8 compares retail prices of broadband Internet access in Regulatel countries for entry level (below 512 Kbps down link speed), mid-range (512 Kbps – 1,024 Kbps) and higher speed (above 1.5 Mbps). Here, Argentina and Colombia fare quite well. Rates in Argentina, in all speed ranges, are among the lowest, not only in Latin America and the Caribbean, but also in comparison with North America and Europe. For example, Telecom (ADSL) and Clarin (cable modem) offer a 600 Kbps down-link/ 128 Kbps up-link for US$24.30/month including a number of features such as anti-spam, anti-virus, web hosting and multiple e-mail addresses. By comparison, Telmex charges double this for a simple 512 Kbps down-link service in Chile, and US$136/month in Mexico. Such excessive prices are also found elsewhere. In Ecuador, Andinatel charges corporate customers US$100/month for a 512 Kbps/256 Kbps service. Residential customers are charged US$20/month less, for essentially the same service.

VI.2.3 What has worked well, and why?

Liberalization policies have been quite effective in increasing fixed line penetration levels across Latin America. In many of these countries, the compound annual growth rate (CAGR) for fixed lines since 1995 has exceeded 10%. The growth in mobile penetration has been even more spectacular (Table VI.2). The reasons for this success are well documented and widely acknowledged: open markets encourage competitive entry, aggressive deployment of services, efficiency in operations, and creative pricing and marketing strategies, all to the benefit of the consumer. The theories that drove liberalization strategies and the actively licensing of multiple operators in these markets have proven their validity in the only test that matters: the response of the marketplace.

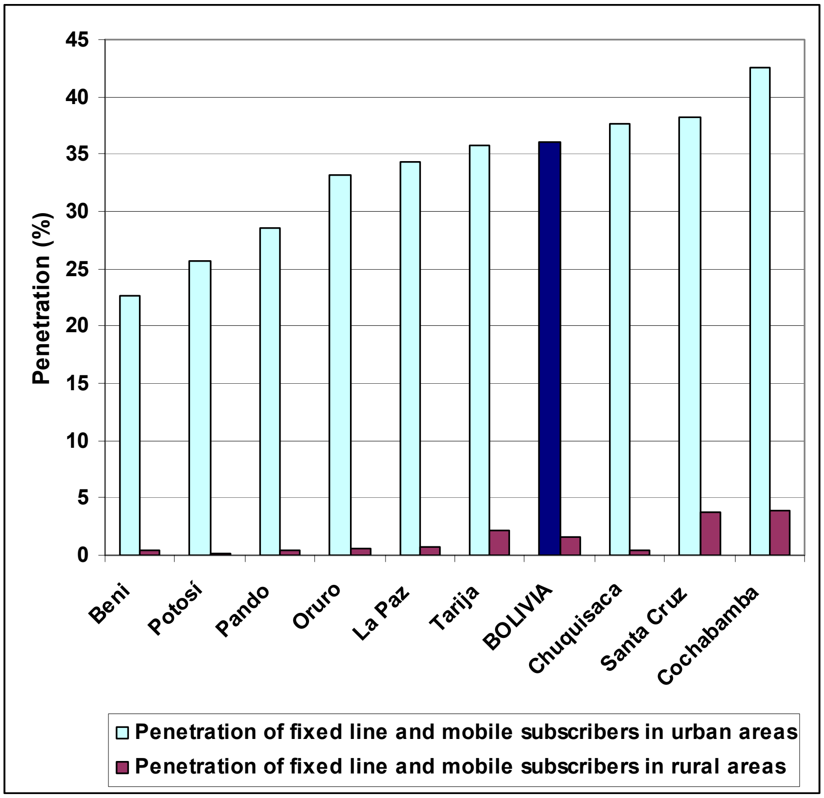
Table VI.2: Compounded annual growth rates for fixed and mobile Services (1995 – 2004)

Country	fixed	mobile
Panama	0.28	78.50
Peru	6.73	73.59
Mexico	7.89	53.87
Bolivia	11.12	114.03
El Salvador	11.52	69.65
Brazil	12.99	46.54
Guatemala	13.46	63.45

Source ITU WTI 2005

However, not everyone has benefited equally from this market-driven expansion of networks. Much of the success has been concentrated in metropolitan areas, as illustrated above in the cases of Guatemala and El Salvador. In Bolivia, urban areas enjoy combined fixed and mobile penetration rates of between 22.7 and 42.6%, while rural areas have rates that are only between 0.2 and 3.9% (Figure VI.11). Given population and income distribution characteristics, serving these urban and peri-urban regions amounts to achieving almost 80% access coverage, at least for public and mobile voice access. This does not, however, entirely address the question of affordability and service penetration for individuals and households. That is why it is so essential that Bolivia has undertaken the many other initiatives described in Chapters V and VIII and in Figure VI.11, that have helped to increase access for these other groups and regions.

Figure VI.11: Penetration of fixed and mobile subscribers in urban and rural areas in Bolivia's nine departments



Source: Grover Barja

VI.2.4 Main problems encountered and responses

Liberalization initiatives, despite their overall successful track record, are not a panacea for reaching all segments of all markets with needed telecommunications services. Barriers and other difficulties often interfere with the effective implementation of liberalization goals. These include disputes over interconnection terms, conditions, and pricing, as well as access to rights of way, tax and tariff policies, and bureaucratic, regulatory and political impediments to market entry or expansion.

The countries with the largest remaining market efficiency gaps for access to mobile voice telephone service – the basic telephony of choice for most of Latin America – are Nicaragua, Ecuador, the Dominican Republic, and Colombia, with market gaps ranging from 14 to 19% (Figures IV.2.1). The factors that have interfered with these countries' attempts to close those gaps are various and not always clear. Some of the apparent influences are as follows:

- In Colombia, the mobile market was a duopoly until about three years ago, when a third operator emerged. It may also be that the underlying structure of the telephone industry tends to inhibit growth, due to such factors as interconnection barriers or costs. Colombia contains numerous small, local municipal telephone operators, which have monopolies in their local service areas. This may create greater challenges for mobile operators to negotiate consistent interconnection agreements, and for CRT to regulate.

- The regulatory situation in the Dominican Republic falls short of many standards for independence, flexibility, and efficiency. INDOTEL is too rigid and not well adapted to regulating in a modern, dynamic, competitive environment. There is an overemphasis on judicial procedures as opposed to direct economic and technical regulation. INDOTEL has been criticized for ceding to political influences. The legal framework is outdated, resulting in confusion and lack of flexibility for licensed operators. All of these factors likely contribute to slow adaptation on the part of all telecommunication segments - including mobile services - to build-out and interconnect services efficiently and profitably.

- Similar concerns exist in Ecuador, where the legal framework is comparably outdated, there is confusion and overlap among various telecommunications laws and regulations, and the regulator is subject to political influence and conflicting mandates. There are three mobile operators, but two of them, América Móvil and Telefónica Móviles, control 90% of the market. In 2007, new concessions are due to be negotiated, which may result in commitments to faster expansion.

- In Nicaragua, the operator ENITEL, was initially state-owned and later privatized. It is now owned by America Movil (that is, Telmex). ENITEL officially had exclusivity for all local and long distance service until April 2005, when TELCOR, the telecoms regulator, declared the market open. ENITEL was, in fact, able to retain its exclusivity until the end of 2005. The mobile market was not opened until 2003; before that time, there was only one operator, Bell South. There is also conflict between two regulators with overlapping responsibilities: TELCOR and SISEP, the new public utilities regulator which was created in November 2004).

Universal access obligations have not always received the most affirmative responses from operators. In Bolivia, according to SITTEL's own evaluation, the policy of universal access obligations imposed on operators has not sufficiently achieved the desired results, in particular for fixed telephone service expansion. The reasons for this are as follows:

- There has been a lack of clarity in the definition of targets.
- There has been a lack of clarity in defining the methods to be used in measuring progress toward meeting those targets. As a consequence, operators have used different and incompatible methods;
- The regulator did not properly supervise the process. It relied too much on information provided by the operators themselves.

VI.2.5 Lessons learned and the way forward

In all but a few of the countries examined by our Gaps Model, the remaining market efficiency gaps where further liberalization and removal of non-economic barriers could generate still greater expansion are relatively small (less than 10%). This is especially true of public access to voice telephone service via mobile networks. While Internet access is still a growing market, and exhibits much larger market gaps, there is good reason to believe that the present trends will also help competitive operators to cover increasing portions of that market. Even broadband services appear likely to expand significantly under unrestrained market forces, particularly with the increasing availability and encouragement of cost-effective wireless broadband services.

There is much that governments and regulators can do to further encourage these trends. This is discussed at length in the next three chapters. Eliminating the legacy restrictions that still favor the traditional incumbent or dominant operators, and that limit the introduction of new technologies and innovative services such as Voice-over-IP telephone calling, is likely to encourage faster deployment of new networks, and new entrepreneurial initiatives. Latin America has demonstrated the value of promoting market-based expansion of access combined with enlightened public policies. There is every reason to continue and complete this task.

Chapter VII discusses innovative technology, services, financing, business strategies, and regulations adapted to the needs of rural operators.

VI.3 Universal access programs and funds

VI.3.1 Introduction

Universal access fund programs in Latin America have so far been limited primarily to building physical infrastructure to connect rural and remote localities to basic telecommunications networks. They have successfully subsidized the installation and operation of public payphones and public access telecenters. More recently they have begun, or are planning to begin, to subsidize Internet access and, in some cases, cellular mobile networks. In other cases, they have begun to focus on applications which allow all citizens to reap the benefits of ICT through e-learning, e-health, e-commerce, e-government, and so forth. Applications which depend on this infrastructure for their delivery, are increasingly being considered as part of a wider government strategy to promote ICT for social and economic development. An important lesson learned, is that universal access fund programs which emphasize physical infrastructure construction and connectivity, must be coordinated with the broader ICT agendas and initiatives. There is little question that universal access fund programs will continue to form a centerpiece of national universal access policies for a long time to come.

VI.3.2 Results achieved

The achievements of some of these funds have been quite significant. In Chile, 25,000 payphones have been installed in about 8,000 population centers since Fondo de Desarrollo de las Telecomunicaciones was established in 1995. Close to 2.7 million people are benefiting. It is estimated that there are less than 150,000 people (1% of the population) without access to a basic telephone. Between 1995 and 2000, rural telecommunications operators invested US$161 million in universal access projects. Of this amount, US$22 million (13.6%) was provided from the fund.

In Colombia, 85% of 22,242 population centers with more than 150 inhabitants now have at least one rural community telephone. This is benefiting an estimated 5 million people. Colombia's Compartel Program, operational since 1999, has subsidized the installation of Internet Community Access Centers which are accessible to an estimated 5.2 million people of which an estimated, 2.5 million are school children (Table VI.3).

Since 2000, Paraguay has installed 2,844 payphones in 2,109 localities with a total subsidy of US$10.7million (US$3,762 per payphone or US$5,073 per locality) from the Fondo de Servicio Universal. Various cellular mobile and other companies won minimum subsidies in three different auction phases to install and operate these payphones. The following three criteria were used to select the localities to receive a payphone:

- Less than 400 inhabitants;
- Presence of one primary school and availability of commercial electricity;
- Absence of an automatic telephone exchange.

In cooperation with the Ministry of Education and Culture, CONATEL, the Paraguayan regulator and fund administrator, has also supplied 287 schools in 14 departments with computers, peripherals, and Internet access (initially for three years, extended for another three). CONATEL also subsidized the building, equipping, and running of special educational telecenters in the 17 departmental capitals. Those educational telecenters were developed under Proyecto Arandurá, to facilitate vocational training not generally available in the Ministry of Education's curriculum. Among the courses offered, are first aid, agricultural subjects, stockbreeding, fish farming, computers and accounting. The fund has also financed the implementation of a nation-wide 911 emergency calling system.

Table VI.3: Results of various phases of Colombia's Compartel programs 1999 - 2004

Program	Year of award	Number of Installations	Subsidy (US$ million)	Investment per installation (US$)	Duration (Build, Operate and Maintain)
Rural Community Telephone – Phase I	1999	6,745 population centers with more than 250 inhabitants	36	5,361	11
Rural Community Telephone – Phase II	2002	3,000 population centers with more than 150 inhabitants	15	5,033	6
Total		**9,745**	**51**	**5,233**	
Internet Community Access Centers Phase I	1999	670	7	9,781	11
Internet Community Access Centers Phase II	2000	270	8	30,242	6
Internet Community Access Centers Phase III	2002	500	44	88,997	6
Broadband and Public Institutions	2004	3.000 schools 624 city halls 120 hospitals 30 military garrisons	43	11,394	6
Total		**4,440 telecenters (incl. 3.000 schools) 774 Public institutions**	**102**		

Source: Compartel and Carlos Balen

The universal access fund in Guatemala, FONDETEL, has subsidized the construction of more than 5,500 telephone connections, including pay and residential telephones in nearly 2,000 population centers at a cost of US$8 million since 1998. However, it is estimated that only 20% of them are providing adequate service[56]. In the Dominican Republic, the dominant fixed line operator, Verizon Dominicana, installed 500 public payphones in 2001 in the poorest provinces. A local new entrant, BEC Telecom, completed the installation of 1,750 payphones in August 2005. Both initiatives were financed through the Dominican universal access fund, FDT (Fondo para el Desarrollo de las Telecomunicaciones).

In Peru, close to 10,000 population centers have been provided with a payphone, of which 6,500 were subsidized through the universal access fund. The rest were installed by the incumbent Telefonica del Peru to meet its universal access obligations, and also on its own initiative. As a result, the average distance that any person has to walk in Peru to reach a telephone has dropped from 56 km to 5.7 km. The total subsidy paid out for the four FITEL programs is just under US$60 million, (Table VI.4).

FITEL has also been subsidizing other types of projects. These include: (i) partial financing of the infrastructure for a rural health network in the Province of Alto Amazonas[57]; (ii) an agrarian information system and community telecommunications network project in the Chancay–Huaral Valley (jointly with the community and the Ministry of Agriculture); (iii) a privately initiated and operated regional telecommunications company in Huarochiri Province (jointly with the entrepreneur who initiated the project); and (iv) a small community based operator or micro-telco in the Department of Junin (jointly with USAid).

The last three projects are described in detail in Chapter VII.

FITEL is also developing a rural broadband project that will provide high speed internet access to 2,840 localities, public payphones to 1,535 localities, and up to 24 residential telephones to each of 95 localities. It will also provide shared services and applications, including ISP and various applications such as prepaid, video conferencing and tele-surveillance, streaming, and platforms for e-government, e-health and e-learning.

FITEL, Nicaragua's universal access fund, was established at the end of 2003. FITEL's first project was to subsidize the expansion of cellular coverage into rural areas. This was to include 353 localities of more than 400 inhabitants, and 30 municipal capitals. The total amount of the subsidy awarded to Empresa Nicaragüense de Telecomunicaciones (ENITEL), the incumbent fixed and mobile operator, was US$6.7 million, or US$17,500 per locality. It is estimated that 500,000 people in rural areas (about 44% of the entire rural population), will fall under the expanded cellular footprint.

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[56] This is because of inadequate planning and structuring of projects, poor timing of subsidy flows and, above all, the complete lack of any kind of supervision.

[57] Proyecto Piloto EHAS Alto Amazonas: Sistema de Comunicación para Establecimientos Rurales de Salud financed by FITEL and the Spanish international aid agency, Agencia Española de Cooperación Internacional (AECI) and involving Pontificia Universidad Católica del Perú, la Universidad Peruana Cayetano Heredia, la Universidad Politécnica de Madrid and Ingeniería sin Fronteras.

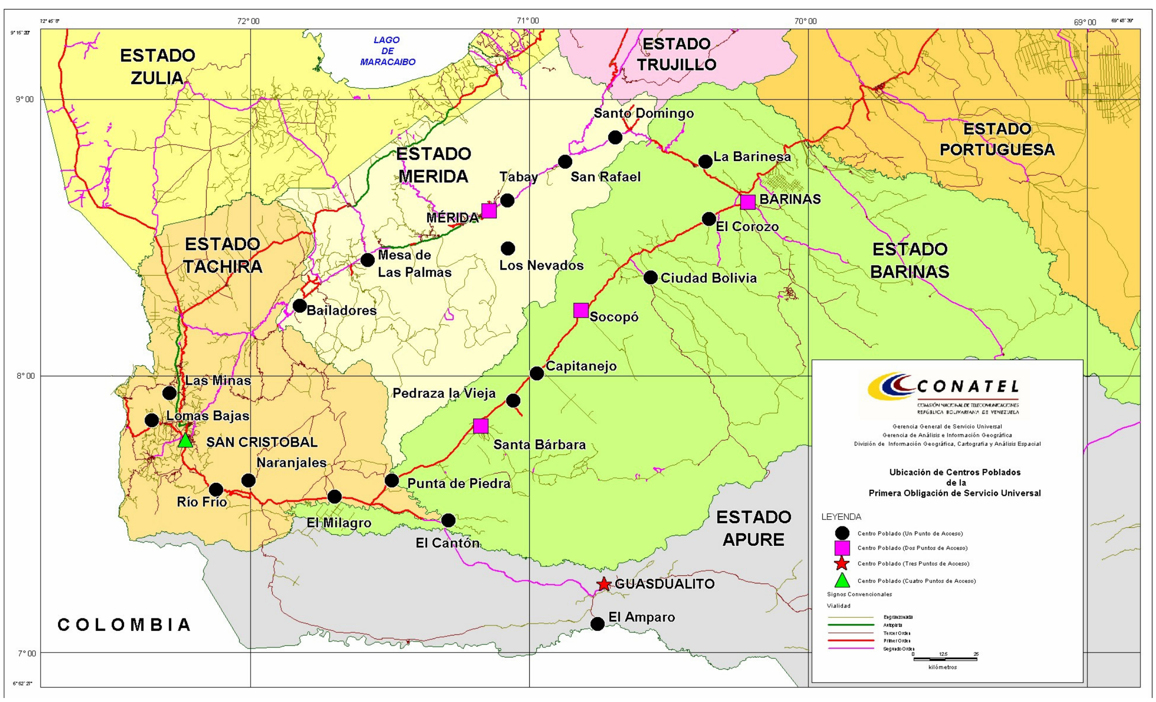
Table VI.4: Localities and population benefiting from FITEL projects and universal access obligations imposed on Telefonica del Peru (1995 – 2004)

Item	Universal Access Fund (Four Phases)					Universal Access Obligations (Telefonica del Peru)	Total/ average
	FITEL I (01/2000)	FITEL II (03/2003)	FITEL III (06-10/2003)	FITEL IV (2004)	Total/ average		
Number of localities served	213	2.170	2.520	1.614	6,517	3,000	
Operator(s)	Gilat-to-Home	Gilat-to-Home	Rural Telecom Gilat-to-Home	Rural Telecom Gilat-to-Home		Telefonica del Peru	
Number of people that benefit	140,000	1,600,000	2,100,000	2,900,000	6,740,000		
Total subsidy (US$million)	5.1	12.1	30.7	11.4	59.3		
Subsidy / locality (US$)	23,937	5,575	12,163	7,061	8,266		
Avg. no. inhabitants/ locality	689	758	827	1,822	1,024		
Subsidy / inhabitant (US$)	34.74	7.36	14.71	3.88	8.65		
Average distance - before (km)	90	54	24	NA	56		
Average distance - after (km)	5	8	4	NA	5.7		

Source: FITEL and Luis Bonifaz

In Venezuela, the first universal access project is to fund the installation of 34 multipurpose telecenters in 24 population centers in four western states (Apure, Burinas, Merida and Tachira). This includes building the local access and transport network to connect them (Figures VI.12 and VI.13). The subsidy was US$11.6 million, of which US$3.9 million has been awarded to 34 local cooperatives to build, operate, administer and maintain the telecenters (Puntos de Acceso). The remaining US$7.7 million has been awarded to Movistar, one of the two dominant mobile operators, to design, build, operate and maintain the 8 x 2 Mbps backbone network and local access network necessary to connect the 34 telecenters. Each telecenter's income will be derived mainly from what it charges for Internet access and telephone calls.[58]. Under the conditions of the subsidy, the local access and transport operator does not charge for these services. Its operating revenues will be derived from interconnection and termination charges paid for calls coming into the network destined for the telecenters. That is estimated to be 10% of the number of outgoing calls. Movistar is free to use the network to provide other services not related to the telecenters, so long as these do not interfere with telecenter services.

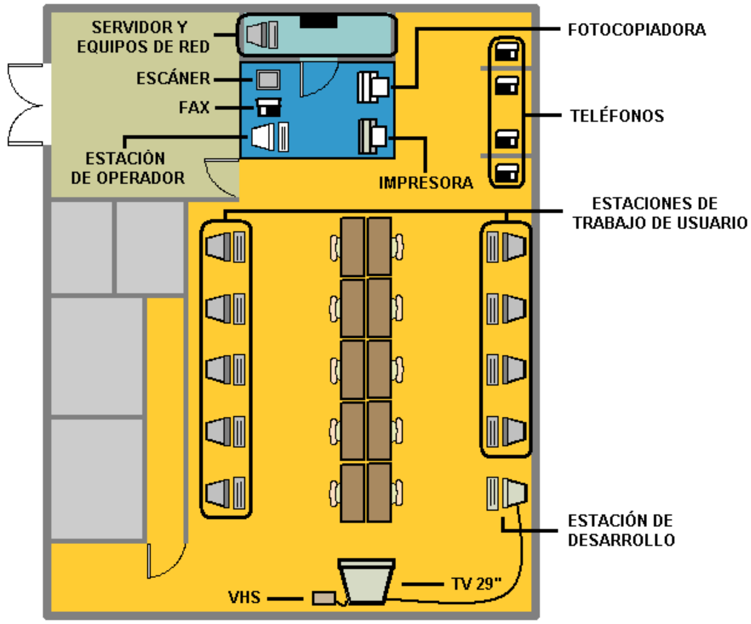
Figure VI.12: First universal access project in Venezuela: Network of 34 telecenters in Western States connected by 8 x 2 Mbps backbone



Source: CONATEL

[58] To a lesser extent, the telecenters can also get revenues for other services such as printing, faxes, photocopying, training and web hosting.

Figure VI.13: Venezuela's Punto de Acceso Project:
Layout of a typical telecenter



Source: CONATEL

In El Salvador, thus far, practically all the telecommunications projects have been funded through the electricity sector, despite the existence of a universal access fund (FINET), underpinned by the necessary legislation.

FUST in Brazil has collected over US$1 billion, but has not yet spent any of it. In Argentina, FFSU exists for the time being only in legislation.

VI.3.3 What has worked well, and why?

Universal access funds have produced mixed but generally positive results when they have been actively implemented. Although there are many salient characteristics of well operated and successful funds, a number of key beneficial elements stand out.

Projects that originate within the communities that will be benefiting from the services, or with the entrepreneurs or operators that will be taking the risks, have tended to do better than those designed primarily by distant bureaucrats or regulators. The success of the Chilean model is due in large part to its demand-driven nature. Recognizing the advantages to this approach, the government in Peru in 2004 issued a decree, which allows operators to request subsidies for projects that they propose on their own initiative[59]. However, the subsidy cannot exceed their own financial contribution to the project. FITEL is currently financing several of such bottom-up projects on a trial basis. Two of these, the Chancay-Huaral agricultural information network (SIA) project[60] and the Valtron project in the Province of Huarochiri[61], are discussed in the next chapter, as are several other new models.

59 Decreto Supremo Nº 040 – 2004 – MTC of 22/12/2004.

60 The Chancay-Huaral agricultural Information project was originated and developed by the association of farming communities in this fertile but arid valley some 80 km north of Lima. The purpose was to better manage farming activities and especially the distribution of scarce water resources, and to provide access to ICT for children.

It should be noted that in Colombia and Peru, top-down projects initiated by the government and the fund administrator have been extremely successful. A top-down approach is generally more appropriate for large-scale projects that are national in scope, where each auction awards subsidies for thousands of access points. Chile, and to a lesser extent Guatemala, have been able to combine one-time auctions involving many access points with a "bottom-up" approach to identifying requirements. Bottom-up projects for which subsidies are eventually awarded through auction are feasible when they originate with the potential users, such as communities and municipalities. It is unlikely that entrepreneurs or operators would propose projects for which they may not end up being selected.

Regulators are contemplating the creation of more favorable regulatory conditions for rural operators in Peru and elsewhere. These include: (i) rebalancing regulated tariffs and interconnection charges, so that prices reflect the higher costs of providing service in rural areas; (ii) imposing little or no spectrum license and usage fees, in order to encourage investment in rural areas; (iii) reducing coverage obligations for rural operators; and (iv) facilitating and speeding up the process of getting a license (Chapter VII).

VI.3.4 Difficulties, problems encountered, and responses

The following section specifies various types of problems and difficulties that have arisen, even in countries that by most criteria have quite successful universal access fund programs.

a. Examples of organizational and operational problems and difficulties

- Because they are directly or indirectly the responsibility of governments, universal access fund programs are often subject to lengthy bureaucratic rules for approval of disbursements. When other agencies and government departments are involved, as is the case in Peru, this can have an important impact on the pace with which funded projects are implemented. Excessive bureaucracy and delays also add to the administrative and transaction costs of the project. This often leads to missed opportunities.

- There is potential for conflict when there is more than one entity involved in the definition and administration of the fund. This may be the case when the government, through the department responsible for the sector, not only defines policy, but also makes project decisions separately from the program administrator. Such bifurcation of responsibilities tends to create conflict and problems. This has been the case in several countries in which universal access initiatives are not the responsibility of a sole agency. In at least one case, it resulted in the funds never having been spent.

- When a universal access fund serves more than one sector, funds may not be equitably distributed among those sectors. The Fund established to serve both the electricity and telecommunication sectors in El Salvador has concentrated largely on the former.

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[61] Huarochiri Province is located in the Andes Mountains. It is approximately 6000 km^2. has about 60,000 inhabitants, 64% of whom live in urban areas. Only 22% of its 32 districts have private telephone service, and only 19% of the territory has mobile coverage. This project will provide inhabitants with a whole range of fixed and mobile voice, Internet and video services, using an extremely economical network design and a unique form to commercialize these services.

- Funds are sometimes subject to political interference. There may be a dispute over whether an alleged instance of political interference is merely a perception, or whether it is really taking place. The case of the Brazilian fund, FUST, which is detailed in Box VI.1, is instructive.

Box VI.1 Unused funds in FUST, Brazil's universal access fund

According to the FUST Law, the Ministry of Communications is responsible for setting policy, the general direction and priorities for FUST and for defining programs, projects and activities to be funded out of FUST resources. ANATEL, the regulator, is responsible for implementing, controlling and following up on FUST financed projects. ANATEL is also responsible for proposing an annual program for FUST financed projects and activities to the Ministry[62]. Recently, the Brazil National Auditing Tribunal (TCU) undertook an enquiry into the failure of FUST to spend any of the R$4billion (US$1.8billion), which has been already been collected from telecommunications operators since 2000, and which is increasing at rate of about R$600million per year[63]. Some observers allege that the government is using the accumulated resources in FUST in conjunction with other savings to show international financial institutions and commercial banks that it is meeting (and indeed exceeding) its annual savings targets[64]. The Ministry, it is alleged, has been refusing to approve projects proposed to it by ANATEL, because these projects do not meet the criteria of FUST projects defined in the General Telecommunications Law (LGT). The LGT states that resources of FUST are to be used to cover the cost of universalization targets, which are not otherwise being met by obligations imposed on operators in the public regime. The Ministry maintains that the Internet access and connectivity projects that ANATEL has been proposing do meet this criterion[65]. The universalization objectives are defined in Article 79 (1) of the LGT as "those that aim to enable and provide access by any person to *telecommunication* services, regardless of his or her location, social-economic status, as well as those destined to permit utilization of essential *telecommunication* in services of public interest." The Ministry argues that ANATEL's proposed projects, including one to equip 185,000 schools with computers and Internet connection, are not "telecommunications service" projects, but electronic service projects. Therefore, they cannot be funded out of FUST. ANATEL counters that since the universalization objectives have already been largely met through the universal services objectives imposed on operators in the public regime, it is appropriate to use FUST funds for these projects.

- In Bolivia, a strong lobby of operators was successful in preventing the establishment of a proposed universal access fund that would have required a contribution of 3.5% of their net income. They were able to convince parliamentarians that they already had universal service obligations and that additional contributions had not been foreseen in their concession contracts.

[62] Lei do FUST, Lei 9.998 (17.08.00) Articles 2 and 4.

[63] This year (2006) is it planned to spend about R$300 million on: (i) Internet access in telecenters; (ii) access in rural and urban schools; (iii) handicapped access; and (iv) Internet access in rural schools.

[64] The situation appears to be the same as with funds collected in FISTEL (Fundo de Fiscalização dos Serviços de Telecomunicações). See Section v.2.2.

[65] Articles 80 and 81 of Lei Geral de Telecomunicaces.

b. <u>Examples of problems and difficulties related to universal access project design and planning</u>

- Winners of rural operating licenses in Chile, Peru and Colombia are facing encroaching competition from a growing cellular mobile footprint and from other services. In Peru, it was estimated that the "corredores" project designed to provide cellular coverage in eight economic corridors, would affect about 10% of the 6,500 VSAT payphones installed under the FITEL I to IV programs since 2000. These payphones are currently being operated by two rural operators, Gilat-to-Home and Rural Telecom. These two operators, like their counterparts in other countries, have argued that even though their licenses are non-exclusive, the conditions under which these licenses were awarded have changed so dramatically, that they are due compensation. They have argued that competition, especially from mobile services, is having a serious negative impact on the traffic over their networks and revenues. They believe that, at the very least, they should be compensated for moving their payphones and VSAT terminals to other unserved locations. Critics have countered that these operators signed their non-exclusive licenses voluntarily, and thereby assumed the associated risks.

- Operators of rural networks in other countries may be experiencing difficulties for other reasons. Some may simply have underestimated the risks of operating in these areas. Others may be burdened with an environment that is too restrictive - that did not account for the potential impact of mobile service. This may be the fault of policy-makers or fund administrators, who should have pre-qualified bidders in a minimum subsidy tender, or who did not have a sufficiently good appreciation of the market and evolution of the technology.

- Difficulties can arise when some important factors or parameters are overlooked in the project design. For example, in one country, some subsidized rural projects were unwittingly planned for areas where mobile coverage was already in place.

- Rural operators have complained about the negative impact of local issues and politics. The choice of sites for public payphones or other funded installations may be subject to political influence. A mayor or municipal official might prefer to have it located in the municipal office, rather than somewhere more convenient for people or more practical for the operator. The placement of antennas in rural communities can become a political issue because of environmental and potential health-risk concerns.

- Government officials and fund administrators may misjudge the impact of the timing of the disbursements on rural operators and their funded projects. Issuing disbursements over an extended period of time, and making them dependent on certain milestones being met, may create difficulties for these operators who depend on a predictable flow of cash. There may be situations in which failure to meet the milestones is beyond the operator's control.In Peru, for projects costing over US$1 million, the payout takes place over a four or five year period. Rural operators in Chile, Peru and Colombia have proposed various formulae. Regulators and fund administrators have not always sufficiently taken into account the cost of having to post a performance bond, obtain project financing, pay penalties, administer the subsidy, pay taxes, file reports, or meet other requirements. In addition, policy makers and fund administrators may not have paid sufficient attention to the optimum balance between public and private sector contribution to any given project and the need for sharing of risk.

- Even well developed and analyzed projects can fail if the practicalities of their implementation are overlooked or neglected. In at least one Regulatel country, a project initiated by the regulator failed despite the fact that it had been thoroughly researched and planned in terms of location and financial requirements, including its net value and the amount of subsidy that it would require Ultimately, the project had to be abandoned, due to inadequate financing and, more importantly, the absence of an executing agency and operator.

- Fixing the maximum amount of a subsidy for a project at the start of an auction, as has been done in Guatemala, may favor smaller projects and small, inexperienced operators. This is because serious bidders, who from the outset assume that they will exceed the maximum, will be discouraged from participating.

c. Examples of problems and difficulties related to universal access project implementation

- It can sometimes be difficult for people in rural areas to pay even a minimal amount for a prepaid telephone card. It is a big challenge for operators and fund administrators alike to come up with an efficient and cost-effective way for users with very few monetary resources to pay for telecommunications services in rural areas .

- Coin operated payphones will cease to operate when the collection box is full. Collection can be costly, especially in very remote places where access is difficult. Payphones are easily robbed and damaged. Prepaid cards avoid the problems of full boxes and pilferage. However, getting those cards into the hands of users is not much easier than maintaining and collecting from coin-operated payphones. The minimum denomination for prepaid cards may be too large for some people to afford. In Peru, FITEL had requested that Gilat-to-Home (GTH), one of the three satellite-based rural operators, make available an S/.1 (US$0.33) card to make service more affordable for people with low incomes. However, GTH was allowed to maintain its minimum denomination S/.3 cards, because GTH thought that the cost of production and distribution did not justify a lower denomination card.

- Inadequate supervision of subsidized projects during construction or operation will inevitably lead to poor results, if not outright failure. In Chile, there is no provision for supervising funded projects. It is estimated that only 20% of the 5,500 telephones installed under this program at a cost of US$8million, are providing adequate service. Similarly, in 2002, 293 telecenters were awarded through minimum subsidy auctions under the FDT II (Programa de Telecentros y de Infocentros). Of these, 84 were awarded to public institutions (universities, government, NGOs, etc.), and 209 to private enterprises. The recipients of the subsidies were committed for 5 years. Nevertheless, by the end of 2005, only 20 of the 209 commercial telecenters were still operating. Meanwhile, the public and non-commercial institutions were actually operating 53 more telecenters than their subsidies covered[66] (Table VI.5). According to an analysis done by Francisco Proenza, the number of publicly-run telecenters grew because they ended up taking over telecenters that had initially been run privately. They were able to do so, because the government (i) was able to subsidize operating costs, something private firms could not do and (ii) recognized that these telecenters could play a major role in stimulating demand for connectivity. Many, though not all, of these public agencies have done a good job. Biblioredes, which recently won the Stockholm challenge award in the area of culture, has done an outstanding job in digital literacy training.

[66] Francisco Proenza, Guatemala: Programa de Acceso Rural a Internet, 5º Informe de la Serie, Apoyo a la inversión en el desarrollo de tecnologías de información y comunicación para combatir la pobreza rural en América Latina y el Caribe, Centro de Inversiones de FAO, Roma 9 de mayo 2006

Table VI.5: Telecenters subsidized by the Fondo de Desarrollo de las Telecomunicaciones in Chile in 2002 and telecentres which are still operating as of 26 December 2005

Entities awarded subsidies	Awarded and authorized			Present situation		
	1st tender **	2nd tender ***	Total 2002	Operating	Under construction	Total
Universities						
Universidad de la Frontera (UFRO)	12	9	21	21		21
Universidad de Concepción	15		15	15		15
National government agencies						0
Instituto Nacional de la Juventud (INJUV)		17	17	48	11	59
Dir. de Bibliotecas, Archivos y Museos (DIBAM)			0	10	2	12
ONGs and foundations						0
Corporación Maule Activa	20	11	31	30		30
Subtotal public institutions and NGOs	**47**	**37**	**84**	**124**	**13**	**137**
Companies						
Megasat	12	5	17	12		12
Sociedad comercial Borques y Flores	25	32	57			0
CCT		32	32			0
Sociedad Consultora Quantitativa		5	5	2		2
Soc. Comercial Lorenzo Miranda Yañez y Cia.		28	28			0
Ing. y computación visión Pc. Limitada		61	61			0
Soc. Educn San Francisco		9	9	6		6
Subtotal companies	**37**	**172**	**209**	**20**	**0**	**20**
Total telecenters:	**84**	**209**	**293**	**144**	**13**	**157**

Source: Francisco J. Proenza, Guatemala: Programa de Acceso Rural a Internet, 5º Informe de la Serie, Apoyo a la inversión en el desarrollo de tecnologías de información y comunicación para combatir la pobreza rural en América Latina y el Caribe, Centro de Inversiones de FAO, Roma 9 de mayo 2006, based on Subtel data (www.subtel.cl).

d. Lag between collection and disbursement of universal access funds

Table VI.6 shows the amounts that have been collected and disbursed in Regulatel universal access funds since 1994[67]. Table VI.7 shows the total amounts which have accumulated and been spent since the start of these programs. In every country except Paraguay, large portions of what has been collected has remained unspent[68]. Half of the countries have not yet spent anything at all from their funds. It has sometimes taken four to five years to finance the first universal access project.

There are five basic reasons why these countries have been so slow to finance these projects:

- The political process may be very slow. Governments either fail to pass enabling legislation, as is the case in Bolivia, or they hold back approval for funds to be spent, as is the case in Brazil[69];
- There is the considerable amount of time required to elaborate, evaluate and implement projects to be financed out of these funds;
- Since these projects are often considered by governments to be public investments, they are subject to the same lengthy approval process as any other project funded from public funds. In Peru, for example, it may take an additional 17 months for the Ministry of Transport and Communications to approve a project after it has been approved for funding by the fund administrator, FITEL;
- Sometimes the regulator does not attach high priority to universal access as appears to have been the case in the Dominican Republic before 2004;
- Disbursements from universal access funds may be subject to additional constraints established by outside institutions, such as the International Monetary Fund.

[67] The 10 countries that have fully functioning universal access funds, Brazil where nearly US$1.4billion has been collected FUST but nothing has been spent and Bolivia's Fondo Nacional de Desarrollo where similarly nothing has been spent.

[68] In Chile no money is collected from operators or anyone else. Universal access projects are financed out of the National treasury.

[69] In Argentina legislation has been enacted but neither the mechanism to collect nor to disburse funds has been implemented.

Table VI.6: Amounts collected and disbursed in Regulatel members' universal access funds

Country	Fund		Currency	1994		1995		1996		1997		1998		1999	
Bolivia	FNDR	Collected	BOB	0		0		1,081,304		15,837,322		13,339,846		776,849	
		Disbursed	BOB	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Brasil	FUST	Collected	BRL	0		0		0		0		0		0	
		Disbursed	BRL	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Chile	FDT	Disbursed	CLP	0	0%	836,000,000	100%	371,000,000	100%	3,396,000,000	100%	2,545,000,000	100%	2,243,000,000	100%
Colombia	FCM	Collected	COP	0		0		0		0		0		0	
		Disbursed	COP	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Ecuador	FODETEL	Collected	US$	0		0		0		0		0		0	
		Disbursed	US$	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
El Salvador	FINET	Collected	SVC	0		0		0		0		54,155,427		16,209,642	
		Disbursed	SVC	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Guatemala	FONDETEL	Collected	GTQ	0		0		0		24,066,947		3,000,000		34,540,706	
		Disbursed	GTQ	0		0		0		0		0		24,800,000	
Mexico	FCST	Disbursed	MXN	0		0		0		0		0		0	
Nicaragua	FITEL	Collected	NIO	0		0		0		0		0		0	
		Disbursed	NIO	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Paraguay	FSU	Collected	PYG	0		0		0		0		21,000,000,000		34,085,053,069	
		Disbursed	PYG	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Peru	FITEL	Collected	US$	5,233,618		9,067,332		9,425,967		12,478,386		11,703,708		11,085,696	
		Disbursed	US$	0	0%	0	0%	0	0%	0	0%	2,050,059	18%	1,266,299	11%
Republica Dominicana	FDT	Collected	DOP	0		0		0		0		0		0	
		Disbursed	DOP	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Venezuela	FSU	Collected	VEB	0		0		0		0		0		0	
		Disbursed	VEB	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

Country	Fund		Currency	2000		2001		2002		2003		2004		2005		Total	
Bolivia	FNDR	Collected	BOB	155,932,740		24,761,172		10,644,859		13,930,993		83,247,094		42,117,099		361,669,278	
		Disbursed	BOB	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Brasil	FUST	Collected	BRL	0		835,203,963		1,086,824,028		553,783,986		705,544,016		595,890,000		3,982,404,000	
		Disbursed	BRL	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Chile	FDT	Disbursed	CLP	932,000,000	100%	0	0%	2,978,000,000	100%	0	0%	3,831,000,000	100%	0	0%	17,132,000,000	100%
Colombia	FCM	Collected	COP	0		0		226,217,000,000		263,763,000,000		342,085,000,000		370,615,000,000		1,202,680,000,000	
		Disbursed	COP	0	0%	0	0%	125,122,000,000	0%	62,071,000,000	0%	114,010,000,000	0%	143,826,000,000	0%	445,029,000,000	0%
Ecuador	FODETEL	Collected	US$	0		659		67,703		202,892		318,454		408,269		997,977	
		Disbursed	US$	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
El Salvador	FINET	Collected	SVC	2,715,219		222,917,659		650,652		711,206		1,970,268		0		299,330,073	
		Disbursed	SVC	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Guatemala	FONDETEL	Collected	GTQ	33,721,361		619,373		8,657,047		33,749,498		4,607,013		0		142,961,945	
		Disbursed	GTQ	12,400,000		0		11,900,000		3,100,000		2,200,000		7,400,000		61,800,000	43%
Mexico	FCST	Disbursed	MXN	0		0		0		0		0		274,000,000		274,000,000	100%
Nicaragua	FITEL	Collected	NIO	0		0		0		0		16,410,325		42,303,130		58,713,455	
		Disbursed	NIO	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Paraguay	FSU	Collected	PYG	2,261,254,919		2,538,938,900		2,975,929,746		6,602,871,054		5,881,416,145		0		75,345,463,833	
		Disbursed	PYG	34,553,375,461	1528%	12,670,000,000	499%	9,484,500,000	319%	10,306,032,270	156%	5,533,213,716	94%	0	0%	72,547,121,447	96%
Peru	FITEL	Collected	US$	11,318,060		12,147,598		12,828,689		14,999,737		16,930,553		15,844,258		143,063,602	
		Disbursed	US$	4,729,970	42%	12,023,180	99%	2,751,412	21%	14,007,224	93%	4,680,831	28%	3,567,281	23%	45,076,256	32%
Republica Dominicana	FDT	Collected	DOP	0		258,176,320		297,564,164		390,984,840		593,227,634		704,639,896		2,244,592,854	
		Disbursed	DOP	0	0%	0	0%	17,542,901	6%	32,078,154	8%	102,091,548	17%	216,634,639	31%	368,347,242	16%
Venezuela	FSU	Collected	VEB	0		20,156,540,170		33,233,295,673		37,243,577,542	0%	70,195,484,836	0%	82,446,545,770	0%	243,275,443,990	0%
		Disbursed	VEB	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

Table VI.7 Total amounts collected and disbursed since the beginning of fund in each country

Country	Fund	Started	Total amounts collected and disbursed by end 2005 (US$)		Disbursed/ Collected
Bolivia	FNDR	1996	Collected	$43,461,797	0%
			Disbursed	$0	
Brasil	FUST	2001	Collected	$1,772,129,956	0%
			Disbursed	$0	
Chile	FDT	1995	Disbursed	$29,981,000	100%
Colombia	FCM	1994	Collected	$448,599,640	37%
			Disbursed	$165,995,817	
Ecuador	FODETEL	2001	Collected	$997,977	0%
			Disbursed	$0	
El Salvador	FINET	1998	Collected	$32,701,810	0%
			Disbursed	$0	
Guatemala	FONDETEL	1996	Collected	$17,943,154	43%
			Disbursed	$7,756,518	
Mexico	FCST	1995	Disbursed	$25,300,064	100%
Nicaragua	FITEL	2004	Collected	$3,278,559	0%
			Disbursed	$0	
Paraguay	FSU	1998	Collected	$12,966,954	96%
			Disbursed	$12,485,360	
Peru	FITEL	1994	Collected	$143,063,602	32%
			Disbursed	$45,076,256	
Republica Dominicana	FDT	2001	Collected	$65,654,341	16%
			Disbursed	$10,774,157	
Venezuela	FSU	2001	Collected	$113,220,392	0%
			Disbursed	$0	

Although these funds continue to grow, and in some cases earn interest, they are not being used as intended. The following are three possible options for addressing this problem:

1. Give the fund administrator greater autonomy to disburse funds

   The first option is to give the independent boards or commissions in charge of disbursement could be greater autonomy, They could be spared from further ex ante approval. In Chile, for example, the Council for Telecommunications Development (Consejo de Desarrollo de las Telecomunicaciones), which is made up of three government ministers, three professionals, and the Sub-secretary of Telecommunications, has complete autonomy with respect to the administration and management of the fund. Once the Council has decided which projects will be given up to tender, no further approvals, permits or other types of confirmations are needed before the project is implemented.

   Projects receiving funds, without need for approval beyond that of an autonomous board or commission, would still be subject to reporting during construction and ex-post auditing after implementation, as is the case with other government-funded projects.

Giving boards and commissions of universal access funds greater autonomy would require the following: (i) that they have the competence needed to decide on which universal access projects are selected; (ii) that they are representative of stakeholders in universal access projects including government agencies, contributors to the fund, users, and small and large operators; (iii) that there are clear guidelines established for the nature and types of projects eligible for funding; and (iv) that the staff of the fund has the qualifications and experience to prepare project proposals for the board's or the commission's consideration and approval.

2. <u>Implement a structured approach for developing and initially vetting universal access projects</u>

The second option is to take a structured bottom-up approach for developing and initially vetting projects before actually proposing the funding itself. The electricity sector in Ecuador uses that type of approach (Box VI.2). Projects in designated regions are developed jointly by local government authorities and electricity distribution companies by engineers and other professionals. The national electricity regulator, CONELEC, receives all regional proposals once a year, vets them and proposes an annual national plan of projects to be funded out of the electricity sector's universal access fund, FERUM. The process of developing and approving projects is subject to well-defined procedures and a strict timetable. It reduces the burden on the regulator by having the companies send their own engineers and other professionals out in the field to do much of the work of identifying and planning these bottom-up type projects. The local authorities, the local distribution company, the regulator and the fund administrator share the work of evaluating and approving projects. There are strict reporting requirements. Approval of projects depends in part on performance with previous funded projects.

The procedure is similar in El Salvador, where FINET (Fondo de Inversion Nacional en Electricidad y Telefonia) has very effectively subsidized over 500 small rural electrification projects since 2000. The average cost per project is about US$44,500, and the average FINET subsidy is about US$13,600 (Box VI.3). In large part due to the fund, electricity penetration in El Salvador has reached 86%. The objective is to reach 99% by 2009.

Some of the reasons why FINET has been so successful are as follows: (i) all projects are similar in nature – they involve the extension of the local distribution network to a few dozen families; (ii) the technology and the procedure is essentially the same for each project; (ii) FINET is capable of handling a large number of projects at any one time, and the duration of each project is less than four months; and (iv) the FINET board has full powers of decision-making with respect to disbursement of funds - not even SIGET, the telecommunications and electricity regulator gets involved.

The source of all of FINET's funds is the telecommunications sector. This includes the proceeds from privatization of the state-owned telecommunications company, frequency auctions, and fines. Nevertheless, no telecommunications projects have so far been subsidized. FINET's priorities are clearly to address the continuing unsatisfied demand for electricity, especially in rural areas. FINET believes that the demand for telephone services is being met by the private sector, and that there is no need to subsidize projects in this sector.

Box VI.2: Ecuador's Fondo de Electrificación Rural y Urbano Marginal (FERUM)*

Ecuador established the Fondo de Electrificacion Rural y Urbano Marginal (FERUM) to fund electricity generation and distribution projects in rural and peri-urban regions. The funds are used for new works or improvements to existing distribution systems. They can also be used to build non-conventional renewable energy systems in rural areas, and for operation and maintenance of non-incorporated systems in the border provinces, Amazonia and the Galapagos Islands. FERUM's source of funds includes, inter alia, 10% of electricity bills (generation and distribution) of commercial and industrial users and 5% of the state's share of non-reinvested revenues of generation, transmission and distribution companies in which it is part owner.

Each year provincial councils, in conjunction with municipalities and local electricity distribution companies that have concessions in eligible rural and peri-urban areas, plan and propose projects which are presented to the distribution companies by August 30. These projects must be planned, designed and prepared by professional electrical engineers who are employees of, or working on behalf of, the distribution companies or other entities, including the provincial governments. Each project must obtain final technical approval from its local distribution company. The distribution companies submit their lists of selected projects to the national electricity regulator, Consejo Nacional de Electricidad (CONELEC) by September 30.

CONELEC evaluates each distribution company's proposed plans and decides which projects will be eligible for financing. Its decisions are based on several criteria including:

- The number of people who will be served;
- Whether or not the electricity system will be integrated with independent generating companies;
- Whether or not the electricity system will be used for supplying drinking water;
- The cost per household served by the project;
- The past performance of the distribution company; and, of course,
- The amount of funds available.

CONELEC presents the selected projects to the Fondo de Solidaridad, which administers the FERUM. CONELEC also presents a consolidated national program and a schedule of disbursement of funds for each company At the same time CONELEC informs the local authorities and electricity distribution companies of which projects have been approved.

Funds are disbursed to each company according to the schedule drafted by CONELEC. Distribution companies can request modifications to their annual work plan until July 31. They must justify these requests. The companies then have until April 30 of the following year to complete the work outlined in the annual approved plan.

Since it began in 1998, FERUM has funded over 9,000 projects at a total cost of US268.5million. These have benefited over 1.3 million people. Ecuador has a much higher electricity penetration rate (84%) than fixed telephone penetration (12.9%)

* Reglamento para la Administración del Fondo de Electrificación Rural y Urbano Marginal

Box VI.3 El Salvador's Fondo de Inversión Nacional en Electricidad y Telefonía (FINET)

While its operation is similar to that of Ecuador's FERUM, El Salvador's Fondo de Inversión Nacional en Electricidad y Telefonía (FINET) was established to facilitate access to both electrical and telephony services for rural and poor sectors of the population. FINET was established in 1998 and is administered by the Fondo de Inversion social para el Desarrollo Local de El Salvador (FIDSL)[70]. Its revenues are derived from the telecommunications sector (income from privatization of the state owned telecommunications company, frequency auctions, fines, etc.).

Since 2000 and up to the end of 2005, FINET subsidized 501 projects of which 444 were partially self-financed by the local electricity distribution company. The municipalities provided additional subsidies, and in some cases so did the French Government.

The total cost of all 501 projects is US$22.3 million of which US$18.8 million have been subsidized as follows: FINET, US$6.8 million[71] (36%); municipalities, US$8.5 million (45%); French Government, US$3.5 million (19%). On the average for the 444 projects where the local electricity distribution company has also partially financed the project, FINET contributes about 24%; the municipality, 38%; the electricity company, 19%; and the French Government, 19%.

The average cost of each of the 501 projects is US$44,491 - the average number of users is 74. FINET's contribution on the average was US$13,600 per project.

Projects are drafted by the municipality, the local electricity distribution company, and FINET's field representative (asesor local). The proposals are submitted to FINET. They must each contain the following: (i) a list of beneficiaries; (ii) a sketch of the proposed installation (local distribution network); and (iii) the signature of the mayor of the municipality. FINET analyzes the proposals and negotiates a level of subsidy with the municipality and the electricity distribution company, which both also contribute to the financing.

Several times a year, proposed projects are grouped together and presented en masse to FINET's board. On average, about 50 projects are approved at any one time. The electricity distribution company receives 30% of the subsidy up front, and the rest upon satisfactory completion of the project, which is verified by the FINET field representative. On average, projects take about 100 days to complete.

The fund also subsidizes low volume (≤ 99 kw/month) users, and electricity used for pumping drinking water.

[70] Ley de Fondo de Inversión Nacional en Electricidad (FINET), Decreto 354 del 9 de Julio 1998 and Ley de Creación del Fondo de Inversión Social de El Salvador (FISDL), 31.10.90.

[71] Out of a total US$34million received so far.

The FERUM and FINET models depend on close collaboration between the established permanent regional electricity companies, the national regulator, and the fund administrator. They depend on a certain level of consistency in the types of projects that are funded. This may be easier to achieve in the electricity sector, where technology and business models are not changing as rapidly as in the telecommunications sector. Projects developed by these regional companies, their engineers and other staff will tend to supplement current services, and will be quite different from entrepreneurial-driven projects.

While it may not be directly applicable to telecommunications universal access fund programs and to the entrepreneurial-driven type of projects presented in Chapter VII, there may be some interesting lessons to be learned from the FERUM and FINET models. Those lessons might be more applicable for countries such as Argentina, Bolivia and Colombia, which have permanent regional institutional structures in the form of regional cooperatives and municipal telephone companies.

3. Venture–oriented universal access fund financing model

his approach builds on the valuable experience gained with smaller-scale micro-financed projects. That includes the Chancay-Huaral, Huarochiri and Televias Puyhuan Projects in Peru, the privately initiated and operated local telecommunications company in Quixada, Brazil, and the systems integrator model of the community telecommunications cooperative in Bolivia, described in Chapter VII. It is consistent with and particularly well adapted to the entrepreneurial-driven, new technology and business model type of project that this study recommends for furthering the objectives of universal telecommunication access policies.

Under this approach, universal access funds are structured so that a portion can be used for micro-financing operations. That includes loan approval, equity participation in projects or in the implementing telecommunications company, grants, or a combination of these. Application of funds out of the micro-financing budget item would be subject to somewhat different criteria with respect to risk, and would have to have some provisions for possible failures and defaults. It might also be a source of income for the fund, through interest on loans and potential returns on investments.

Evaluating and vetting of proposals for micro-loans, equity positions and grants in small rural and peri-urban universal access projects will require regulators and fund administrators to develop special due diligence skills that many of them may not have today. They will have to be able to assess the financial, technical and commercial viability of such entrepreneur-driven type of ventures. They will have to be able to structure loans, equity positions and grants based on each particular project and set of circumstances. They will also need to factor in the broader social and economic development considerations, and not base their decisions solely on the commercial merits. Fund administrators will need to develop a core of engineering, financial and economic skills that may very different from what was required for their previous work. They will need to be able to make decisions rapidly based on the analysis and recommendations of the fund's staff.

The Peruvian fund administrator, FITEL, has placed a strong emphasis on developing these skills not only in traditional types of projects but also in the growing number of pilots that are suitable for this sort of venture-oriented financing. Other Regulatel countries are developing similar due diligence skills. Regulatel should promote the development of these skills in conjunction with its annual program of activities. Regulatel should implement training and exchange programs in this area, and promote and extend the concept across the membership. It could extend this capacity-building activity through a cooperative program in which such expertise is shared across borders, with members being invited to evaluate and vet potential projects for other members.

Such a venture-oriented financing model can easily be combined with the various financing arrangements discussed in the next chapter, especially the micro-credit and Enablis models.

VI.3.5 Lessons learned: Best practices in universal access fund programs

The success of universal access programs and funds depends in large part on how well coordinated they are among key public and private sector stakeholders across the spectrum of ICT related activities. The legislative underpinning has to be clear and unambiguous. The process should be transparent and, to the extent possible, participative. When all interested stakeholders are represented within the administration of the fund, it is easier to have broad agreement on how the fund should operate and the sorts of projects that should be financed. Successful projects tend to give the fund administrator a good deal of autonomy in designing and implementing projects. Focusing attention on key public service objectives can yield efficiencies and benefits. Box VI.4 summarizes the attributes of successful universal access programs and funds, Box VI.5 summarizes the attributes of well-designed universal access projects. These boxes present regional best practices.

Universal access fund administrators must be prepared to learn constantly from their own and others' experiences. They must be prepared to adapt to changing circumstances resulting from evolving requirements, rapidly changing technologies and service concepts, political priorities, innovations in financing, and commercializing of telecommunication operations.

Box VI.4: Attributes of successful universal access programs and funds: BEST PRACTICES

Successful universal access programs and funds are characterized by:

- Clearly defined objectives, strategies and plans derived from public consultation with all stakeholders and which take into account the national ICT agenda and its role in the social and economic development of the country;
- Clear, solid and unambiguous legal and regulatory framework, including strong provisions that prevent funds from being used for other purposes;
- Consistency among the various pieces of legislation which concern universal access;
- Well-defined roles of the regulator and administrator;
- Clearly defined and transparent process and procedures for requesting and obtaining subsidies, whether through a minimum subsidy auction or other method;
- Strong and continued political and administrative support;
- An administrative and regulatory environment and fund structure which:
  - facilitates and actively promotes the deployment of new services and technologies, including new fixed and mobile broadband technologies;
  - encourages the development and involvement of small, independent, decentralized, community-based telecommunication companies and cooperatives;
  - encourages and facilitates the development of demand-driven, entrepreneur-initiated projects;
- Flexibility to adapt to changing circumstances including new technologies, services, delivery methods, and other developments;
- Clearly defined funding obligations with some flexibility to account for changing circumstances, but with any changes being subject to prior consultations with other stakeholders and with those most directly affected;
- Strong and effective leadership at both the policy and implementation levels and a high degree of autonomy for the fund administrator;
- Transparent and participative process of identifying projects and awarding of subsidies;
- An effective mechanism for receiving and acting quickly on user complaints;
- Sustained but not excessive project supervision and follow-up;
- Provision for pre-selection of bidders to ensure that only experienced operators and service providers can participate in bids;
- An efficient internal management characterized by minimal paper work, and an unencumbered decision-making process;
- A method and formula for disbursing funds which reduces the financial burden on operators receiving subsidies, but leaves the administrator with adequate means to control the implementation and operation of each project;
- Provisions for asking for and receiving essential data needed by the fund administrator to control, follow-up and plan projects.

Box VI.5: Attributes of well-designed universal access projects: BEST PRACTICES

Well-designed universal access projects are ones which:

- take into account:
  - Basic project parameters such as availability of electricity, rights of way, local sensitivities, the ability of users to pay, etc;
  - Optimal backbone capacity requirements;
  - Other competing and/or complementary infrastructure projects
  - The potential impact of competing technologies
  - Particularities of the community and region to be served including its topography, economic activity, income, population density, local politics and other constraints.
  - The cost to rural operators of various local, state and federal taxes, license, spectrum usage and other fees, performance bonds, missed target penalties, borrowing, reporting requirements and the transaction costs of administering the subsidies;
  - Operators' need for predictable cash flow;
  - The need for an optimum balance between public and private sector contributions and risk sharing.
- have clearly defined conditions and requirements imposed on operators and service providers including quality of service obligations (e.g. maximum number of rural stations that can be out of service at any one time; the maximum amount of time required to repair a station that is out of service;……) and a minimum set of qualification required for administrators of rural telephones, telecenter and rural telephone companies;
- allow operators/service providers complete freedom to choose any technology they wish to deploy so long as it meets quality of service, interference and type approval requirements;
- permit other non-subsidized services to be provided;
- contemplate providing one stop shopping for all service licenses;
- have license conditions with certain flexibility to cater for changing technologies and circumstances;
- have performance indicators which take into account the particular circumstances under which rural operators have to provide service;
- are accompanied by business plans which confirm their sustainability during the life of the project (Each project should be subject to a cost-benefit analysis to determine its benefit to the people who will be served)

Box VI.6 Lessons learned and best practices from World Bank sponsored output based aid (OBA) universal access fund projects

- OBA has been effective in bringing infrastructure closer to the unserved.
- The use of OBA schemes has demonstrated that commercially sustainable operations are feasible in rural and low-income areas and has led to accelerated deployment.
- OBA has increased overall investment in infrastructure.
- The use of OBA schemes leverages substantial additional private sector investment.
- The key to successful OBA is competition.
- OBA is no substitute for sector reforms.
- Successful OBA programs make use of coherent and adaptive results frameworks.
- Substantial outreach activities are required to ensure successful implementation of OBA.
- Sustainability of the OBA program is increased through small and predictable contributions by all sector players.
- Adequate due diligence needs to be conducted prior to the launch of an OBA program.
- OBA programs involve substantial administration and innovative approaches toward shortening and streamlining the OBA life-cycle are necessary.
- A complete set of operational guidelines and reference documents may need to be developed for OBA.
- The design and implementation of OBA in the ICT sector must constantly evolve as technology and markets change.
- The new generation of OBA ICT programs will need to focus on both supply-side and demand-side stimulation.

Source: World Bank

VI.3.6 Recommended action: Universal access programs and funds

The following actions are recommended with respect to:

a. Universal access policy, strategy and coordination among stakeholders

- The design of universal access fund programs should take into account the attributes of successful programs indicated in Box VI.4
- Active participation of all stakeholders in the development and operation of these programs is critical to their success. This includes the fund administrator, operators, manufacturers, regulator, policy-makers, and state and local governments. It is therefore important that these stakeholders initiate and maintain an open and ongoing dialogue. Engagement of local activists, especially those involved in initiatives at the community level, should be encouraged. The small rural operators and local manufacturers of equipment for rural application should not be excluded from this dialogue.
- Policy-makers should encourage projects which are initiated at the local community level by private citizens, community groups, local governments, small and local entrepreneurs and NGOs. Policy-makers should learn from the experience of these projects and initiatives when they are developing broader scale programs.

b. Giving greater autonomy to fund administrators

- Independent boards and commissions of universal access funds should have greater autonomy to disburse funds without having to seek further ex-ante project approvals from other government authorities. Projects receiving funding in this way would still be subject to reporting during construction and ex-post auditing once the project has been implemented, as is the case with other government funded projects.

c. Restructuring universal access funds to permit venture oriented financing of projects

- Universal access funds should be structured so that a portion can be used for micro-financing operations, including the offering of loans, equity participation in projects, and the implementing telecommunications company, grants or a combination of these. Application of funds out of the "micro-financing" budget item should be subject to somewhat different criteria with respect to risk – there would need to be some provision for occasional failures and defaults.
- The staff of universal access funds should be trained to evaluate venture-oriented, entrepreneur-driven project proposals. The boards or commissions of these funds should then make decisions on financing these projects based on the evaluation and recommendations of the fund staff.

d. Project design and implementation

- Policy-makers should take into account the attributes of successful projects as indicated in Box VI.5.
- Performance indicators used in output-based aid (OBA) schemes should be along the lines of the ones indicated in Box VI.7.

e. Supervision, project follow-up and the timing of subsidy flows

- Fund programs must have provisions for and adequate resources to supervise projects during both their implementation and operation phases. Fund administrators should ensure that there are no delays in paying out approved subsidies.
- Fund administrators and regulators should support the establishment of a centralized institutional framework for rural operators to obtain ongoing technical, management, procurement, and other assistance and support, following contract awards.

Box VI.7: Guidelines for performance indicators used in output based aid (OBA) schemes

Performance indicators for OBA schemes:

- Should focus on the needs of users in rural and remote regions, including when service needs or does not need to be available, what charges should be applied and what means there are for people to pay;
- Should be quantifiable and calculated according to a clearly defined formula, which diminishes subjectivity;
- Should not be administratively and financially burdensome for the operator to gather and process;
- Should have penalties which are in proportion to the cost and inconveniences suffered by users;
- Should have indicators designed to encourage the operator to improve quality and invest; and
- Should take into account operational and maintenance difficulties and costs involved in accessing, operating and maintaining service in remote and difficult locations. They should, for example, recognize and make allowances for batteries that cannot be recharged until the sun returns, and for very remote stations whose maintenance is very difficult and expensive.

f. The role of Regulatel

- Regulatel should gather, analyze and disseminate best practices with respect to:
    - Policies, objectives and strategies pertaining to universal access programs and projects;
    - The application of universal access funds to venture-oriented, entrepreneur-driven projects;
    - The application of bottom-up approaches for developing and initially vetting universal projects using the Ecuadorian FERUM model as a guide;
    - The disbursement of funds, and the supervision and project follow-up in Regulatel member organizations;

- The most appropriate technology for universal access, including results of in situ trials and pilot projects;
- The promotion and facilitation of demand-driven and small entrepreneur-initiated projects;
- Special regulations and licensing conditions which should apply to rural operators, including tariff regulations designed for the rural environment;
- Programs to assist small rural operators in the management, administration, financing and commercialization of their projects;
- New universal access models based on service, technology, financing, commercial and administrative innovations;
- Information on multi-lateral funding of universal access projects in the 19 member countries.

- Regulatel should create and maintain a set of indicators based on international best practices in universal access fund programs that can help the 19 members measure the results obtained by their programs and define objectives to be attained. The set of indicators should also help provide a more objective way of determining if universal access goals are being met. The various indicators gathered and presented in this report should serve as a starting point for establishing a Regulatel universal access data base;
- Regulatel should implement training, exchange and cooperation activities to actively promote and extend the concept of universal service funds being used to funding venture- oriented, entrepreneur - driven projects.

VI.4 Other financing initiatives

VI.4.1 Introduction

There are many financing initiatives that have been enacted outside of universal access fund programs and universal access obligations. These initiatives have been financed and supported by various other entities, including local, regional and national government bodies, national and international NGOs, local industry associations, and cooperatives. Some representative examples presented here provide illustrative insights into some of the advantages and challenges of this approach.

VI.4.2 Results achieved

Some of the results of "other financing initiatives" have been remarkable.

In Peru, there are an estimated 30,000 "cabinas publicas" - privately established and run telecenters - which receive no subsidies or any other state help. They offer very affordable Internet and telephone access, mainly in urban areas, and provide an invaluable service to the many people who do not have a computer at home.

In Costa Rica and the Dominican Republic, the LINCOS (Little Intelligent Communities) community telecenters offer a variety of community services. These telecenters are partially self-financed. In Costa Rica, they are partially financed by an NGO, and in the Dominican Republic, they are partially financed by the state. The services they offer include telephone access Internet access at about US$0.30/hour, training in various MS Office software, photocopying, banking, and a local radio station for broadcasting of information of interest to the community.

In Brazil, the federal government's GESAC Program has already installed more than 4,000 telecenters with 18,000 computers using LINUX OS license free software. These telecenters offer access to more than 4 million people, mainly in the C, D and E social classes, in schools and various public locations in 27 states. The Sao Paulo State Government has deployed more than 200 telecenters and Internet access booths under its Acessa Program. Each of these telecenters has an average of 10 computers per center. They also serve mainly the C, D and E social classes. By the end of 2006, 80% of the cities in Sao Paulo State - about 500 cities - should be served. In Rio de Janeiro State, the City of Pirai Digital Project has set up 60 telecenters in schools and various public buildings. These telecenters use license free LINUX OS software to integrate the ICT needs of the public sector, business, education and third sector organizations. They offer Internet, E-mail, discussion groups, news, agenda, document management, e-learning, hosting, messaging, and public services (e-government).

Since 1994, Cuba's Joven Club de Computación y Electrónica (JCCE) Program has offered free training in information technology to nearly 900,000 persons in its 600 telecenters, which include five mobile units. The program is available to everyone. The JCCEs have also served as places to confirm technical and professional qualifications in IT, develop specialized software, identify talented young people for careers in computer science and IT, and promote web development and communications.

In Bolivia, *Ticbolivia's* ICT for Development Program has installed 90 rural information centers and school laboratories directly accessible to 50,000 people. It is offering radio programming, websites and printed information indirectly to around 500,000 farmers, indigenous people, teachers and students. Part of this initiative is the International Institute for Communication and Development's (IICD) "shared satellite connectivity" project, consisting of community information centers connected to the Internet via a VSAT link. This project offers local connectivity via a community wireless link in 11 communities in the Departments of Santa Cruz, Chuquisaca and La Paz. In addition to providing these communities with access information important for work and education, these centers also provide telephone and Internet access for personal and business communications. After three years, IICD's "shared satellite connectivity" centers are still operating in all 11 communities. In five of them, the network and services provided have been shown to be technically and financially sustainable. About 95% of the costs are covered by the partner community organizations. The other 5% is directly generated by visitors to the information centers, who are not members of the community organizations.

Other projects have been unable to find the necessary financing despite having been well researched and prepared. These include the SITTEL and IDTR Projects in Bolivia. The SITTEL Project was supposed to have provided a public telephone within 2 km. (24 min walking distance) of any rural household in the country, and Internet connection in larger population centers. The estimated cost was US$60 million. The project lacked not only financing but also an executing agency. The IDTR project was supposed to have provided cellular and other types of connectivity to 15,000 rural communities. The estimated cost was US$38.8million. It was to have been 40% financed by a World Bank loan. A first subsidy auction in April 2005 was unsuccessful.

Less than a year after the Centros Tecnológicos Comunitarios (CTC) were installed in Argentina as part of the Argentina@Internet.todos Program, a survey was done of about one-third of the CTCs. The survey found that only about 70% were offering the services that had been foreseen in the agreement between the Secretaria and the administrators. Many were not staffed or open. Others were offering access only to the institution in which they were located. Most of the public libraries were provided with only one instead of two computers, and this computer was being used for internal administrative purposes. Therefore, it was not available for the public to access the Internet. Many centers could not offer free Internet access because of inadequate government subsidies. Soon the government reneged on its commitment, and centers that could not pay for Internet access were cut of by the ISPs. Those that could pay did so through "voluntary" contributions from users. Many centers had to close. There is almost no more communication between the administrators and the central authority, which was taken over by the Secretaria in February 2001. It is estimated that close to one-third of the centers are no longer working due to lack of resources and stolen equipment.

VI.4.3 What has worked well, and why?

The characteristics that lead to successful implementation of NGO or community based ICT development projects are as diverse as the projects themselves. A review of IICD's projects in Bolivia is illustrative.

IICD recently did a comprehensive assessment of its "shared satellite connectivity" project in 11 communities in Bolivia after three years of operation. They concluded that this type of community access model could be sustainable from an organizational, technical, financial and ownership perspective. The following are some of the factors that have contributed to making the IICD model sustainable - many of the same factors can also be found in the other initiatives mentioned above:

- The local partner organizations (ICO, ACLO, APCOB and AOPEB), who had all been working in the participating communities for over 10 years, were able to easily and quickly gain a high level of trust in the community. Many earlier top-down nationwide telecenter initiatives which did not have local linkages, failed due to a lack of active participation at the community level.
- The local partner organizations played a key role in negotiations with VSAT service providers. All the same, professional legal advice was found to be necessary to ensure sound contractual terms and conditions in the service agreement.
- Users were willing to pay for high-quality basic telephone and Internet access services if these met their needs, which were above all to communicate and have access to information and the capability to share it. In most cases a basic dial-up link with limited bandwidth was not sufficient to address the needs of users.

There is strong evidence that the use of ICT has a direct economic and social impact. Participating farmers reported having experienced direct economic benefits from using the telephone and Internet services in the project's information centers. They particularly value agriculture-type information on market opportunities, prices and improved production methods. They want to use ICT to promote their produce to a wider public via the Internet. Teachers and students participating indicated that the use of the e-mail and Internet, more than the telephone, directly enhanced the quality of education in rural areas. Teachers and students are able to access and receive better teaching materials through the Internet. They are able to enhance their cultural awareness through communication with their counterparts in other parts of the country and throughout the world.

VI.4.4 Main problems encountered and responses

The main problems that IICD encountered are in many ways similar to those encountered with other initiatives. They include the following:

- The project has been plagued with some serious quality of service problems. Often the actual bandwidth provided has been less than what was promised and at times there has been no connection for days on end. Actual uplink speeds of 32 Kbps - instead of the 128 Kbps promised - have resulted in lag times of up to 16 seconds, making VoIP communications virtually impossible. Users have had to deal with this by saying "over" when they were finished talking, as a signal for the other party to start talking. Downloading information from the Internet has also tested users' patience. Other implementation and maintenance problems resulted for the following reasons: (i) the service provider installed outdated VSAT equipment, which broke down after only a few months; and (ii) the service provider has been unable to solve system failures and complaints about quality-of-service, because it has no online equipment to monitor its network. The matter is further complicated by the fact that the VSAT equipment and local WiFi network were installed by two different local companies, making it easier for the suppliers to blame each other[72].

  Satellite service providers, who must buy space segment capacity from a satellite operator and IP Transit, are not respecting contractual agreements. They frequently do not provide the quality of service necessary to satisfy users and partners[73]. Service descriptions are sometimes vague. It has been difficult to confirm guarantees which may have been included in the contract[74].

  The unfortunate result is that people in the community rapidly become discouraged and stop coming to the information centers, especially if they have to travel from far away. This reduces the willingness of partners in the community to share costs, and to expand or undertake other such projects.

  However, expectations may need to be lowered, in light of the relatively low prices that are being paid for the VSAT connectivity. The service provider who has to pay relatively high space segment costs will naturally try to share transmission channels among as many users as possible and save on costs by providing inferior equipment and customer service.

- Collaboration among potential parties is often difficult to obtain because of differences in management style or political interests;

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72 This with the exception of external consultant and suppliers that IICD brought in.

73 IICD terminated the contractual agreement with the first service provider but is not getting better service form the second.

74 For example, IICD and its partners have found it very difficult to determine whether a "clear channel" is really a clear channel as in many cases it is suspected that a connection may be shared by a larger number of users at a time than should be permitted with the promised speed.

- Many well-intentioned initiatives involving several agencies and government departments have proven difficult if not impossible to coordinate. Often there is no high-level political commitment.
- There has been a fast turnover of trained administrators. This makes it necessary to have a continuous training program.

Other problems encountered by community projects of this nature have included:

- Many installations have unstable and unreliable sources of electrical power, and poor quality and workmanship. For example, unprotected wiring hanging loosely from ceilings and the absence of surge protectors has resulted in burn-out of routers and modems;
- Many installations do not have proper software security measures (firewalls and anti-virus software) in place. In some cases this results in servers becoming so infected that they are no longer workable;
- The service provider may send technicians who are inadequately trained or insufficiently knowledgeable to resolve the problem. Technicians who come out to remote locations may neglect to bring the spare parts needed;
- Often there is no simple but reliable accounting system to set prices and tariffs, and to charge for Internet use in the local information centers. Some centers base their charges only on the cost of the VSAT (or other backbone) connection and fail to take into account overhead costs, such as rent, electricity, the administrator's salary, and on-going expenses for technical support and maintenance.

VI.4.5 Lessons learned and the way forward

IICD's experience in Bolivia has proven that it is possible to implement sustainable small-scale universal access projects in rural areas of Latin America. There is a strong local demand from farmers, small businessmen, the education communities, local governments, and individuals, which ensures that such community-based connectivity solutions can greatly enhance universal access policies. The lessons learned from these initiatives in Bolivia apply to similar community-driven projects in other Regulatel countries. These lessons can be summarized as follows:

- At least initially, a cost-sharing model should be applied to medium-sized communities where there are a sufficient number of local organizations that can sustain the overall cost. Smaller communities can be added to the network at a later stage.
- Community-based initiatives need to have a clearly defined and formal organization structure, including a written agreement among all parties, specifying how the network is to be administered, and what are to be the arrangements for service level and billing.
- It is essential to involve leaders of participating local organizations and political leaders in the community from the start. This requires that the project manager, technical personnel and others involved in the project explain the concepts, benefits and consequences of making major community investments in connectivity. A prior understanding of the way these projects are organized and structured can save a lot of time and confusion, and turn local leaders into allies rather than enemies.

- Local administrators need to be trained in organizational and financial management to ensure that the centers are run efficiently and remain viable. The most successful information center administrators have a thorough knowledge of their community, and the needs of the specific target groups. Local technicians need to be trained from the start and involved in the initial installation. They will be responsible not only for operating and maintaining the network, but also for subsequent additions and enhancements. The project needs to have a continuous training program, including the building of strong technical teams on the ground.
- Project organizers and sponsors should ensure that there are regular exchanges of information and knowledge-transfer among similar projects throughout the country and the world at large.
- The local community organizations involved, including local governments, schools, hospitals, agricultural and other associations, have to commit to sharing costs either through a specific budget item or a user fee. In most cases, the additional budgetary requirements will be offset by savings resulting from the project in communications and travel.
- There needs to be a simple but reliable accounting and financial control system for costing and price-setting the community information centers;
- Local community organizations need to get future users directly involved in the planning, construction and operation of the information centers. This helps create awareness of innovative ICT-based instruments that can enhance users' lives. This also makes it easier to identify information needs among the different user groups. The initiating organizations need to be very familiar with the local context.
- All technical installations need to be tailored toward the specific site, local circumstances, environment and use. There should be provision for preventative maintenance at regular intervals. This includes having a back-up generator and essential spare parts stored on site, even if this adds to the initial cost.
- Networks built and operated on universal access funds depend on the ability of users to aggregate demand for telecommunications facilities and services (including bandwidth capacity). Much of this demand will come from federal, state and local governments' needs. While some government rules can make such aggregation difficult or impossible, it is important to find ways to facilitate and encourage such aggregation.

Small-scale projects can benefit significantly from aggregation and integration on the supply side, and from harmonization of standards and procedures employed to acquire satellite bandwidth.

The OmniGlobe model of system integration and bandwidth aggregation discussed in Chapter VII, or a model based on the defunct "e-Links Americas initiative", can ensure that high standards are maintained, along with reasonable prices.

Another outstanding model for governments, regulators, and industry to emulate is the Global Broadband Satellite Infrastructure (GBSI) Initiative. The GBSI initiative was undertaken by the International Telecommunications Satellite Organization (ITSO) in order to create a global open market for broadband equipment and services. To achieve that goal, IYSO took the following steps: (i) the adoption of a universal technical standard for user terminals; (ii) the facilitation of effective access to the geostationary orbital and frequency spectrum resources; and (iii) the creation of a minimal and pro-competitive regulatory environment.

The GBSI Initiative seeks to:

- Identify worldwide harmonized radio-frequency bands, not shared with terrestrial services and orbital positions, and primarily suitable for the provision of high-speed Internet services for the exclusive use of broadband access through simple and affordable user terminals (governments);
- Develop harmonized and minimal satellite regulatory frameworks and common principles for the regulation and administration of satellite services in order to promote competition for satellite-based broadband services. This includes the following: granting landing rights to satellite operators, licensing qualified local service providers; promoting the use of shared gateway services; certifying user terminals; and supporting public funding for broadband services to benefit poor communities.
- Induce members of the telecommunication industry to voluntarily agree on a universal and open technical standard for user terminals for accessing satellite based high-speed Internet service. The goals are to facilitate interoperability and interconnection among different broadband satellite networks and to foster mass production of user terminals.
- Induce the telecommunication industry to put measures in place to facilitate interconn-ection among all private satellite networks which offer broadband services[75].

The lessons learned from Argentina's experience with the CTC telecenters are as follows: (i) much care needs to be taken in the selection of local administrators; (ii) if it is a government or fund initiated and financed project, the government or fund needs to maintain continued oversight; (iii) there should be strict rules about the use of computers and other equipment, and those rules should be enforced; and (iv) the government should not commit to free Internet use unless it is assured of having sufficient financial resources.

VI.4.6 Recommendations: Other financing initiatives

The following actions with respect to other financing initiatives are recommended:

- ➢ For rural connectivity projects, governments and regulators should be prepared to assist in ensuring the following: (i) that the terms and conditions of contracts between satellite and other backbone operators, and operators of universal access projects, are clear, unambiguous and fully understood by all parties; (ii) that the responsible parties meet their obligations with respect to quality of service, response times, and liabilities; (iii), that the prices charged are cost-based; (iv) that bandwidth sharing ratios are clearly specified and respected; and (v) that there is provision for compensation if these conditions are not met.
- ➢ Those persons and agencies involved in universal access funds should be aware of the large demand in rural areas for combined telephone and Internet access. National universal access programs should build close relationships with community organizations and NGOs such as the International Institute for Communication and Development (IICD). These relationships will help to ensure that community-based projects are well coordinated, that potential overlap is avoided, and that these projects can be rolled-out quickly, without bureaucratic hindrances.

[75] http://216.119.123.56/dyn4000/dyn/docs/ITSO/tpl1_itso.cfm?location=&id=326&link_src=HPL&lang=english

- Fund administrators, regulators and larger, established operators in the country should consider supporting small community-based projects by giving them independent technical advice and legal support during project design, construction and especially during contract negotiations with service suppliers.
- Fund administrators should contemplate subsidizing the high cost of good quality satellite backbone capacity for such small community-based projects, if no other terrestrial alternatives are available.
- Regulators, government officials and the telecommunication industry should support the GBSI initiative (See Chapter VI.4.5).
- Government agencies, the telecommunication industry, and NGOs should encourage, support, and facilitate international cooperative and private satellite bandwidth aggregation and integration initiatives.
- For small, community-based universal access projects, it is important to take into account the lessons learned as listed in Chapter VI.4.5.

VI.5 State controlled mandates

VI.5.1 Introduction

Four of the 19 Regulatel countries have adopted primarily the state-controlled mandate approach. They have achieved some quite remarkable and successful results.

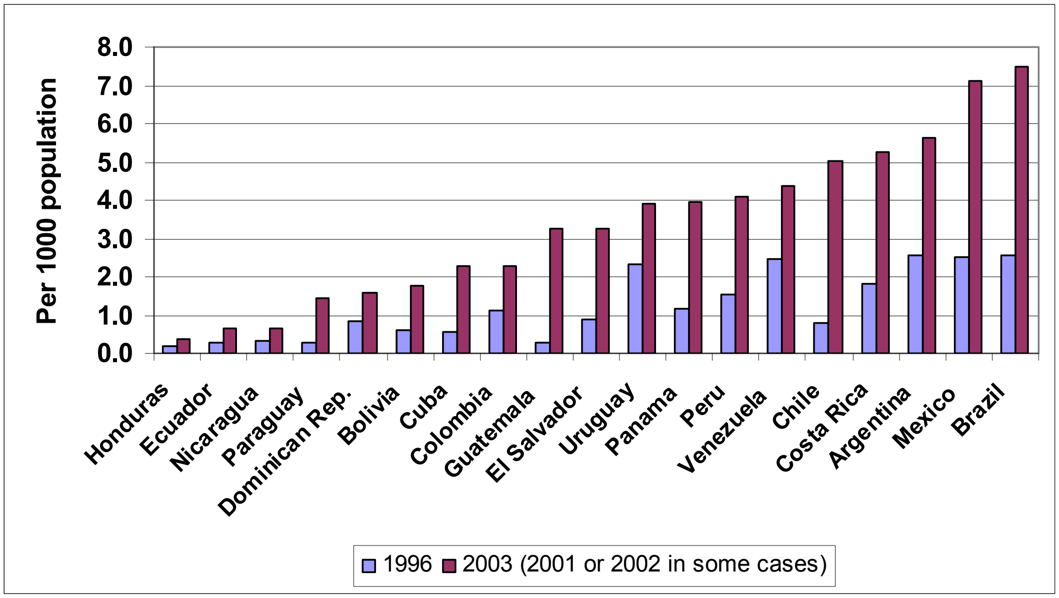
VI.5.2 Results achieved

Neither Uruguay nor Costa Rica has a universal program or even a telecommunications law. Nevertheless, both have achieved the following objectives: (i) penetration rates of about 28%, which is the highest in Latin America; (ii) nearly 100% national network coverage through deliberate cross-subsidization by the state-owned monopoly fixed line operators, ANTEL in Uruguay and ICE in Costa Rica (Figure V.1); (iii) very affordable local rates (Table VI.7). In both countries, the initiative to provide universal access came from the operator and not the government or the regulator.

Table VI.8: Indicative retail prices for telephone and Internet access services (in US$ including all taxes)

	Uruguay	Costa Rica	Guatemala	Brazil	Argentina	Peru		Mexico
Telephone calling								
						Daytime	Night time	
Local call/min	0.05	0.0072	0.03	0.04	0.004	0.02	0.012	0.02
National long distance call/min	0.11	0.0072	0.06	0.28	0.11	0.21	0.128	0.15
International (USA)/min	0.22	0.27	0.25	0.47	0.20	0.71	0.356	0.44
Monthly line rental (residential)	17.48	3.70	5.97	18.78				14.05
Monthly line rental (business)		4.30						
Internet Access								
Internet dial up (monthly)		16.00		35.97	0	4.09		16.70
Internet dial up/min (+ local call rate)	0.01		0.04		0.007			
Internet ADSL (256 Kbps/128 Kbps)	53.41	41.00				36.77		
Internet ADSL (512 Kbps/128 Kbps)			50.00	46.90				36.03
Internet ADSL (1,024 Kbps/256 Kbps)		81.00			23.00			62.03
Cable modem (256 Kbps/128 Kbps)				44.55	15.00	66.55		
Cable modem (600 Kbps/256 Kbps)			50.00					17.95

Figure VI.14 : Payphones/1000 population (1996 and 2003)



Source ITU WDI 2005

Uruguay, which has a population of 3.5 million people, has made it a strong priority to provide coverage to the whole of the territory, and ensure that any person who wants a telephone can obtain one immediately. As a result, 100% of the population has access to a fixed telephone, a cellular mobile footprint and the Internet. In 1995, Uruguay had a waiting list of more than 90,000 people, and ANTEL undertook a project to provide service to all of them. ANTEL deployed a state-of-the-art wireless (DECT) system in rural areas, and reduced connection fees from US$250 to US$100. ANTEL implemented this project on its own initiative, and paid the entire cost out of its own budget. Other initiatives of ANTEL include the installation of free telephones in 300 impoverished localities, the expansion of the high-speed backbone network throughout the country, and the adoption of a policy of installing a data node in any town where there is a request for at least one dedicated leased circuit[76]. As of July 2005, ANTEL had installed 68 educational telecenters (Centros de Acceso a la Sociedad del la Información or CASI). Each of these telecenters has five computers connected to the Internet via a broadband (ADSL) 384 or 256 Kbps (down-link) connection, along with two printers and a scanner. ANTEL supplied the furniture, and provides maintenance, training for the centers' administrators, and free Internet access for two years. Local partners provide the venue, personnel, electricity, water and security. Use of the CASI is free. ANTEL launched this initiative ("Proyecto Uruguay Sociedad de la Información" or USI) in 2002, in support of the Government's Educational Connectivity Program aimed at closing the digital divide mainly in the interior of the country. Similarly ANTEL has established nine special centers (Centros de Acceso al Sistema de Intermediación Laboral or CASIL) to facilitate job searches.

ANTEL has also participated in and financed various information society or ICT projects jointly with the Ministries of Education, Public Administration, Labor and Social Security, local governments and the private sector and civil society. These joint projects include the installation

[76] All towns with more than 5,000 inhabitants and many with less than 3,000 have a data node.

of 25 telecenters (Centros de Acceso a la Sociedad del la Información, or CASI), which offer free access to the Internet plus over 1,300 education centers meant primarily for young people along with an education portal. Other joint projects include the establishment of a comprehensive e-government program and specially created centers (Centros de Acceso al Sistema de Intermediación Laboral) using ICT to facilitate job searches.

In Costa Rica, which has a population of about 4 million people, 63% of households have access to a fixed telephone - 77% in urban areas and 44% in rural areas. Universal access in Costa Rica is understood to mean the deployment of public pay phones generally through terrestrial wireline and wireless connections. However, Costa Rica has not used either population density or geographic criteria in assessing where these are to be placed. The penetration of public telephones is 5.3 per 1000 population, one of the highest in Latin America (Figure VI.14).

RACSA is a subsidiary of the Costa Rican operator ICE – it is in charge of data transmission and value-added services (VAS). RACSA has established free telecenters in more than 50 post offices.

Various Costa Rican government ministries and agencies have set up five comprehensive community-based telecenters or LINCOS (Little Intelligent Communities), computer laboratories in 434 schools, and an information system for the agriculture and fishing sectors (Sistema de Información del sector Agropecuario Costarricense, or Infoagro).

In Honduras, the fixed line market was not opened to competition until the end of 2005. The Telefonía para Todos Project resulted in only about one-third of the targeted 200,000 telephones being installed before 2006. Honduras continues to have one of the lowest fixed line penetration rates in Latin America.

In Cuba, a particularly successful computer and Information Technology education initiative is the Joven Club de Computación y Electrónica (JCCE) (http://www.jcce.org.cu/). This initiative has established more than 600 training centers, including five mobile units, that offer free computer and electronics instruction to everyone. Since its inception in 1987, the program has trained nearly 900,000 children, young people, workers, retirees, etc. Each center has at least 10 computers and peripherals, an administrator and five instructors.

The following are some of the services provided by the JCCEs: (i) confirmation of technical and professional qualifications in IT;, (ii) development of specialized software in areas such as the tourism industry; (iii) identification of talented young people for careers in computer science and IT, web development and communications.

In addition, the Cuban government has put computers in all schools and universities, and implemented a comprehensive e-government program that emphasizes health culture, and social security.

VI.5.3 What has worked well, and why?

The examples of accomplishments achieved by traditional state-owned or mandated approaches in some of these countries raise interesting questions, particularly given their significant contrast to the liberalization-based principles underlying telecommunications access policies in most of the region. It is worth pointing out that such state-run, even monopoly approaches to telecommunication development have been employed successfully elsewhere in the world. Much of the telecommunication infrastructure of Europe, and even of the United States and Canada, was initially developed in a monopoly or state-controlled environment. When resources were adequately available to finance cross-subsidies, these models did a fairly good job of spreading access almost universally. Costa Rica and Uruguay, the two Regulatel countries that have shown the most success with this traditional model, have among the highest per-capita GDP levels in Latin America. This certainly contributes to these nations' capacity to invest in infrastructure, even in the absence of private market competitive forces. In Cuba and Honduras, where the state-run approach has yielded far less successful results, income levels are far lower. Therefore, these nations have fewer internal resources with which to finance such investments.

Much of the success in Uruguay can be attributed to the stability and competence of the management of ANTEL during the critical period of network expansion and modernization in the 1990s. Upper management did not change during the whole of this period. ANTEL was able to make healthy profits each year, part of which it paid to the treasury as a dividend, and the rest of which it reinvested in modernizing and expanding its network. During this period, ANTEL reinvested between US$150 million and US$200 million annually. ANTEL digitized 100% of the network, built a cellular mobile network, built an ubiquitous national multi-services data network, expanded wireline and wireless local access to eliminate all backlog, built a fibre optic backbone, and installed a new Enterprise Resource Planning System[77] Retained profits were used from 1995 on to fund the various universal access programs. As explained in Chapter VI.5.2, these were decided internally but had to be justified on social grounds. Even today, in the face of growing competition, ANTEL has remained a profitable company.

Similarly, ISE, the fixed line monopoly that was established in Costa Rica in 1949, has been guided by a state socioeconomic policy that emphasizes investment in education, health and public infrastructure. The Planning Department of ICE is responsible for developing and recommending universal access projects, which are then submitted to the board of directors for approval.

Unlike ANTEL, ETECSA in Cuba and HONDTEL in Honduras pay no dividends to the government, and all of their profits are reinvested in expanding and improving their networks and services.

VI.5.4 Lessons learned and the way forward

In most Regulatel countries, the path to liberalization is already well established and its successes are clearly visible. Those countries are unlikely to use the programs of Costa Rica and Uruguay as blueprints. Nevertheless, there are positive lessons to be learned from the way in which Costa Rica and Uruguay have harnessed their energies and strategic agendas toward making ICT access a national priority. The focus of development efforts is likely to be more streamlined and efficient when there is sound "central planning". Key stakeholders should be encouraged to cooperate in the process of identifying needs and defining policy choices,. As we have emphasized throughout this report, this type of coordination is one of the most important prerequisites to effective universal access policy. In that sense, Costa Rica and Uruguay have set useful examples.

[77] Software support to business: finance, material and human resources management, sales, and marketing.

VI.6 Operators and manufacturers

VI.6.1 Observations of operators and manufacturers

The following is a summary of observations made by operators and manufacturers with respect to universal access funds and programs:

- Governments and fund administrators should ensure that operators, service providers and manufacturers have a clear understanding of government policies, needs and priorities. For example, they should specify the types of services and technologies or the different models of regulation that they consider to be most appropriate for rural and isolated areas.
- When there is a lack of coordination among different levels of government, it makes life extremely difficult for operators. Different rules - mainly administrative - that apply at the federal, state, and municipal level, can seriously interfere with the ability of operators to do their jobs effectively.
- High levels of taxation discourage the use of and investment in telecommunications. A good example of this is Brazil, where many tax officials consider telecommunications to be a luxury service. Tax incentives can be especially valuable to operators and manufacturers when it comes to developing networks and services in remote areas. Policy-makers, regulators and fund administrators need to evaluate the long-term impact of taxes on achieving universal access goals.
- Coordination among donors and institutions for universal access projects and e-government strategies is essential for the development of the sector. A central clearinghouse to avoid duplication could be very useful, as could a central depository of key data like the World Bank's data base of all the development projects of the WB, USAID, and other organizations (www.developmentgateway.org).
- It is important that governments streamline bureaucracy in administration of universal access funds, and that the process be transparent.

The following is a summary of observations made by operators and manufacturers with respect to the sector in general:

- In an era of convergence, a fragmented market in which individual services are treated separately is no longer appropriate. An obsolete regulatory framework produces uncertainty and discourages investment. It encourages opportunistic behaviors in some "small" operators. Regulators should recognize its importance and therefore make allowances for convergence between fixed and mobile, and for the different modes of delivery of essentially the same services, be it via copper local loop, wireless or via the cable TV network Regulators should give operators the flexibility of offering bundled services and all-inclusive pricing. The regulatory framework should be designed to encourage investment and promote innovative uses of new fixed and mobile technologies.
- Regulators also need to understand the implications of VoIP, which reduces operators' revenues but at the same time provides other opportunities. Regulators need to decide if and how to regulate VoIP.

VI.6.2 Recommendations related to observations of operators and manufacturers

- *Policy-makers and fund administrators should ensure that there is an open and continued dialogue between themselves and operators, service providers and manufacturers on plans and strategies for universal access programs and funds. Regulatel can play an important role in this, especially through its cooperation and annual summits organized with AHCIET. It is important that this dialogue include the small rural operators and local manufacturers of equipment for rural applications. Regulatel can also act as the clearinghouse for information on multilateral funding of universal access projects in the 19 member countries.*

VI.7 Conclusions

The liberalization of telecommunications in Latin America has been a key factor in raising mobile penetration rates, especially in Argentina, Ecuador, Paraguay, Brazil, Mexico, Venezuela and Chile, where competition in this market segment has been relatively effective. In some Regulatel countries, however, there remains a significant market access gap in fixed telephone penetration. This is especially true in countries where one operator - usually the incumbent - continues to dominate. Venezuela illustrates the point. CANTV continues to corner 82% of the market even though there have been other operators - in particular the largest mobile operator, Movistar - who have entered, using mainly wireless technologies to provide access (Figure VI.12). By contrast, there are three strong players in the cellular mobile market. Venezuela has seen a Compounded Annual Growth Rate (CAGR) of over 100% in the cellular mobile market since 1990, and has one of the highest mobile penetration rates of the 19 Regulatel countries. The countries that have been most successful in increasing fixed telephone penetration (Figure VI.1) have achieved this through one of two means. Uruguay and Costa Rica have done it through the socio-economic motivated initiatives of the state-owned monopolies. Brazil has done it through the effective use of universal access obligations. Chile, Guatemala, and El Salvador can attribute relatively high CAGR in fixed telephone to competition in this sub-sector. However, there remain large regional disparities within many Regulatel countries because the capitals and large cities continue to have by far the highest rates of access.

Latin America has experienced much greater CAGR for both fixed and mobile access than North America. The figures for mobile are particularly impressive (Figure VI.4).

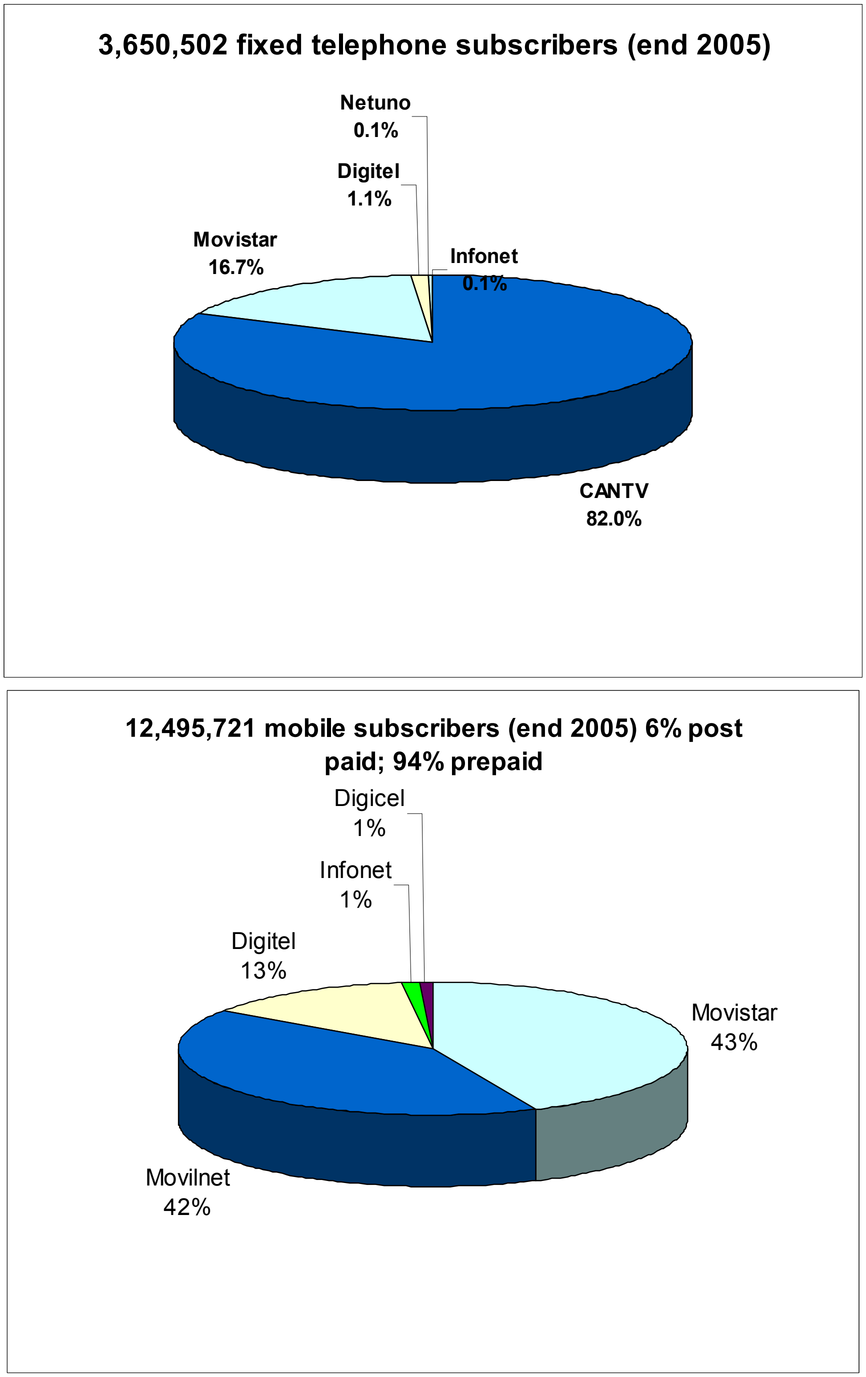
Until very recently universal access funds in Latin America have financed only public payphones and Internet (at telecenters), and not expansion of residential or business fixed or mobile access. Payphone projects have brought public access to many people in rural and remote areas of Latin America. In Peru, FITEL is now funding a number of pilot projects that, inter alia, are helping to extend the local access networks into smaller rural communities and even whole provinces (Chapters VII and VIII). Peru has achieved its objective of having a public telephone within 5 km of every person. It should be noted that this still means that many Peruvians must spend a substantial amount of time traveling this distance.

The success of these universal access fund supported payphones is tempered by the following factors:

- Their use is fairly limited.
- The encroaching cellular footprint has affected payphone operators' business plans.

- Their remoteness in rural areas leads to operational and maintenance problems. These include finding an appropriate payment mechanism, and supplying prepaid cards.
- They are not appropriate for data applications including Internet.
- Regulations are often poorly adapted for rural applications.

Figure VI.15: Venezuela: Market shares of operators in fixed telephone and mobile markets



Source: CONATEL

The most successful purely privately funded telecenters have been the 30,000 or so cabinas públicas in Peru. These have operated in a fairly open environment which has facilitated entry. The favorable circumstances favoring their expansion are discussed in Chapter VII. In Venezuela, Cuba, Uruguay, Costa Rica, and the Dominican Republic, telecenters that have received support from the state and from universal access funds are being used to serve a number of additional social and economic goals. These include the following: (i) improving education; (ii) improving the health system; (iii) facilitating the distribution of food; (iv) enhancing security, (v) strengthening the legal system; (vi) supporting the dissemination of local information through mini-broadcast centers; and (vii) supporting small, local businesses through the provision of photocopying, faxing, web hosting and other small business services.

In Brazil, market liberalization policies combined with universal access obligations imposed on certain operators have been effective at increasing both fixed and mobile line penetration. It is particularly easy for both large and small investors to enter the telecommunications market. A good example of this is the case of the small operator Ruralfone in Ceara State, which is described in Chapter VII. The number of mobile operators that have established networks in Brazil is impressive. Universal obligations have been less effective in certain other Regulatel countries, like Venezuela and Bolivia. In Venezuela, the problem stemmed from the fact that these obligations were only imposed for a limited time in conjunction with a privatization. In Bolivia, there have been numerous administrative problems, such as a lack of clarity in the definition of targets.

Best practices and recommended action in universal access fund programs are summarized in Chapter VI.3.5 and for other financing initiatives especially for smaller rural community oriented projects in Chapter VI.4.6.

While this report does not recommend returning to state-mandated policies for universal access such as the ones in Uruguay and Costa Rica there are nevertheless important lessons to be learned from their experiences and achievements not the least of which are a high degree of stability in the institutions responsible for universal access, the social consciousness of the people responsible for these initiatives and a large degree of coordination among policy makers, regulators, fund administrators and in certain cases also the private sector.

Table VI.9 summarizes the results of universal access programs and initiatives in Regulatel member countries using the four approaches of this analysis. The table shows the level of subsidy granted for each project where this is available and attempts to indicate these amounts on a per locality or per person basis. These figures do not always present a good comparison of subsidies because the sizes of localities are not the same. Also the target group of people for whom the project was designed - for example students - does not represent all the people near the point of access. It is difficult to determine exactly how much a universal access project costs because the subsidy sometimes accounts for only a part of the overall costs and sometimes for the entire cost. Private companies implementing projects with subsidies received from universal access funds are not generally willing to give information on the overall cost.

Table VI.9 Universal access projects and initiatives in Latin America

Country		Lines/100 pop.		% rural pop.	Appr. *	Source of funding	Year	Type of projects/number of installations	No. of localities served	Pop. served (1,000)	Subsidy granted (US$)			Operator(s) Incumbents in bold	Period of subsidy flow	Status
	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
Argentina	13,153	22.8	57.3	11	**C**	Programa Nacional para la Sociedad de la Información	1999-2000	3,031 Internet access points (1.281 CTCs, 1,750 libraries	n.a.	n.a.	60.0			n.a	1999-2000	Est. 1/3 no longer working
					C	Rural cooperatives	1960s →	2,677 rural residential connections	199					Rural cooperatives	n.a.	operating
					C	Rural cooperatives (TECOOP)	2004	230 public payphones						TECOOP	n.a.	
Bolivia	3,049	7.0	26.4	39	**A**	Operators' targets		2,173						**ENTEL, COMTECO, COTEL, COTAS**		
					C	SENATER	1979	347 HF radio stations	88/111 provinces							
					C	Various NGOs		90 rural information centers (ticbolivia)	90	50						
Brazil	8,745	23.5	46.3		**A**	Operators' universal access obligations	1998 - 2005	11.4 million new telephone lines; 400,000 new public payphones	44,000	155,800	n.a.	n.a.	n.a.	**6 operators in "public" regime**	n.a.	completed
					C	Federal Comm. Ministry		GESAC Program: 4,400 telecenters		4,000				n.a	n.a.	completed
					C	State of Sao Paulo		Acessa (200 telecentrer and Internet booths)						n.a	n.a.	completed
					C	State of Rio de Janeiro (Prefeitura)		Pirai Digital Project: 39 points of presence connected by WiFi	1					n.a	n.a.	completed
					C	City of Sao Paulo	2001-5	Sao Paulo City Portal Coordination: 122 telecenters and portal	1					n.a	n.a.	completed
					C	Gemas de Terra NGO		Gemas de terra telecenters						n.a	n.a.	completed
					C	NGO, Ministry of Planning, Bank of Brazil		CEMINA: Radio and Internet based broadcast network in North and Northwest Brazil						n.a	n.a.	
Chile	11,537	22.0	67.8	15	**B**	FDT	1995-2004	payphones	6,059	2,200	17.7	2,256	8.05	**CTC (Telefonica)**; CTR; Gilat, Megacom; Geneva		
							2002	293 telecenters	293		5.0			Universidad de la Frontera, Instituto Nacional de la Juventud, Sociedad comercial Borques y Flores, etc.	5 years	Commercial telecenters have not been successful
							2004	Internet in rural schools	667	108	6.5	12,727	60.20			
Colombia	7,303	17.1	47.8		**B**	Compartel	1999-2002	Rural payphones (80% VSAT; 18% cellular; 2% WLL)	9,745	5,000	51.0	5,300	10.20	**Colombia Telecom**.; Gilat; **Edatel**; Union Temporal (Comsat); Internet por Colombia	6 to 10 years	Most operating

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	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
							1999-2004	Internet community centers	4,440	5,200	102.0	9,000 to 89,000	1.96		6 to 10 years	
Costa Rica	4,368	32.1	25.5	48	**D**	Operator's initiative		Payphones installed	n.a.	n.a.	n.a.	n.a.		**ICE**	n.a.	
					D	Fundación CAATEC	→ 2001	52 free telecenters in post offices		350				**RACSA**		Stopped due to legal and financial problems
					D	Fundación Omar Dengo	1988 – 2001	Equipping 434 schools with computer labs and Internet connection		253						Cont. in spite of financial difficulties
					D	Fundación Entebbe		5 community telecenters (LINCOS)								Stopped because of lack of financing
					D	Ministry of Agriculture, NGOs, CIDA (Canada)		Infroagro nationwide ICT network for agricultural sector								Being expanded
Cuba	3,000	7.5	1.2		**D**	Operator's UA obligations (ETECSA)		Coverage of all localities > 300 pop., 1,125,000 fixed and mobile phones by 2008; complete digitization of network; fiber backbone; 50,000 payphones (non convertible pesos)	Whole country					**ETECSA**		In process of realization
					D			> 600 Joven Club de Computación y Electrónica training incl. 5 mobile	Whole country	773						Being expanded
Ecuador	4,010	12.9	47.2	38	**C**	Fondo rural marginal	2003	5 community telecenters in Guayaquil	5		0.112	22,470		**Pacifictel**		
					C		2001-3	3 community telecenters and 8 "cabinas publicas" in Galapagos	11	18	0.326	29,659	18.12	**Pacifictel**		
					C		2004-5	Replace and/or install 200 monocanales(?)	178	500	0.339	1,902	0.68	**Andinatel**		
					C			Install 72 community telecenters	72	500	3.008	41,778	6.02	**Andinatel**		
El Salvador	4,525	14.1	35.1	40	**B**	FINET		41 Infocenters	41							
					B	Ministerio de Educación		Programa "Conéctate" computer equipment and education								
Guatemala	4,136	8.9	25.0	60	**B**	FONDETEL	1998-9	3,063 public payphones	1,117	925	5.7	5,102	6.16	Prearq S.A. Serat S.A. Hidroc S.A.		
					B	FONDETEL	2001	1,617 public payphones	230	180	1.6	6,957	8.89	Eurotec S.A.		
					B	FONDETEL	2002	350 public payphones	135	89	0.4	2,963	4.49	**Guatel**		

Table VI.9 Universal access projects and initiatives in Latin America

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	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
					B	FONDETEL	2003	472 public payphones	403	300	0.5	1,241	2.50	**Guatel**		
					C	USAid and local partners	2000	26 Agexpront (Exporters' Guild) telecenters	25							
					C	USAid, Planeta en Línea	2006	Establishment of microtelecos with a WiMAX network in 5 locations	5					UNITEL/Metrovia		
Honduras	2,793	6.9	17.8	54	D	no subsidy, sub-contractual arrangement with HONDUTEL	2004-5	200,000 new telephone lines (Telefonia para Todos) various technologies employed						**HONDUTEL** and 54 sub-operators		Less than 40% of objective met by end of 2005
					C	Consejo de Ciencia y Tecnologia, IADB	¿	100 telecenters (Centros de Conocimiento, Comunicación y Capacitación)	¿	¿	¿					
					C	ICA, Red de Desarrollo Sostenible	2005	Free IP based telephone service (alooo.com)	?	?	?					
Mexico	10,090	18.2	44.3	23	B	FCST/National Treasury	¿	Residential and public telephones; Internet access	3,930	3,600	25.38	6,458	7.05	**TELMEX**	Up to 10 years	In progress
					C	State/e-Mexico	¿	Community telecenters (CCD)	> 7,500	5,750	22.2	3,000		**TELMEX** (indirectly)	¿	
					C	Various federal and state initiatives incl. Centros de Educacion Educativo (Fed.), Centros de Saber (Guanajuato), Internet en mi Biblioteca (Fed., etc.										
Nicaragua	2,779	3.8	19.7	41	B	FITEL	2005-6	Expansion of cellular coverage to 30 municipal govts and installation of 343 payphones in some localities > 400 pop.	343	500	4.2	12,245	8.4	**ENITEL**	10 years	Implementation phase. Total cost of project = US$ 8.7 m
					C	Telcor,CONICYT, Sia Magfor, Mecd, Siniamarena	?	176 Telecenters of which 46 have been financed by Telcor	?	?	?					

Table VI.9 Universal access projects and initiatives in Latin America

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	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
					C	USAId, Fundacion Nicaraguense-American, Govt. Of Japan, Telefonica, MIT, Universidad Centroamerica, etc	2005 → 2010	Cyberescuelas 2.0: Installation of telephones, computers and peripherals and Internet connections and provide teacher training in 9,000 schools								110 schools equipped in 2005
Panama	7,327	13.6	41.9	27	A	Operator's UA obligations (C&WP)	1997-2003	670 public telephones of which 200 are in rural areas						**C&WP**		
					C	IADB, SENACYT, other govt. and non govt. org.		58 Infoplazas								
Paraguay	4,663	5.2	30.6	45	B	FSU	2000	480 public telephones (prepaid cards)	240		0.944	3,935		Artes Gráficas Zampirópolos S.A.	Total subsidy paid out as soon as equipment was installed, inspected and confirmed to be operational	
					B	FSU	2000/1	1,500 public telephones (prepaid cards)	1005		7.022	6,988		Telecel S.A., Consortio Electro Import S.A. Impsat S.A.		
					B	FSU	2001-2	864 public telephones (prepaid cards)	334	167	2.731	8,177	16.35	Núcleo S.A., Consortio Loma Plata S.A., Impsat S.A.		
					B	FSU	2000	287 schools in 14 departments were supplied with computers, peripherals and/or access to the Internet	71	70	2.71	38,169	38.71		40% on contract signature; 60% once installations were completed	
					B	FSU	2000 -4	Proyecto Arandura: Building, equipping and connecting educational telecenters in 17 dept. capitals plus an operational center	17	10	0.659	38,739	65.90	Telecel	6 quarterly payments over 18 months	

Table VI.9 Universal access projects and initiatives in Latin America

Country		Lines/100 pop.		% rural pop.	Appr. *	Source of funding	Year	Type of projects/number of installations	No. of localities served	Pop. served (1,000)	Subsidy granted (US$)			Operator(s) Incumbents in bold	Period of subsidy flow	Status
	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
					B	FSU	2002–5	Installation in Asunción of a national 911 emergency system	5,400	5,701	2.308	427	0.43	Data Lab S.A. Omni. S.A.	50% 30 days after contract signature; 50% on completion and certification of installation by police	
Peru	5,594	8.1	20.0	28	A	Operator's UA obligations (Telefonica)	1994-98	3,000 rural payphones						**Telefonica del Perú**		Completed
					B	FITEL I, II, III, and IV	2000-4	6,517 rural payphones	6,740		59.3	8,266		Gilat-to-Home, Rural Telecom		Completed
					B	FITEL, Agencia Española de Cooperación Internacional (AECI)	2000-1	Installation of telephone and Internet access in 7 of 40 rural health stations in Alto Amazonas Province	7							Completed
					B	FITEL, Ministry of Agriculture, Cooperative of Farmers	2004 – 5	Pilot Project: Agrarian Information Network in Chancay – Huaral Valley and 14 information centers	14	16,000	0.155	11,714	9.69			Completed
					B	FITEL	2005-6	Pilot Project: Province of Huarochori fixed, cellular and Internet access project	120	59,000	0.295	2,458	5.00	Valtron		Project inaugurated on June 21, 2006
					B	FITEL		Rural broadband access								On going
					B	FITEL	2006-07	Broadband Satellite Project (First Phase)	68	60,000	1.13	16,600	18.00	Gilat –to-Home	4 Years	On going
Republica Dominicana	7,055	10.0	40.7	36	B	FDT	2002	Public payphones in 500 localities	500	1,424	3.4	6,793	2.39	**Verizon**		
					B		2004	1,750 public payphones	1,750		6,437	3,678		Bec Tech.	15% contract sign.; 45% inst.; rest over 5 yrs.	
					C	Govt.	2000-2	15 LINCOS rural telecenters	15							
					B	FDT	2004	9 community telecenters	9		0.865	96,111		Movicell		
					B	FDT	2005	52 of 135 CTC telecenters	52							
					B	FDT		Computers in 30 public libraries			0.650					
					B	FDT	2004	Digital libraries in schools			1.08					
					B	FDT		Computers and Internet access in universities			0.615					

Table VI.9 Universal access projects and initiatives in Latin America

Country		Lines/100 pop.		% rural pop.	Appr. *	Source of funding	Year	Type of projects/number of installations	No. of localities served	Pop. served (1,000)	Subsidy granted (US$)			Operator(s) Incumbents in bold	Period of subsidy flow	Status
	Per cap. GNP (US$)	Main	Mobile								Total (x 10^6)	per locality	per person			
					B	FDT	2005	Tele-education network and portal			2.79			**Verizon, TRICOM**		
Uruguay	9,619	30.9	18.5		D	Operator's own resources	1996 -7	Removal of 90,000 people from wait list using DECT technology		90	60[78]		667	**Antel**		
					D	Operator's own resources		Installation of 300 free phones in very poor areas			0.3[79]			**Antel**		
					D	Operator's own resources	2002	68 educational telecenters Centros de acceso a la Sociedad de la Informacion (CASI)						**Antel**		
					D	Operator's own resources	→ 2005	Connecting 1,300 schools (80% of all students) to the Internet						**Antel**		
					D	Operator's own resources		9 job search centers (CASIL)						**Antel**		
					D	Operator's own resources	1997	Universal access from any phone in the country to UruguayNet data network								
					D	Operator's own resources		Installation of data nodes in all towns of > 5,000 people (some > 3,000)								
					D	Operator's own resources	1998-9	10 video conference centers in each of the 10 departmental capitals ("aulas virtuales")						**Antel**		
Venezuela	5,801	13.5	46.7		B	FSU	2005	Planning, installation, operation and maintaining a telecommunications network to connect 34 Access Points (Telecenters) in 24 localities (4 States)	24	327	7.71	321,209	23.8	**Telcel (Movistar)**		Planned to be operational in Aug. 2006
					B	FSU	2005	Plan, install, operate, administer and maintain a network of 34 Access Points (Telecenters) in 24 localities in 4 States	24	327	11.6	484,407 341,935*	35.55	34 local cooperatives		
					B	FSU	2006	Plan, install, operate, administer and maintain a network of 323 Centros Bolivarianos de Informatica y Telematica (CBIT) – educational telecenters		3,041	15.4		5.06	CVG Telecom		Contract signed 5.5.06

78 Initial investment and O&M during five years. The project had a positive return on investment on the long term.

79 Initial investment. Recurring operating costs were marginal for local calls.

Table VI.9 Universal access projects and initiatives in Latin America

Country	Per cap. GNP (US$)	Lines/100 pop. Main	Lines/100 pop. Mobile	% rural pop.	Appr. *	Source of funding	Year	Type of projects/number of installations	No. of localities served	Pop. served (1,000)	Subsidy granted (US$) Total (x 10^6)	Subsidy granted (US$) per locality	Subsidy granted (US$) per person	Operator(s) Incumbents in bold	Period of subsidy flow	Status
					B	FSU	2006	Plan, install, operate, administer and maintain a network of 341 Infocenters		14,102	27.1	101,500	1.92	CVG Telecom		
					B	FSU	2006	Plan, install, operate, administer and maintain a network of connecting 444 agricultural estates		22,049	14.6		0.66	CVG Telecom		
					B	FSU		Plan, install, operate, administer and maintain a network connecting 288 civil registries and 219 notaries with the Ministry of Justice		14,815	25.2		1.70	CANTV Onidex		

* Approach

A	Market liberalization combined with regulatory initiatives, including universal access obligations and special regulations and conditions which favor projects and operations in uneconomic areas
B	Universal access programs and funds
C	Other financing methods and project initiatives by national, state and local governments, cooperatives, NGOs and others
D	State-mandated and controlled approaches using cross-subsidies and other financing sources

VII. INNOVATIVE STRATEGIES, BEST PRACTICES AND NEW MODELS FOR ACHIEVING UNIVERSAL ACCESS

VII.1 Introduction

There is a wealth of new and innovative ideas, experiments, and promising practices in the policies and experiences that Regulatel countries have been pursuing to achieve universal access goals. Communities, governments and NGOs, small entrepreneurs, individuals and universal access fund administrators are testing creative ways of facilitating and expanding the delivery of telecommunications and information services. Many initiatives remain speculative, either as to their effectiveness, sustainability, cost-effectiveness, replicability, or scalability – and some experiments will undoubtedly prove impractical in the long run. Nevertheless, the mix of new approaches and broadening involvement in the process offer valuable insights that can be shared among the Regulatel countries and with others.

This chapter highlights some of the most interesting and promising strategies and practices in Regulatel universal access policies, programs and projects in terms of innovative technologies, financing, business, commercial and new partnership arrangements, and regulation. It provides a sampling of general ideas and specific case examples from around the region, and some from beyond. Not all of these practices are entirely new or revolutionary, as many of these countries have been leaders for quite some time. But each offers elements of critical and creative thinking; each offers the implementation of new strategies that sometimes depart from traditional approaches to delivering communications services to the public. A selection of new models and pilots is presented and discussed at the end of the chapter.

VII.2 Transmission technologies for local access and transport

VII.2.1 Introduction

Universal access programs in Latin America are experimenting with evolving wireline and wireless technologies for providing access in rural, remote and unserved areas. Manufacturers, operators, and service providers are well aware of this trend. They have recognized the opportunity for market growth, especially for new generation services and applications.

The emphasis here is on local access, one of four basic components of a telecommunications network, which consists of the following: the terminal (e.g. a telephone set, a mobile terminal, a payphone, a computer, etc.); a local access network; a transport or backhaul network; and the network management function[80]. Current wireline and wireless technologies used in the local access and transport networks are shown in Table VII.1, and described in greater detail in Annex 5. The most commonly deployed of the wireline technologies are DSL and coaxial cables. Power line communications (PLC) uses the low and intermediate voltage lines of the electricity power distribution network to transmit high speed voice and data signals. PLC presents an interesting possibility, especially in countries such as Ecuador and El Salvador, which have high

[80] Including network management and control; billing, customer provisioning and care.

electricity penetration rates. However, PLC is in the developmental stage, and has so far not been widely used outside of experimental and pilot projects.

Table VII.1 Current wireline and wireless technologies in local access and transport networks

Type	Support, Generic Name	Specific technology and/or service	Used in: local access network	Used in: transport network
Wireline	Copper local loop	Digital subscriber line (DSL); dedicated line	✓	
		Integrated Services Digital Network (ISDN); dedicated line	✓	
	Coaxial cable systems	DOCSIS, Hybrid Fibre Cable (HFC)	✓	✓
	Fiber optic cable systems	Dedicated line, Hybrid Fibre Cable (HFC)	✓	✓
	Power transmission lines	Power Line Communications (PLC)	✓	
Wireless	Radio-in-the-loop (RLL)	**GSM** (GPRS, EDGE, W-CDMA. I-HSPA, HSDPA, HSUPA); **CDMA** (CDMA (IS 95A & B), CDMA 2000 1x, CDMA 2000 1x EV-DO)	✓	
	Broadband Wireless Access (BWA) Systems	Line-of-sight multi-channel, multi-point (MMDS) and local multipoint (LMDS) distribution systems	✓	
		WiFi, WiMAX	✓	✓
	Geostationary and low earth orbit satellites	Satellite, VSAT	✓	✓

VII.2.2 The most promising wireless technologies for local access

Among the most promising wireless technologies for application in universal access projects are the following:

a. Second and third generation cellular mobile (radio-in-the-loop) systems

This is a mature technology for both voice and data. The cost of a Greenfield installation can be relatively high, but expansion of existing second and possibly third generation systems can be cost-effective, because the major component of capital cost is in the installation of new base stations. The core network, consisting of the local access, transport, and network management[81] components, would also have to be expanded. But the cost of adding new subscribers and capacity is usually marginal, as these functions are shared by all users.

b. Broadband wireless access (BWA) systems

[81] Made up of the Network Subsystem (NSS) which includes the switch or Mobile Services Switching Centre (MSC); Home Location Register (HLR), Visitor Location Register ((VLR); Authentication Centre (AUC); and the Equipment Identity Register (EIR)) and the Operation, Administration and Maintenance (OAM) centre which includes the Operation and Support Subsystem (OSS), network management, control, billing, customer provisioning, etc.).

Because of their decreasing price and wide coverage areas, BWA and pre-WiMAX systems are very promising solutions for providing affordable access to stand-alone communities in universal access applications. Figure VII.1 shows a BWA configuration with a satellite backhaul link. A single base station transmitting in the 2.5–2.7 GHz licensed frequency band[82] can cover an area with a radius of up to 30 km in a flat rural setting. It can be practical in such a setting to receive a signal with a small outdoor antenna, depending on the signal strength within any particular location in the covered area. Non line-of-sight (NLOS) coverage is available within a radius of 3 km. Where the signal is strong and line-of-sight (LOS) is not required between the base station and the customer, it is possible to use an indoor antenna, which is part of a single, integrated indoor unit called customer premises equipment or CPE. This unit consists of the antenna, a transceiver, and a modem. The subscriber installs the CPE by simply plugging it into a power source and a terminal which can be a residential VoIP telephone, a computer or a public payphone (Figure VII.2). A system like the one illustrated in Figure VII.1 costs less than US$50,000. That includes a base station and remote network management and control function. The CPE itself costs in the order of US$200 to 250. The backhaul capacity required depends on the number of customers, the traffic type (continuous such as in business uses or intermittent such as in residential uses). For a village with 50 customers, a 128 Kbps link may be enough; however, for more intense use up to a 2 Mbps (E1) link may be needed.

NextNet, a USA based supplier of pre-WiMAX systems, has supplied equipment for a local network in Técpan (population of 45,000), Department of Chimaltenango, Guatemala[83]. Unitel/Metrovia, a micro-teleco, is instaling and will be operating the network under a franchise arrangement. The Técpan pilot system, which has a single base station providing line of sight (LOS) coverage of up to 30 km., is designed to give priority to VoIP communications and handle up to 600 simultaneous calls. The OmniGlobe model which is discussed in greater detail below also uses this type of network configuration.

[82] Other such pre-WiMAX and WiMAX systems operate in the 3.5 and 5.8 GHz bands.

[83] The main industries in Técpan, located 100 km from the capital, Guatemala City, are textile and tourism. Inter alia, the network will support these industries.

Figure VII.1: Broadband Wireless Access (BWA) with satellite transport

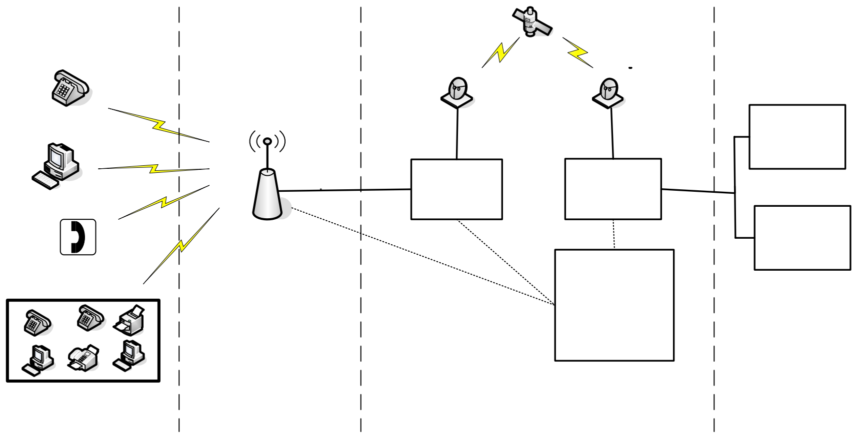


Figure VII.2: Pre WiMAX: Indoor Customer Premises Equipment (CPE) containing an antenna, transceiver and modem.

Source: NextNet

The QINIQ network (http://www.qiniq.com/) uses this type of configuration to provide broadband connectivity to 29,000 people living in 25 remote communities in the territory of Nunavut in Northern Canada. This network covers 5.2 million square kilometers. It was built under an initiative of the Nunavut Broadband Development Corporation (NBDC), a not-for-profit corporation which represents the public. NBDC received some start-up funding from the Canadian Government's Broadband for Rural and Northern Development (BRAND) program, and in kind contributions from various local Nunavut organizations. QINIQ consists of local BWA networks operating in the licensed 2.5 GHz band in each community connected via a satellite-based transport network operating in the C band. It has the following features:

- A full mesh satellite network, enabling any site to talk to any other site on a single satellite hop. This is particularly important for video conferencing.

- Support for dynamic bandwidth allocation, allowing satellite bandwidth to be effectively shared between all communities, based on demand. The QINIQ network re-allocates bandwidth on a second by second basis, to ensure that communities who need the bandwidth, get it when they need it.
- Several technologies to enhance the performance of the overall network, including TCP/IP acceleration and transparent caching.

Because of the low angle to the satellite larger VSAT dishes are needed than in locations closer to the equator.

The network was built in one year. It was completed by April 1, 2005, as required to receive a Canadian government subsidy for about one-third of the construction cost. Meeting this deadline posed a number of challenges, due to the harshness of the winter climate and the fact that none of the communities are accessible by road or rail. Everything, from people to fuel to food, must be brought in by plane or sealift.

Figure VII.3: QINIQ Network: 4.5 m. VSAT Antenna at Arviat, Nunavut, Canada

Figure VII.4: QINIQ Network: 4.5 m. VSAT, Base Station Antenna Tower and shelter at Chesterfield, Nunavut, Canada

Another access solution is the deployment of a cluster of WiFi hotspots covering a whole area of a community. Each hotspot can provide coverage within a radius of a few hundred meters of a WiFi base station. Maple Leaf Networks (www.mleaf.net) has built a network in and around the town of Harmony, Minnesota covering an area of nearly 200 km^2, using 12 WiFi Meshboxes supplied by LocustWorld (www.locustworld.com). The meshboxes are situated on top of silos and water towers in this rural region. According to Maple Leaf, the capital cost of the whole network was less than US$20,000. Maple Leaf offers a 1 Mbps down/256 Mbps up service for US$30/month. An indoor LOS CPE costs US$125; an external unit costs US$175.

In Bolivia, the small agricultural community of Sopachuy in the department of Chuquisaca, has been connected using a simple and very inexpensive WiFi mesh network consisting of three base stations (meshboxes). Each of these base stations costs about US$500. The network provides coverage to at least half the 1,500 inhabitants. Each WiFi transceiver/router has an individual IP address by which it can be controlled and managed by a local operator, or centrally by the supplier at a location in the UK or the US. The system supports data, soft (computer based SIP) telephony and VoIP.

FUNEDESIN, the Foundation for Integrated Education and Development (www.funedesin.org), has deployed a wireless mesh network at Yachana in the Amazonian region of Ecuador.Yachana is 2.5 hours by motorized canoe from the small city of Coca. The network was supplied by LocustWorld. It connects the Yachana Technical High School, the Yachana Lodge Ecotourism Center (http://www.yachana.com/), the Yachana Reserve Biological Field Station, and the

Mondaña Medical Clinic[84] (Box VII.1). The different sites are between 1.5 km and 5 km. apart. The mesh is connected to the outside world via a VSAT link. All power for the meshboxes and laptops is provided using solar panels. VoIP is used to provide voice services within the network and to link users to the worldwide public telephone network through Skype. This provides very good service with the outside world, even though some delays between words and dialogue are perceivable because of the satellite link.

Used in a point-to-point mode WiFi can also be used as a backhaul transmission link with line-of-sight ranges that can easily reach up to 20 km. The area it can cover depends on antenna gain and the power which can be applied to the radio, which can be higher in rural areas than that which might be permitted in urban areas for the 2.4 MHz unlicensed band[85]. An agricultural community information system located in the Chancay–Huaral Valley, north of Lima, Peru, uses a network of 12 WiFi backbone links - the longest of which is 20 km - operating in the 2.4 MHz frequency band to cover the whole 22,000 hectare (220 km^2) valley (Figure VII.5). The system is capable of providing a throughput of 1 Mbps. The installed cost for the tower, antenna, and radio equipment at each site was between US$1,200 and US$1,500.

Figure VII.5: Tower and Yagi Directional Antenna of the Chancay–Huaral WiFi backbone network, at the farmers' cooperative in La Huaca, Peru

[84] FUNEDESIN owns 4,380 acres of rainforest, that is protecting biodiversity and the culture of the indigenous peoples of the Amazon rainforest. FUNEDESIN was able to purchase this land through donations from Rainforest Concern. The aim of FUNEDESIN is to be self-sustaining through eco-tourism and establishment of micro enterprises. It has been recognized for its world-class pioneering work in these areas. Yachana Lodge was awarded the "Conde Naste Ecotourism Award" in 2004, and was a finalist in the World Travel and Tourism Council award in 2005. FUNEDESIN was a finalist for the Alcan Prize for Sustainability Award in 2004.

[85] The world record for a terrestrial- based unamplified WiFi point-to-point connection, achieved by a couple of students in 2005, is 124.9 miles (201 km). See Wired News, August 2, 2005

Box VII.1: Connecting FUNEDESIN's Yachana Sustainable Development Center in the Amazon Region of Ecuador

The integrated center located at the Yachana facilities in Ecuador, consists of a technical high school, an ecotourism lodge, a medical clinic and a bio science center. All of them benefit from being connected among each other with a newly established WiFi mesh network, and with the outside world via a VSAT link.

The school was established in 2005 to provide vocational training to very poor students from four provinces and five ethnic groups in the Amazon. It operates year-round, with two groups of students alternating for 28 days each as boarders. This schedule gives them time to work at home and help in their local communities. The school specializes in ecotourism, sustainable development, conservation, agronomy, animal husbandry and micro-enterprise development. It offers a degree in Ecotourism and Sustainable Development[86]. FUNEDESIN relies partly on donations to help cover the difference between the token $40 per annum the students pay and the actual cost. Being online provides a significant educational benefit for the students and teachers in every subject.

The medical clinic was built by FUNEDESIN in 1997. Ecuadorian medical residents, who are doing their annual year of rural service, can now have live tele-medicine consultation from this remote clinic with experts at the Metropolitano Hospital in Quito, or anywhere in the world on line. The clinic provides excellent, low-cost medical and dental care to over 10,000 residents, many of whom are indigenous.

The Bio Science Field Station is run by Global Vision International. Recently, the station was able via the internet to quickly inform the world of the discovery of a new species of frog found on the reserve.

Profits from operating Yachana Lodge (http://www.yachana.com/), which has 40 beds and receives 2,000 visitors annually, are used to partially fund the school. Guests have access to high speed Internet connections while they are enjoying the remote Amazonian jungle experience. The lodge has generated more than US$4.3 million over the past ten years, which has been reinvested in the foundation's efforts in conservation, poverty reduction, healthcare, and community development projects.

Until recently, all administrative, booking, accounting and other functions were carried out by FUNEDESIN and Yachana in the capital, Quito. With the newly established mesh network and connection to the Internet, these functions have been moved to the "field" at Yachana, saving money, time and travel costs.

The Yachana site also serves as a training center where FUNEDESIN can teach others how to establish similar centers in remote but needy areas throughout the world.

[86] Secondary education in Ecuador is provided free by the state, but the quality in rural areas is generally poor and the emphasis is more on theory than on practical skills.

c. Access using the 450 Mhz frequency band

There has been growing interest in using the 450 MHz band, and more specifically, CDMA 450 technology, for rural, suburban and sparsely populated areas for both mobile and fixed applications. The reasons for this are as follows: (i) the relatively large cell sizes decrease costs because fewer base stations are required to cover a given area; (ii) the commonality of design and commercially available standard ensures that both the terminal and network equipment are produced in large quantities, which results in lower prices; and (iii) it is a broadband system that can simultaneously transmit high speed data, voice and VoIP. In-building coverage is also good in this frequency band.

Televías Huarochiri is a small new privately initiated and operated regional telecommunications company in Huarochiri Province, Peru. It has deployed a CDMA 450 network to provide fixed access to an entire province in the Andes Mountains, using only four base stations. Huarochiri Province is 5,700 sq km. It has 60,000 inhabitants and mountain peaks of up to 5000 m. The distance between a base station and a remote subscriber is typically 20 to 30 km. This makes it necessary to boost the signal in non-line-of-sight situations, using low powered repeaters. But the advantage is that only small roof-mounted antennas need to be installed on the subscriber's premises. Telephone and Internet capable customer premises equipment (CPE), including the roof-mounted antenna, wiring and telephone, costs about US$160. The cost per base station is US$25,000. Televías Huarochiri plans to offer services through this network to about 1000 fixed telephone and 200 Internet subscribers, and about 150 public payphones. It has also deployed a CDMA 2000 1x network, with which it will serve up to 1000 mobile customers.

VII.2.3 Applications in rural and underserved areas

The evolving wireline and wireless transmission technologies offer various options for providing effective access to rural, remote and underserved areas. The particular option chosen will depend on the nature of the community, the services that are to be provided, and the way users will be accessing these services. Even in poor rural areas, networks and technologies can be designed to bring service to individuals when there is a significant demand and willingness. They can offer fixed telephones in the home, a cellular mobile connection or some sort of limited mobility residential access depending on the technology used. Alternatively, they can be designed to bring service to a collectivity where the level of demand and the customer/investment ratio does not justify offering service to individuals or households.

Applications depend on the types of communities and users that are being served. The three basic types of communities to be considered are as follows:

- Communities on the periphery of metropolitan areas, where there are large concentrations of low-income residents who do not have access, even though there are networks close by.

- Stand-alone communities, which are somewhat further from existing backbone networks but which could be reached through terrestrial (wireline or wireless) links to these backbones. The type of link selected is determined by the distance from the community to the existing network. Depending on the size of the community, local access can be provided using a variety of BWA, pre-WiMAX, WiFi hotspots and cellular mobile technologies. Older and more mature technologies such as copper local loops and MMDS can also be used.

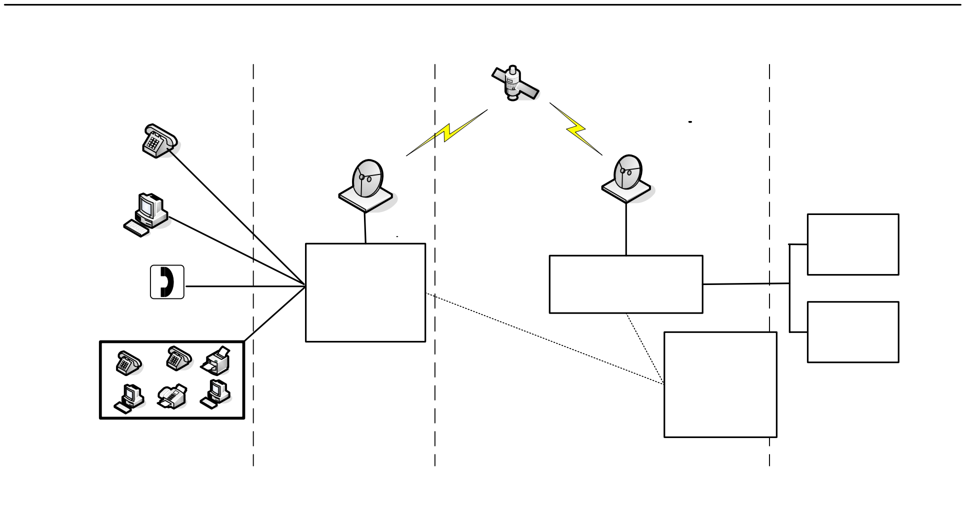
- Isolated communities, such as ones in the Amazon regions of Brazil, Peru and Colombia, or in the Andes Mountains of Peru, Bolivia and Chile. These communities can usually only be reached via a satellite link. Local access can be provided directly via satellite (Figure VII.6), which is the case for the many narrowband public payphones that have been installed in Peru, Colombia, Chile, Guatemala and elsewhere. Alternatively, it may be possible to provide access via the same kind of BWA/WiFi, line-of-sight MMDS and LMDS, and fixed and mobile solutions that are used in stand-alone communities.

Distance from the existing network is normally not an issue for communities on the periphery of metropolitan areas. Therefore, the capacity and coverage of existing second and third generation cellular mobile systems can simply be expanded to serve these areas, especially if the regulatory framework is conducive to investment.

Where there is already coverage, an operator can offer restricted mobile telephone services or home-zoning. This service option uses existing mobile infrastructure to expand connectivity to low income populations, by offering them lower connection and user fees than for regular mobile. The implementation of this solution, however, may not necessarily be inexpensive. In order to distinguish these from regular mobile services, ANATEL defined a limited range of use for fixed telephone customers. This is the range of the cell in which the customer is located and is referred to as the customer's service or home area. Vesper, an early new entrant in the Brazilian telecommunication market, is currently offering home-zoning to over 300,000 customers in 24 states, including Sao Paulo[87]. In the State of Ceara in Northern Brazil, a small new entrant, Ruralfone, is offering a simple, economical, community-oriented telephone service using a single cell site to cover an entire town using off-the-shelf GSM equipment manufactured in Brazil. Ruralfone's business model will allow it to offer access at much more affordable rates than its competitors, and thereby help close the market gap in this state of 7.42 million people. In Ecuador, cellular operators have installed fixed radio-based payphones linked to their wireless networks in response to contractual service obligations.

[87] It is understood that after the acquisition of Embratel, Vesper is not focusing household but on businesses, even though it does continue to provide residential services.

Figure VII.6: VSAT access/transport



VII.2.4 Deployment of broadband

With hundreds of thousands of citizens in large sections of Latin America not yet connected to basic voice telephone services, it might seem that it would be premature to promote universal access to broadband networks and services in most of the region. However, technological and market trends suggest that there may be a strong new opportunity to leap ahead toward wider scale broadband deployment, on a cost-effective basis, even in rural areas. The latest market research suggests that demand for broadband connections is growing rapidly in the region's major markets. The number of broadband connected households in Argentina, Brazil, and Mexico more than doubled from 2003 to 2004, leading to average penetration levels of more than 4%, which represents about 3 million broadband users.[88] Chile leads the region with over 11% broadband penetration (Box VII.2).

[88] eMarketer, "Latin America Broadband", www.eMarketer.com, June 2005.

Box VII.2: Broadband in Chile

The Korean success story with deployment of broadband telecommunications access has become widely known. Through aggressive public policies and private initiatives, up to 78% of the Korean population is now served by broadband. This has helped facilitate rapid growth in the Information economy sectors in that country. In Latin America, Chile may be the country that is closest to emulating that model.

Chile already leads the region in broadband deployment, with penetration estimated at over 11% in 2004, and strong continuing growth. Meanwhile, Chile is actively pursuing rural broadband development objectives as well. A demonstration project in the town of Cora Cora is combining WiFi access to some 7,000 inhabitants, as well as government and business offices. The regulator, Subtel, together with the World Bank, completed a study[89] in 2003 which recommends a phased rollout of WiFi-based access to 1,000 rural communities over 10 years. This would be financed by the Fondo de Desarollo de Telecomunicaciones (FDT), the Chilean Universal Access Fund. The study estimated that such investments could yield a positive net return after about 6.5 years. The FDT is now actively looking into implementing this plan.

Broadband customers are largely higher-income and tend to be concentrated in urban markets. However, the advent of newer wireline and wireless broadband technologies and standards such as WiFi, WiMAX, other BWA technologies and rapidly decreasing costs are creating conditions in which much more extensive broadband rollouts can be contemplated.

Table VII.2 summarizes the deployment of fixed (ADSL, Dedicated, ISDN), cable modem, and direct wireless access for providing broadband Internet (local) access in the Regulatel countries.

[89] Fritis, Kester, "Bringing Broadband Internet to Chile's Rural Areas", World Bank/Subtel, May 2003.

Table VII.2: Deployment of fixed, cable modem and direct wireless access technologies to provide broadband Internet access in the Regulatel member countries
(Number of operators and service providers, where available)

Country	Copper, fiber, coax, satellite (in brackets = no. of operators)	Cable Modem	Direct wireless access (technology)
Argentina	ADSL (44) Satellite (11) Otras (VDSL, LRE, etc) (10)	✓	LMDS WiFi
Bolivia	?	?	?
Brazil	ADSL (5)	5	?
Chile	ADSL Dedicated	✓	?
Colombia	ADSL Dedicated	✓	?
Costa Rica	ADSL (1) Dedicated (1)	1	1
Cuba	Dedicated (2)		?
Ecuador	Dedicated (3) ADSL (1)	1	12
El Salvador	ADSL (6) Dedicated (10)	?	?
Guatemala	?	?	?
Honduras	?	?	?
Mexico	ADSL ISDN	?	?
Nicaragua	ADSL (1)	5	10
Panama	ADSL	✓	?
Paraguay	?	✓	MMDS
Peru	ADSL (1) Dedicated (4)	2	MMDS
Republica Dominicana	ADSL (2), Fiber (2), Coax (2), Satellite (1)	Two cable TV operators, Tricom S.A. and Aster offer high speed Internet access via cable modem.	FWS (1)
Uruguay	ADSL (1)	No	LMDS (4)
Venezuela	Dedicated (2)	?	?

Source: Regulatel

The economics of wireless broadband deployment illustrate the potential scenarios for leveraging these technologies for broad public access[90]. Assuming reasonably low construction barriers due to terrain, the incremental cost to install a wireless broadband facility – specifically

[90] Telecommunications operators in developed markets of North America and Europe are refocusing their business strategies towards broadband Internet access and mobile services to offset declines in traditional local and long distance telephone services where they are subject to growing competition from VoIP services offered by cable TV companies and new entrants such as Skype and Vonage. See "Qwest profits rise in wake of cost-cutting", Financial Times, May 4, 2006.

in conjunction with existing or planned backbone network transport infrastructure - can be quite affordable. Such an investment can provide high-speed data connectivity generally within a radius of 20 to 30 km. In many cases, this cost may be substantially lower than installing a narrowband wireline access connection, and will provide better coverage and higher quality service. The wireless access scenario can be deployed very quickly. It can connect public telecenters, schools, local administrative offices, and individuals and small businesses, all at the same time, for only the cost of customer premise equipment at each site.

In Brazil, there are more than 200 Internet Service Providers (ISPs), scattered throughout the country, jointly working under the Global Info Brand[91]. These ISPs are providing broadband Internet access using WiFi in a very cost-effective way, to deliver service to small municipalities which are not otherwise offered such broadband services by either the telecommunications companies or CATV operators. In many cases, the initiative of these small ISPs induced the telecommunications operators to install competing ADSL networks

Based on these successful experiences, some municipalities have developed local networks to provide low-cost or free Internet access based on WiFi technology. Two examples are Piraí in the State of Rio de Janeiro and Sud Mennucci, a small town of less than 10,000 inhabitants, in the State of Sao Paolo. In Sud Mennuci, there are over 600 public and private points connected to the network all with at least a 64 Kbps and sometimes a 128 Kbps connection. Public access is offered in four locations: there are two IT laboratories in local schools, and one IT lab each in a state school and the local library. The network was built by the municipality with the full support of local politicians.

Some of the objectives were as follows: (i) to promote democracy and civic participation in the running of the local government; (ii) to make city services and information more accessible to the population; (iii) to hold public servants - especially budget directors - accountable for their numbers; (iv) to introduce greater transparency in the public administration as a way to fight against corruption; and (v) to ensure that the town remains attractive to young people[92].

A WiMAX variant is the OmniGlobe model which offers an easy way for small entrepreneurs in rural and remote areas to establish a small-scale local telecommunications operation. The Pirai, Sopachuy and OmniGlobe projects and models are discussed at the end of this chapter, and presented in greater detail in Annex 3.

VII.2.5 Conclusions

Several new technologies and network configurations offer very promising possibilities for providing access in rural, remote and unserved areas in Latin America. Among these are fixed and mobile wireless technologies, including WiFi, BWA, pre-WiMAX and WiMAX, as well as those evolving from the more mature GSM and CDMA mobile systems, such as CDMA operating in the 450 MHz band. Even though these are more expensive than terrestrial based wireless systems satellites, especially SCPC DAMA[93], they often offer the only possibility for access in very remote areas. At the same time, copper local loops, fiber optic cable systems, hybrid fiber cable and power line communication technologies (PLC) for both transport and access are evolving rapidly.

[91] See http://www.globalinfo.com.br/

[92] http://www.sudmennucci.sp.gov.br/wifi/index.php.

[93] Single Channel per Carrier Demand Assigned Multiple Access.

VII.2.6 Recommendations: transmission technologies for local access

The following steps are recommended with respect to transmission technologies for local access:

- *Policy-makers and universal access fund administrators should support:*
  - *The deployment of and experimentation with local access networks using new wireless and wireline technologies, including WiFi, WiMAX, SCPC DAMA and PLC.*
  - *The use of second and third generation mobile technologies, including those operating in the 450 MHz band, as a fast and cost-effective means to deliver not only voice telephone, but also broadband service, in rural areas[94].*
  - *The deployment of new broadband technologies, at least on a trial basis. As the field evolves, a rapid shift in focus away from traditional narrowband and voice-only projects, toward full-service, high-capacity deployments, might well be warranted.*

VII.3 Financing Innovations

VII.3.1 Introduction

There are numerous opportunities for policy-makers, universal access fund administrators, and regulators to support the initiatives of potential investors and entrepreneurs, who seek financial resources to support new investments in telecommunications projects. These can include indirect enabling and cooperation with financial institutions dedicated to underwriting ICT projects, and micro-financing of small-scale projects, through co-financing, risk mitigation, loan guarantees, and other mechanisms. The governments' own activities as a user of telecommunications can lead to direct financing of major components of new networks and services, which can help expand the market and reduce risk.

In Chapter VI, we recommended a potential new financing mechanism for use with universal access funds, involving venture capital oriented initiatives. In this section we highlight two other promising new financing instruments that are also particularly well-suited to smaller, entrepreneur-driven projects. One of these other financing schemes is micro-credit, which has been successfully applied to telecommunications development in certain parts of the world. The other is a newer credit scheme called Enablis, which is filling a gap between extremely small micro-credit loans and venture capital. Enablis, was developed specifically for small and medium-sized projects in the ICT sector. The initial Enablis fund was established very recently in Africa, where it has been successfully funding a number of projects. More traditional financing and credit support methods include: foreign donors and lenders; loan guarantees; vendor financing; and a number of public-private partnership arrangements including project finance, build operate transfer, and export bank and credit agency financing. These are summarized in Annex 6.

A typical project will often use a combination of several these financing methods.

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[94] There might be less need to subsidize cellular network rollouts, where overall returns to these investments make rural deployments profitable. Conditions of the licenses should focus principally on ensuring that network coverage leads to practical public access wherever possible.

VII.3.2 Micro-credit

Micro-credit has been an important tool in rural development for years, especially in agribusiness, but increasingly in many other sectors. Micro-financing strategies target small, medium, and micro-enterprises (SMMEs), understanding that they have an important role to play in the reduction of poverty and the creation of sustainable employment. They are often in a much better position than larger enterprises to provide the goods and services that the local population wants.

Within traditional financial systems, commercial banks are often reluctant to lend to SMMEs, because SMMEs have low aggregate returns, high risks, and high transaction costs. The flexibility and responsiveness of SMMEs in the face of rapidly changing demand and supply conditions can be an advantage in the telecommunications and ICT sector, especially in rural and underserved communities. But potential entrepreneurs often face challenges in terms of up-front financing, even when the amount is a few thousand dollars or less.

Both government and multilateral development institutions have an important role to play in reducing these costs and ensuring the efficiency and the competitiveness of SMMEs in the ICT sector, through the support of the emerging class of micro-financing institutions that serve rural and low income populations.

A good example in Latin America of an organization that facilitates micro-credit is the Latin American Challenge Investment Fund (LA-CIF), which partners with a variety of international lenders such as the IADB, Finland-based Finnfund, Norwegian Norfund, and Canada's Groupe Desjardins.[95] LA-CIF provides short-term loans to local financial institutions that offer micro-credit in six Latin American countries, principally Peru and Nicaragua. In 2003, it had a portfolio of some US$20 million, typically supporting micro loans of US$1,200 or less. This type of support can be especially helpful to the establishment of small ICT business operations, such as telecenters, cyber cafés, consulting, technical and administrative support services, and individual cellular resale. In Bangladesh, the famous Grameen Phone rural cellular network was financed through a complex relationship of private and public mechanisms and resources, but spearheaded by Grameen Bank, which has become a centerpiece of micro-credit and development policy in that country and elsewhere. The Chalequeros system in Bolivia is similar to Grameen, and could also benefit from such micro-credit, either through banks or directly from vendors or universal access funds.

A key aspect of micro-credit closely related to the development and utilization of telecommunications networks in Latin America is the growing emergence of credit bureaus. Financial institutions must typically have some means of certifying and validating credit applicants, even micro-credit recipients. With the support of ICT networks and databases, an increasing number of smaller, locally-based credit bureaus are springing up throughout Latin America[96]. Another key aspect of micro-credit is the role of expatriate remittances. These payments from overseas emigrants and workers have long been a critical component of the financial opportunities for low income and rural residents. Now, telecommunications and information technologies are making it more convenient and less costly for expatriates to

[95] http://www.finnfund.fi/ajankohtaista/arkisto03/en_GB/lacif/

[96] See "Credit Bureaus in Latin America: Expanding Financial and Other Services to the Base of the Pyramid", by Robin Young, Senior Development Specialist, Development Alternatives Inc. (http://www.uncdf.org/english/microfinance/newsletter/pages/2005_05/news_cbureaus.php).

transmit small amounts of funds to their families back home. The increasing availability and interconnectivity of networks, local banks and post offices, and the consequent emergence of growing numbers of creative technical solutions to encourage remittances, is the focus of a wide range of research and initiatives[97].

When developing models for expanding telecommunications services to underserved areas, it is well worth considering the business models of micro-finance, given the significant expansion of this kind of financing instrument over the last couple of decades. Micro-finance, like universal access and universal service policies, is meant to deal with access problems. Micro-finance institutions (MFIs) have been fairly successful in surmounting these problems. All three of these business models have the same target populations, namely, underserved areas without access. The difference is that, with a couple of specific exceptions, MFI operations are still largely concentrated in urban areas. Notable exceptions are the Grameen Bank in Bangladesh and Compartamos in Mexico, where there have been substantial expansions into rural areas. One important way to cope with the high operational costs of micro-finance business models is to become highly IT intensive. Development of micro-finance business models begins with community-based or group-based common guarantee groups, and from there goes to individual financing. The design of sustainable universal access/service business models should take this into account, when dealing with financing issues. Micro-finance has been much more prominent in Latin America than venture capital, which has yet to prove its sustainability. While MFI-oriented guarantee funds are already very successful and sustainable, universal access and universal service funds might also be used to at least partly guarantee funds for micro-finance operations related to universal access/service projects and clients. This could complement the three suggested options and approaches for addressing the difficulties in the disbursement of these funds as discussed in Section VI.3.

Another important synergy between universal access/service funds and micro-finance, is the potential use of transfers already managed by MFIs, which are usually very low-margin operations. MFIs need to develop financial by-products to transform transfer flows into high-margin operations. Part of these operations should be related to universal access/service projects, either through financing local entrepreneurs who may use transfer flows as collateral, or as part of a portfolio of services that may be delivered through telecenters.

VII.3.3 Enablis: Filling the gap between micro-credit and venture capital

For most universal access projects, and especially ones which involve some network build-out, micro-finance funding levels are not high enough. For example, the Chancay-Huaral and Valtron projects, which are presented later in this chapter, cost about US$200,000 and US$1,000,000, respectively. Their funding requirements are significantly beyond the capacities of a micro-finance organization such as the Latin American Challenge Investment Fund, but well below hose which interest most venture capitalists. Enablis Entrepreneurial Network (www.enablis.org) is a recently established innovative funding mechanism tailored to fill this financing gap. It was expressly created for entrepreneurs who are unable to find risk capital between the micro-credit and venture capital thresholds. Its purpose is to support entrepreneurs who adopt ICT as a significant enabler for economic and social development in the developing world. Enablis was founded in South Africa in 2003, as a not-for-profit, membership-based, cooperative organization. It was established with the support of international and domestic private sector

97 See "Remittances, the Rural Sector, and Policy Options in Latin America", by Manuel Orozco, The Inter-American Dialogue, June 1, 2003, (http://www.migrationinformation.org/Feature/display.cfm?ID=128).

companies and funds and the Canadian Government's Fund for Africa. The underlying principle for Enablis project financing is that in successful community-based micro-finance institutions, closeness to the borrower ensures loan repayment. The membership relationship that Enablis fosters, together with the capacity-building services it offers, results in reduced risks. The Enablis model is built on a concept of regional chapters that all have the same cooperative vision, governance approach, and operating methods, but are also flexible enough to adjust to regional conditions.

Enablis' financing arm, Enablis Financial Corporation, created the R50-Million (US$6 million-US$7 million) Enablis Khula Loan Fund. This fund offers a 90% bank guarantee above US$20,000, to provide entrepreneurs with necessary start-up and early-stage financing at favorable commercial rates. Enablis is also in the process of raising an R$50 Million Equity Fund in South Africa, to provide a second financing alternative.

What makes the organization unique is that in addition to financially supporting small entrepreneurial-focused ICT projects, Enablis provides a broader range of support to the entrepreneurs. Enablis provides them with the networking, learning, mentoring and coaching that they need to make their ventures succeed. Enablis members have access to a number of on-going support services, including an e-coaching program, an e-advantage seminar program, an e-circle peer-to-peer support program, and an e-finance risk capital program. Members and stakeholders have exclusive access to Enablis' Global Enablis Network and Information for Entrepreneurs (GENIE) portal, which includes business linkages, peer-to-peer forums, virtual mentoring and strategic information. All Enablis chapters are networked through GENIE.

Enablis' private sector founding partners, Accenture, Hewlett-Packard and Telesystem, are providing significant pro-bono services and equipment, and have been instrumental in securing funding of more than US$21 million, primarily for the first regional operation in Southern Africa.

In 2004, Enablis South Africa became the first regional chapter with offices located in Cape Town and Johannesburg. It has over 100 members, of which close to 30% are women. It has 10 full-time employees. In addition, there are 26 business coaches and four area specialists who provide support services on an outsourced basis.

The plan over the next five years is to expand the reach of Enablis South Africa, first to 10 other African countries, and then to other continents. To achieve this objective, Enablis has created the US$100 million Enablis Global Development Trust to raise the core expansion funding. Enablis will match the contributions to this trust dollar for dollar, through a mix of international private sector donors, local partners and social investors who together have pledged to contribute more than US$80 million. Founding partner Accenture is currently preparing a screening model for country selection based on a set of ICT readiness criteria developed by Enablis.

The expectation is that donor funding will only be required for an initial three to five year period, after which each Enablis chapter will reach maturity at between 200 to 300 members, with both a loan guarantee fund and an equity fund to sustain local operations and programming. This will be achieved through a mix of membership dues, fund management fees, a share in profits of the funds and local grants. In this way, contributions to the trust are initially leveraged 100% through the matching contributions, and maximized on an ongoing basis through Enablis' financial engineering. Enablis' 10 step operating model is shown in Box VII.3.

Box VII.3: Enablis' 10 step operating model
Step 1: Establish Enablis operations in selected developing country **Step 2:** Identify people with entrepreneurial abilities within that country and recommend that they pursue the accreditation process. **Step 3:** Undertake accreditation process to assess candidates' entrepreneurial capacity, integrity and willingness to use ICTs to enable growth of their project or active enterprise. **Step 4:** Obtain signatures of new members to the Enablis Code of Conduct, and associate each with an Entrepreneur Development Associate (EDA). **Step 5:** Determine unique support and services required for each Enablis entrepreneur through interactive dialogue between the EDA and the member. **Step 6:** Introduce the Enablis entrepreneur, with the help of the EDA, to a specific E-Circle and conduct the necessary training to allow the member to be an active contributor to this group. **Step 7:** Acquaint the entrepreneur, with the help of the EDA with the GENIE portal. **Step 8:** Track the entrepreneur's project or active enterprise and, when required, have the EDA present the project to an Enablis financing manager for consideration. **Step 9:** Elevate selected financing applications to the Enablis Investment Committee; submit recommendations for improvement to the EDA and the entrepreneur of rejected applications. **Step 10:** Upon approval of an investment, the EDA and the entrepreneur will take the necessary steps to meet the investment conditions. *Note: On an ongoing basis, the Enablis entrepreneur will continue to participate in the various members' activities and the E-Circles, and have access to all the different services and support offered by Enablis. The EDA is the entrepreneur's main point of contact to manage these interactions.*

VII.3.4 Recommendations: Financing innovations

a. Role of policy-makers and fund administrators

- *Develop and incorporate a venture-oriented financing mechanism into their universal access funds, as described in Chapters VI and VII. Under this mechanism, the funds can be used for making loans, taking equity participation in projects or implementing telecommunications companies, offering grants or a combination of the above.*
- *Familiarize themselves with the various potential sources of financing. Help small entrepreneurs establish contacts with these various sources, and as much as possible, support rural operators in their efforts to obtain bank guarantees and financing.*

b. Role of Regulatel

- *Determine the feasibility of creating public access facilities which piggyback on private commercial networks, such as those of banks or transport companies. Develop a model for Regulatel countries that accounts for the following factors: (i) the types of non-core ICT services that could be provided by the aforementioned private networks, and the extra costs and resources which would be required to establish and operate these non-core services; (ii) any regulatory and administrative impediments to such arrangements, as well as typical prices that would be charged to the public for these non-core services; (iii) what, if any, subsidies might be required; and (iv) what other national industries might be suitable for this model.*
- *Regulatel should establish contact with the Enablis Entrepreneurial Network to explore ways of establishing this financing initiative in Latin America.*

VII.4 Innovative business and commercial practices

VII.4.1 Introduction

Many universal access projects in Latin America provide good examples of business, commercial, service-offering and partnership innovations that can serve as examples in other parts of the world.

VII.4.2 Business practices, commercial and service delivery innovations

Often the cost of operating commercial and non-commercial telecenters is offset by non-core commercial activities. These include broadband Internet services, voice mailboxes where people can come to check their messages for a small fee, and non-telecommunications services such as post office services, photocopying, faxing, typing, the sale of local advertising and announcements on community radio stations. This is the case in the LINCOS projects in the Dominican Republic and Costa Rica.

The Hungarian Teleház (Telehouse) concept offers a very good example of commercial and business model innovations and best practices in this area. While not all services are provided on a commercial basis, many that are have been an important factor in ensuring the commercial success and viability of these telecenters.

The Teleház have emerged as a valuable resource for small and medium sized local businesses and entrepreneurs in rural Hungary (Box VII.4). For enterprises that may not be able to afford their own private ICT facilities and related services, the Teleház can serve as a full-service business communications resource. These enterprises, and anyone else, can obtain a wide range of support services to help establish, operate, or support their business ventures. These services include the following:

- technical and industry research materials and resources
- temporary office and conference space
- use of computer, telephone, fax, photocopy, and printing facilities
- Web site development

- advertising services
- translation services
- job listings
- technical consulting support
- clerical services

Box VII.4: Commercial and service delivery innovations at the Hungarian Teleház

In addition to such basic telephone and Internet access services as E-mail, web browsing, and chat rooms, most Teleház offer printed publications – books, encyclopedias, catalogues, newspapers, magazines, etc. – and computer, word processing, and database access. Many also serve as local publishing centers, producing area newspapers, telephone directories, brochures and booklets, and advertisements. There are also a growing number of Teleház that offer multimedia services, including video conferencing, local radio broadcasting, and cable TV production.

Like the Joven Club de Computación y Electrónica in Cuba, the Teleház have taken a strong lead in providing technology training and education within their communities. They offer many levels of classes in the use of computers and the Internet, business management, and other subjects. These classes are available for both school age students and adults. They are frequently provided in coordination with local schools. Teleház services even include access to computer and video games, which can attract local youths to spend time at the centers.

In addition, Teleház provide public service information from local and national government sources. These features range from traditional bulletin-board notices, to reference information on local groups and activities, calendars of community events, tourist brochures and referrals. They also include more complex assistance with Government administrative procedures and documents, such as land registration, tax matters, and numerous other services. These types of activities reflect the priority objectives of some of the strongest institutional backers of the Teleház movement, which has taken a lead in promoting democracy and political participation in Hungary over the past decade.

Finally, as community service centers, the Teleház provide a number of basic conveniences to the public that broaden their appeal and reputation. These include public reading rooms, coffee and tea service, group meeting spaces, carpool and local transport, and even blood pressure measurement. They also offer childcare service and other children's programs, an important feature to encourage women to participate actively in the centers.

Individual Teleház are members of the Teleház Association (Magyar Teleház Szövetség), which provides information via its web site (http://www.telehaz.hu), holds conferences, and generally supports and promotes the interests of its members.

Another interesting business model is that of the chalequeros in La Paz, Bolivia. Chalequeros resell mobile telephone services from a single handset that they carry around with them[98].

[98] The chalequeros got their name because of the colorful vests they wear, which make them easy to identify. Initially they appeared at events that drew large crowds such as soccer games and concerts; over time they spread to other areas, but always those where there is a large confluence of people.

Chalequeros charge a unique tariff of Bs1.00/minute (US$0.125/minute), irrespective of the time of day or how many chalequeros happen to be at a given location. For a daytime call this is cheaper than most regular cell phone subscribers would pay Bs1.68/minute (US$0.21)[99]. Many people who have cellular subscriptions might be tempted to use a nearby chalequero instead of their own telephones.

Chalequeros generally have post-paid contracts with one of the three mobile operators in Bolivia: Telecel, Viva or Entel Móvil. The rates are Bs0.68/minute (US$0.085/minute). Entel charges by 15 second intervals; Viva and Telecel charge by 30 second intervals. This is not a very profitable service for the mobile operators, because 90% of the calls are outgoing, which means that these operators have to pay interconnection charges. It is obviously in the interest of the Chalequeros if the call is less than the minimum payment interval[100].

In Bogotá, Colombia, one can also find individuals reselling their mobile services in the streets and public places. They usually subscribe to plans with advantageous bulk rate minutes, which they are able to resell for as low as 250-pesos/minute (US$0.10/minute), less than most mobile subscribers pay for their own service. The resellers usually resell domestic long distance calls for more than local calls, even though under Colombian mobile operators' tariffs there is a unique rate for both types of mobile calls.

Another area of innovative practices involves the changing role of radio broadcasting. Radio has been a fixture of local communications services throughout Latin America for decades. Today, entrepreneurs and social activists have been finding new uses and new ways, to integrate radio with advanced technologies, to support development objectives Access to "streaming" audio and video content and file downloads via broadband service (and even narrowband), can allow local community broadcasters, as well as users themselves, to access virtually unlimited material. Satellite radio broadcasting can offer similar opportunities. This information in turn, can be used to enhance the delivery of traditional radio and television programming to a wider local audience.

The LINCOS telecenters in the Dominican Republic and Costa Rica have incorporated low power (25 watt) radio transmitters. In some cases these transmitters are being used to provide effective local content broadcasting services to the communities they serve. In Brazil Comunicação, Educação e Informação em Gênero (CEMINA) has developed a successful community radio program called Fala Mulher (Women Speak Up). This program covers issues and information of relevance to women and community life, such as women's rights, HIV/AIDS, violence against women, health, and sexuality. One objective of this project is to help more women become computer literate. It is supported by an NGO, the Ministry of Planning, and the Bank of Brazil (Box VII.5).

99 Nighttime rates may be cheaper at Bs0.68/minute.

100 There are drawbacks to relying solely upon informal resale of mobile service to ensure public telephone access. There is little certainty that someone with a working cell phone will always be available when needed, especially in potential emergency situations.

Box VII.5: Comunicação, Educação e Informação em Gênero – CEMINA

CEMINA, Communication, Education and Information on Gender[101], was founded by Brazilian women who wanted to focus greater attention on issues of concern to Brazilian women. The program has its own website (www.radiofalamulher.com). It creates new content, and its audio files are available for free broadcasting by any community radio station. CEMINA's success with Fala Mulher led the organization to actively engage in a capacity building program. This program offers women the opportunity to learn about radio, and to participate in training workshops on radio program production, content development, etc. CEMINA started a Women's Radio Network, which currently supports about 400 radio programs for women produced by women in local community radios. CEMINA's work has focused on digital inclusion. Some of it's projects are as follows:

- A Mobile Radio Studio Transmitter that allows people from rural and underpriviledged areas to access CEMINA's training activities.
- A Radio production center, that produces programming for partner radio stations across Brazil.
- The Radio and ICT project, which provides ICT facilities for radio program production and information-sharing across the network, including ICT training.
- The Community Radio Telecenters, which provide an opportunity for community radio stations and local residents to share access to ICT. Twelve of these telecenters have already been implemented - there are plans to implement a total of 29.
- Rede Cyberela (Cyberela Network), which provides ICT training and support - including broadband access - to a number of women community radio communicators, to develop content and share it among the network.
- The Youth Project, which supports hip hop youth groups in the development of music with messages focusing on health and gender issues.

CEMINA's work is a testimony to the power of community radio as a tool for information dissemination and women's empowerment, and it has received numerous awards from UNIFEM and UNESCO, among others.

Contrary to most of the other models, the pilot project in Sopachuy, Bolivia (Chapter VII.2.2), is a shared-connectivity model. It tries not to depend too much on income generated by services offered in the telecenter. This pilot project was implemented by ACLO - a local NGO - and supported by IICD - a Dutch NGO. It focused on the implementation of cost-effective ICT solutions within the development context.

The commercial model unites different local actors, including ACLO, the municipality, the school, the farmer association, and a micro-credit office. One single organization cannot cover all operational costs, which are estimated to be about US$1,000/month. Additional services, such as offering Internet, copying, etc., are insufficient to cover the remainder of these costs. The operational costs are shared among the different actors, thereby making the financial burden

[101] http://www.cemina.org.br

more reasonable for each organization. In the event one of the organizations is not able to fulfill its obligations, another actor can take its place.
The pilot is innovative from the technological side. The wide area wireless community network makes it possible for the population to have direct access to service in their homes. Now people can access the community network with a relatively low cost. This can enable Internet use, and also VOIP solutions.

The model has proven to be effective, and already other communities are starting to emulate it. The other impact of this initiative is that various members of www.ticbolivia.net have organized themselves and agreed, along with the ISP, to drastically reduce monthly connection fees.

VII.4.3 Service offerings

Successful undertakings are invariably based on a set of specific service offerings that have been developed and implemented to suit the unique requirements of the community or target population. Televias Huarochiri, the local province-wide operator in Huarochiri Province, Peru decided to develop a comprehensive five services offering, covering the whole province. It includes fixed, mobile, and public telephone, Internet access, and cable TV. Televias Huarochiri found that among farmers tending their cattle grazing in fields outside of the towns, there is a high demand for mobile telephony as a way to fight against isolation and cattle rustlers.

On the other hand, Ruralfone in Brazil found that it was unnecessary to include handsets as part of its service offering, because people in the community had other simpler and cheaper means of acquiring them. Ruralfone offers nothing more than a SIM card and a very simple tariff plan. In Peru, Bolivia, and elsewhere, agricultural associations have built systems designed specifically to get information to improve production, marketing and selling of their produce.

Banco Solidario is a small commercial bank in Ecuador, that specializes in high risk loans to individuals and micro-enterprises, and facilitates money transfers back to Ecuador from emigrants working in Europe and North America. Banco Solidario was at one time contemplating an interesting model, which was to use excess transmission and switching capacity on its private internal high-speed network and some physical space to provide access and non-bank services to both clients and non-clients in the towns and communities. This model included the following features:

- Domestic and international long distance telephone service, which could be, but would not necessarily be, related to its banking business.
- Internet access and e-mail communications, including training in Internet use.
- Training in use of computers and various software.
- Various government services, including applications for and delivery of birth and marriage certificates, identity cards, passports, driving permits, etc.
- Access to certain health services.
- E-commerce in support of local micro-enterprises, including the establishment of web pages, web hosting, provision of credit facilities, procurement, banking and other financial transactions, etc.

The idea was to provide all of these services to the population as a whole on a commercial basis at the marginal cost of making available and maintaining non-banking facilities on the bank's private network. The synergies between communications and financial services in this case present a compelling model for expanding access to ICT to whole sections of the population who do not yet have access. The advantages of such an arrangement are as follows:

- The bank has a built-in incentive to maintain a high quality service network for its own banking operation;
- There are natural synergies between the bank's primary business and the non-banking services that will be provided over the same network. One obvious area of convergence is in the support of micro-enterprises to which the bank wishes to provide credit;
- The possibility is provided to the emigrant community and their families and friends to complete various banking and communications functions in one place (one-stop shopping);
- The costs of providing non-banking services on the bank's private network are minimal;
- The synergies between banking and non-banking services provided by this network are beneficial to both the bank and its customers. For the bank, the network indirectly creates more banking and banking-related business, For the customers, the network provides complete banking, communications, small business support, government, and even health services in one place;
- Employment is created in the ICT sector, and the means and incentives are created to provide training in the use of ICTs in commerce.

It is not known why the project didn’t go through.

VII.4.4 Marketing

Focused marketing is especially important for small, local commercial undertakings. Ruralfone in Brazil has utilized very community-oriented marketing techniques such as door-to-door sales. Ruralfone systematically follows up with new and existing customers, establishes good relationships with local governments, and sponsors and participates in local events. This approach is much easier to adopt when the company is based in the community, the district, or even the province, and when the staff is locally hired.

In the Huarochiri rural telecommunications pilot project in Peru, one of the conditions attached to the FITEL grant was that the entrepreneur, Ruddy Valdivia, train his newly hired local staff in customer care. He decided to offer these courses not only to his own staff, but also to his potential customers such as local restaurants, hotels, transportation companies, etc. He reasoned that if these local enterprises were able to increase their own businesses through improved customer care, they would be inclined to use more of its telecommunications services. The project was inaugurated only in mid-June 2006, but it appears that this strategy is already starting to bear fruit.

VII.4.5 Management practices

In Brazil, Ruralfone's business plan is based on the hiring of local staff to manage and run the operation. Ruralfone has some foreigners to help start its operation in Quixadá, but is not paying them expatriate wages. Decision-making is left to the local staff. This is also the case in the agricultural information system in Chancay-Huaral, Peru. The Junta de Usuarios del Distrito de Riego de Chancay initiated and partially funded this project, and is now responsible for operating and administering the network and installations. Similar cooperative projects in Bolivia are run the same way. A very important policy in both commercial and cooperative type community projects, is to give young people in the community responsibilities for managing, administering, operating and maintaining the network on a day-to-day basis. In the Chancay–Huaral project, close to 200 young people in the valley have been trained to administer, operate, and technically maintain the system, to design and maintain the web pages, and to assist and teach young and older users. Many of these young people were without jobs, or else were working in the fields helping their parents. As a result of the training they received from this project, many of them have been able to find employment outside of the project and even outside of the valley.

VII.4.6 Partnership arrangements

The relationship between NGOs and the ICT sector can be mutually beneficial. NGOs generally need affordable communications, and see ICTs as important instruments with which to accomplish their missions. Some have made ICT deployment their primary activity, recognizing the central value of information resources to other development objectives.

NGOs play an increasingly important role in strengthening the overall knowledge base of indigenous and underprivileged populations, which strengthens community-based development initiatives at the grassroots level. ICTs are a valuable component of that mission. NGOs can contribute indirectly to ICT financing by supporting micro-financing initiatives, and pursuing the same types of strategic procurement decisions for their own activities as governments do.

The International Institute for Communication and Development (IICD)[102] is an NGO that has been deeply involved with ICT development projects in Bolivia, Ecuador and other Latin American countries for a good number of years. IICD is a non-profit foundation that specializes in ICT as a tool for development in education, environment, good governance, health and livelihood opportunities. It develops and finances projects in conjunction with local and other partners from the public, private and not-for-profit sectors (Chapters VI and VIII). The World Resources Institute (WRI) is a non-profit global think-tank dedicated to improving people' lives, and to bringing societies together through physical and digital linkages[103].

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[102] http://www.iicd.org.

[103] The WRI has worked with governments, NGOs, international organizations and the business community, to create a comprehensive, searchable online research tool that highlights some of the compelling uses of ICTs for social and economic development. While the WRI is involved in a variety of development projects around the world, the Digital Dividend Clearinghouse and Market Research Center has become a reliable source for tracking innovative ICT experiments in less developed countries. See the following Internet website: http://www.itu.int/osg/spu/wsis-themes/ict_stories/Usefullinks.html.

VII.4.7 Procurement

Innovative procurement practices have resulted in significant savings in capital investment requirements during the design, implementation and operation phases of these small, local undertakings.

Capital requirements. Ruralfone, the regional operator in Ceara State in Brazil, decided to use off-the-shelf technology in implementing its network. It opted for GSM technology. Because most of the equipment is manufactured in Brazil, Ruralfone is able to cut down on import duties that otherwise can add significantly to capital expenses. This decision also supports Ruralfone's business model, which requires customers to purchase their own handsets. Thus, the operator does not have to stock, sell, or maintain handsets, which is an aspect of mobile operators' business where profit margins are usually minimal or nonexistent.

Outsourcing and demand aggregation are forms of procurement that can be especially effective for the planning, design, installation and operation of small community-oriented enterprises. Many tasks that are complicated and risky can be outsourced. A good example of a successful company that provides outsourcing and demand aggregation is OmniGlobe Networks. This type of company can offer equipment, design, Internet connectivity and on-going support at prices which are lower than a small company or cooperative could obtain on its own. Smaller companies simply do not operate at a high enough volume. Having the support of a system aggregator or outsourcing company can facilitate dealing with regulatory and administrative matters, such as obtaining operating and spectrum licenses and interconnection agreements. Outsourcing reduces the financial risks for small operators, service providers and entrepreneurs.

Franchising is a variant on outsourcing, which is being tried in the USAid-sponsored Last Mile Initiative (LMI) Project in Guatemala. Under this project pre-WiMAX based networks are being deployed in five pilot locations. Each location has a population of less than 60,000 people, and at least 7,000 potential customers, including individuals, businesses, and public institutions such as schools. Unitel/Metrovia is a franchised operator that plans, designs, installs, and then operates and maintains the network. It also provides the billing and management platforms for each of the local networks, including customer provisioning, billing, prepayment, relationships with banks for electronic payments, and network management. The franchisee is Planeta en Línea (PEL), a Guatemalan non-profit organization, which promotes ICT for development in rural areas of Guatemala. AGEXPRONT, the national exporters' guild, is giving its support to the initiative.

Franchising, however, is only successful under certain circumstances. Francisco Proenza has pointed out that developing a viable franchising model for the ICT sector in Latin America is difficult. This is especially true of telecenters, which are often run on a shoestring with minimum costs and minimum income. That does not leave very much to pay the franchisor[104]. Proenza gives the example of the initiative of the Asociación Infocentros, a government-established non-profit organization in El Salvador that was funded through a free 10-year government loan. The Asociación Infocentros extablished about 50 infocenters, and planned to sell 40 of these as franchises for about US$80,000 each. By the end of 2002, it was able to sell only two of these - the most profitable - for the full price. The rest had to be sold off for far below that value. The main difference between the LMI and the unsuccessful telecenter ventures described by

[104] Tecnologías de Información y Comunicación al Servicio de la competitividad y la Integración Sudamericana, Plan de Acción, Documento de trabajo preparado para la Iniciativa de Integración de la Infraestructura Regional en América del Sur (IIRSA), Volumen II, Informe Principal, Banco Interamericana de Desarrollo, Diciembre 2003.

Proenza, is in the scale of the project. Unitel/Metrovia is an operator with a significant amount of resources, technical knowledge, and experience. It has the capacity to build and operate viable networks, and pay the franchise fees. This is not the case with private and commercially-run telecenters: these are usually individual or small family enterprises.

Government procurement. Typically, there is a variety of government departments and agencies, including education, health, and public services, that allocate funds for telecommunications, data networks, e-government projects, and service initiatives that utilize ICT. When such projects are being designed and implemented, they represent a key opportunity for private sector entrepreneurs and investors to leverage public networks and equipment purchases with broader market initiatives. Intra-governmental partnerships and coordination can also reinforce the market attractiveness of ICT sector investments, by aggregating public sector demand. These coordinated partnerships help avoid overlap and duplication of activities and expenditures, which commonly occur in poorly coordinated public programs. This is especially true of projects that require coordination among national, provincial, and local government agencies and offices. Installation of shared network facilities, standardized accounting systems, and internal and external telephone links, can yield immediate paybacks in efficiency and accountability.

The success of the IICD's shared satellite connectivity projects in 11 communities in Bolivia (Chapter VII), depends in part on the involvement of the given municipal governments.

VII.4.9 Recommendations: Business practices, commercial, service delivery and partnership innovations

- *Policy-makers and universal access fund administrators should:*

  - *Encourage, and when appropriate, aid local entrepreneurs to adopt innovative business, administrative, marketing, service delivery, and procurement practices for their universal access projects. The case studies and pilot projects described in this report - especially in Chapter VIII - can serve as examples that can be replicated or adapted as necessary, to fit the particular circumstance. Universal access fund managers should develop information dissemination programs on such practices.*

  - *Make sure that government procurement agencies are aware of the impacts that their purchase decisions can have upon the emergence and expansion of market competition in markets as diverse as telephone services and equipment, computer hardware and software, and technical support services. The development of public service content, such as Web sites, audio-visual training materials, and educational software, should be linked to the enhancement of domestic businesses and employment in those fields. This could be accomplished, for example, through targeted outsourcing rather than in-house development. Government procurement rules should be adjusted accordingly.*

- *Regulatel should create a repository of such innovative business, administrative, marketing, service-delivery, and procurement practices for universal access projects.*

VII.5 Regulatory policies and strategies for universal access

IV.5.1 Introduction

Regulators and fund administrators have come to recognize the importance of adapting regulatory provisions that are tailored toward achieving universal access objectives in rural, remote and underserved areas. This includes policies related to frequency use, Voice-over-Internet protocol, tariffs and interconnection, specifying quality of service requirements and standards, licensing, and facilities and infrastructure sharing.

IV.5.2 Spectrum use policies: Encouraging the development of license-exempt technologies

It has been estimated that more than 70% of the population in developing countries will never be served by broadband wireline technologies, such as cable modem, DSL or power line communications[105].

New wireless technologies and applications have increased the demand for spectrum dramatically over the past few years. Cellular mobile services, where global subscriber numbers now exceed fixed, are often cited as an example of this phenomenon[106]. The ITU reported that it has been advised of more frequency assignments in the last ten years than in the entire preceding period from the start of radio[107]. The scarcity of spectrum, especially in the desirable range of between 350 to 6,000 MHz, is becoming more acute. This is in spite of the fact that the usable spectrum is today 5,000 times wider than it was at the beginning of the radio era in the late 1920s[108]. The need for more spectrum and computerization are leading to the development of new ways to transmit and receive signals over the air. Policy-makers are reflecting on new, more efficient ways of managing the radio frequency spectrum. The most immediate are to allocate an increasing amount of spectrum to license-exempt use, to acknowledge the potential of these new wireless technologies, and to promote innovation in all wireless applications, especially for universal access.

Some observers have suggested that the traditional way of managing the spectrum by assigning it to a particular user or users and controlling it according to frequency blocks (command and control), should be revised. Among them is Kevin Werbach of the New America Foundation, who has suggested that, in addition to the traditional exclusivity period, a revised regime should include the following spectrum use options: (i) dedicated unlicensed; (ii) shared unlicensed; and (iii) opportunistic unlicensed[109]. Dedicated unlicensed spectrum currently exists, and has been allocated primarily in the 2.4 and 5.0 GHz bands[110]. However, WiFi and cordless telephones which operate in both of these bands as unlicensed devices are subject to certain conditions,

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105 See Global Broadband Satellite Infrastructure (GBSI) Initiative of the International Telecommunications Satellite Organization (ITSO).

106 The total number of cellular subscriber numbers worldwide is approaching 2 billion.

107 Lie, Eric, Background Paper: Radio Spectrum Management for a Converging World, Workshop on Radio Spectrum Management for a Converging World, International Telecommunication Union, Geneva, February16-18, 2004.

108 Werbach, Kevin, Radio Revolution: The Becoming of the Age of Unlicensed Wireless, New America Foundation.

109 Werbach, Kevin, Radio Revolution: The Becoming of the Age Of Unlicenced Wireless, New America Foundation

110 5,150 – 5,350 MHz and 5,725 – 5,875 MHz. The 2003 World Radio Conference (WRC) agreed to allocate 455 MHz of spectrum in the bands 5.15 to 5.35 GHz and 5.47 to 5.725 GHz for wireless access systems.

such as output power limits, common protocol and etiquette rules, geographical and other location limits. For example, the rules may stipulate that devices are only to be used indoors.

Not all policy-makers and regulators are keen to offer frequencies for unlicensed uses. Besides being concerned about potential abuse and uncontrolled use of the spectrum leading to congestion, they may also be reluctant to part with a good generator of revenue. Others, however, see the potential benefits for communications industries and citizens, through the mass market that can be created by the development and production of open-standard, license-exempt devices. Of the Regulatel member countries, only El Salvador appears to have a license-free spectrum policy. Others are reviewing these policies in light of technological developments (Annex 3).

The industrial benefits of policies that promote the development and use of license-exempt devices in some Latin American countries may be less than they are in North American and European countries and even in Brazil, which have a greater capacity for producing these devices. However, Latin American policy-makers, regulators and fund administrators should recognize the potential of this technology to provide cheaper and more accessible broadband local access. Policies and regulations for the use of the license-exempt spectrum in Latin America should therefore build on developments in the US, Canada and Europe, while at the same time ensuring that entry of such radio equipment is not hindered, so long as it has been type-approved in North America or Europe.

As previously mentioned, there is growing interest in using the 450 MHz band and, in particular, CDMA 450 technology for rural, suburban and sparsely populated areas, for both mobile and fixed applications. So far, there appears to have been limited or no development of 450 MHz spectrum policies for rural applications in Regulatel countries.

VII.5.3 Voice-over-Internet Protocol (VoIP)

Due to advances in packet switching technologies, it is now possible to provide good quality voice services over the Internet using Voice over the Internet Protocol or VoIP. This presents a particularly attractive alternative to long distance and international calling where prices on the traditional public switched telephone network (PSTN) continue to be high, and where access to high speed Internet at reasonable prices is becoming more readily available. It also presents opportunities for service providers to offer voice services at prices that are much lower than the traditional circuit switched networks.

Skype[111], the leading global VoIP provider, was founded in April 2003[112]. It offers free PC to PC calling anywhere in the world and PC to phone calling (SkypeOut service) for as low as €0.017/min (US$0.022) anywhere in North America and throughout most of Western Europe. Rates to some Latin American countries are more expensive, because a call via the PSTN still requires a local interconnection[113]. Skype boasts over 130 million downloads worldwide of its free operating software, and 80 million users (250,000 new users per day).

111 www.skype.com.

112 " Skype Chief's Disruptive Vision", Financial Times, April 19, 2006.

113 Skype's rates are independent of the origin of the call. Thus a call to the US or Canada costs US$0.022 whether the call originates in Argentina, Paraguay, France or Singapore. Use of Skype requires that its free software be downloaded onto one's laptop or desktop computer. PC to phone service requires setting up an account with Skype. Both its PC to PC and PC to phone service are easy to use, and offer very good quality service.

Another new VoIP company, Vonage, offers a number of additional features for which regular telephone companies usually charge extra[114]. Vonage, which is reported to have 1.6 million customers in the US, offers an unlimited North American calling plan for the US and Canada for US$25/month. Per minute rates for calls outside of North America are very competitive. As an added feature, Vonage offers its customers a virtual US, Canada, Mexico or UK telephone number for an extra US$5/month regardless of where they actually live. For instance, a small family run hotel or travel agency in Peru that subscribes to Vonage could choose a local number in Miami, allowing their US customers to reach them by simply making a domestic or local call. Vonage supplies the IP Phone and router free of charge, which the subscriber can install very easily. Vonage has a WiFi phone that allows its customers to call from any location where they can access the Internet via a WiFi hotspot[115].

International VoIP traffic is growing rapidly. Telegeography estimates that in 2003 there were 24 billion minutes of international VoIP traffic representing about 12 % of all international voice traffic (PSTN and VoIP)[116]. That is up from about 10 % in 2002, and 6 % in 2001.

The rapidly growing VoIP market has become a serious challenge for incumbent telephone operators and regulatory authorities across the region. There have been a wide range of responses. VoIP alternatives directly cut into lucrative long distance and international traffic revenues (even while they also stimulate demand for such calls), including both outgoing call charges and incoming net settlement payments or termination charges. For this reason, many established operators have vigorously opposed authorization of both public and private VoIP applications in all its forms, and some regulators and policy-makers have joined them. In Panama, VoIP calls must pay a 12% surtax, and Internet cafés are subject to heavy fines if they allow customers to use VoIP applications. In the past, both Mexico and Colombia have issued strict prohibitions against VoIP services.[117] In Colombia, only operators that have paid US$150 million can offer long distance services.

In all Regulatel countries except Chile, where it is currently under study, VoIP is considered to be a technology for providing voice services and not a service in itself. Therefore, given that regulations are generally technology neutral, it is treated no differently than public telephony - there is no accounting for the different forms (computer-to-computer, computer-to-telephone, and telephone-to-telephone). In Brazil, for example, computer-to-computer VoIP is not regulated, but other forms require the operator to obtain a license. Cuba is considering permitting VoIP in private networks and closed user groups. Other countries have specific authorization requirements for cybercafés and other types of uses (Annex 2).

The rationale for these types of restrictions sometimes includes arguments that VoIP services do not contribute equitably to national development and universal access obligations, and that some

[114] (www.vonage.com). In mid-2006, Vonage plans to sell a 20% stake in the company. That translates to 31,250,000 shares at between US$16 and US$18/share, valuing the still lose making company at US$2.82-billion. See Financial Times, May 9, 2006. Other VoIP companies include Net2Phone, Deltathree, CallServe, Dialpad, 8X8, and Go2Call.

[115] Taylor, Paul, "Innovation that has Shaken Telephony", Financial Times, January 5, 2005. Both Skype and Vonage offer a number of added features such as instant messaging and conference calls and in the case of Vonage free voice mail, call waiting, call forwarding, and caller ID.

[116] See TeleGeography 2004, Primetrica Inc. For an excellent discussion on VoIP see Downes, Richard, "The Regulator and the IP Network Cloud: Regulatory Challenges Arising from Network Evolution Prepared for the Meeting of the Organization of Caribbean Utility Regulators (OOCUR) and the Regulated Industries Commission, Port of Spain, Trinidad and Tobago", September 16-19, 2003.

[117] Charny, Ben, "VOIP smuggled into Latin America," CNET News, August 3, 2004.

of the revenues they divert could be used to fund expanded access. However, the technical and economic advantages of VoIP also offer intriguing opportunities to support those very universal access goals directly. Public telecenters and Internet cafés that allow low-priced use of VoIP services over their systems, can provide an essential option for public users who could not otherwise afford to place international calls. If VoIP services are integrated with rural network development initiatives such as BWA or satellite broadband, the break-even point for including Internet access, and even broadband connectivity, becomes much more achievable. In effect, voice telephone service, whether for local or long distance calling, can be provided on a packet switched network at a very low additional cost. Revenues from call charges that are lost to VoIP can actually translate directly into cost savings for both users and local service providers, removing many layers of cross-subsidy and bureaucracy from the universal access process.

In Peru, one of the factors which has contributed to the success of the 30,000 or so cabinas publicas has been the VoIP that they are able to offer to users. It is estimated that one-third of all the people who use these cabinas use their VoIP services.

From this point of view, there seems to be little justification for maintaining any significant restrictions on VoIP services, especially in the context of rural access development. VoIP could open many remote markets to both voice and data access on a cost-effective basis. At a minimum, regulators should monitor and study this phenomenon and include indicators of use, costs, and revenues among their market and policy analyses when designing new universal access programs.

VII.5.4 Licensing

Burdensome licensing requirements like high taxation rates are serious barriers to investment, especially for the small investors that policy-makers, regulators and fund administrators would like to entice to build networks in rural and unserved areas. Ruralfone, a North American investor with no particular ties to Brazil, was attracted to invest in the State of Ceara in Northern Brazil at least in part because of the ease of getting a license. There was relatively little paperwork involved and the fixed telephone license for the whole State of Ceara, which has 7.4 million inhabitants, cost only US$4,100. Because of a favorable regulatory environment, Ruralfone was able to sign interconnection agreements with about 20 operators, including the incumbent, Telemar, within a period of six months.

In Argentina, the Secretary of Communications - not the regulator – is in charge of issuing telecommunications licenses. The secretary grants a license to virtually anyone who requests one. The license allows the licensee to provide any and all telecommunications services, fixed or mobile, national or international, with or without the licensee's own infrastructure. However, the licensee must inform the Secretary which services it intends to provide. The secretary is required to award a license within 60 days of having received a request. They are valid for the whole territory, and are technology neutral. They are awarded for an unlimited period of time, and come with a number of rights and obligations, all of which are clearly described in the regulations[118]. Argentina has the fourth highest fixed and the second highest mobile penetration rates of the 19 Regulatel countries. It has one of the lowest broadband Internet access rates (Figures VI.2 and V.3 and Annex 4).

[118] Anexo 1, Marco Regulatorio de las Telecomunicaciones en la Argentina, Decreto 764/2000.

In Guatemala, there is no licensing requirement. Anyone who wants to operate or provide a service, basic or non-basic, has only to register, and thereby obtain a certificate from the regulator. The process is very simple and there is no limitation on numbers. It is also quite easy to get a license in El Salvador.

These are good examples that show the benefits of having liberal licensing regimes. They merit further attention by policy-makers and regulators who are contemplating making adjustments to their regulatory frameworks to promote universal access.

VII.5.5 Quality-of-service and standards policies

Regulations designed for areas with high penetration levels or with industrial imperatives in mind may require that operators respect certain levels of quality-of-service and standards. There are many quality-of-service and other standards which are important to respect if network integrity is to be maintained. However, policy-makers and regulators need to determine where greater flexibility might be introduced with respect to these standards where this will either not cause any harm to the network or where the impacts are minimal if stricter standards are an impediment to investment and development of rural networks and services.

For example in Peru, current regulations do not permit the installation or use of refurbished equipment, even if its performance can be guaranteed as being as good as new. Similarly, regulations and conditions of operation do not take into account that it may be impossible to guarantee the same quality of service in rural as in urban areas even with new equipment. It may take days for a technician to travel to a very remote area of the country to repair a faulty payphone, where the cause of the failure may be none other than a lack of sun to recharge the solar powered batteries. The risk of interference from radio transmitting devices in certain bands may not be the same in rural as in more densely populated urban areas.

VII.5.6 Tariff and interconnection regulations

In 1999, the Peruvian regulator OSIPTEL, introduced tariff regulations that were adapted for the special circumstances of rural services. Those regulations are still in effect today. They permit rural operators to set outgoing and incoming tariffs so long as they do not exceed a maximum in either direction of calls between subscribers of the fixed service (PSTN) and a rural public payphone (Table VII.3). The rural operator establishes the price of a call from urban and rural payphones. The urban payphone operator collects and pays the rural operator a part of the amount per minute collected. This amount is determined by OSIPTEL. For a call from an urban residential telephone, say in Lima, to a rural payphone, the operator in Lima pays the rural operator a per minute interconnection charge established by OSIPTEL. The price of calls between public payphones in urban areas and public payphones in rural areas is not regulated.

Smaller operators are sometimes disadvantaged in negotiating interconnection agreements with incumbents and large new entrants. In Peru, it took Rural Telecom, a rural operator, 14 months to get an agreement with Telefónica, whereas it took Telmex, a large new entrant, only one month. In Brazil, on the other hand, Ruralfone was able to sign 20 interconnection agreements in less than six months.

OSIPTEL is currently revising these tariffs, because operators in urban areas have complained that they are not high enough to cover their costs. The average number of outgoing plus incoming minutes of traffic per day in the 6,500 FITEL-subsidized rural payphones is about 40. Figure VII.7 shows that this varies from about 20 minutes in the smallest and largest localities to about 83 minutes in the 386 localities with between 400 and 500 inhabitants. OSIPTEL is also studying more favorable regulatory and other conditions for rural operators. These include: (i) revising regulated interconnection charges and arrangements to ensure that prices reflect the higher costs of providing service in rural areas; (ii) implementing a policy of charging little or no spectrum license and usage fees in rural areas to encourage investment; (iii) reducing coverage obligations for rural operators; and (iv) facilitating and speeding up the process of getting a license.

Table VII.3: Peru: Maximum permitted tariffs for communications between rural payphones and fixed telephone subscriber

Direction of call		Maximum tariff permitted (per minute including value added tax)	
From	To	S/.	US$
Local			
Rural public payphone	Fixed telephone subscriber	0.20	0.066
Fixed telephone subscriber	Rural public payphone	0.17	0.056
Long distance			
Rural public payphone	Fixed telephone subscriber	1.00	0.33
Fixed telephone subscriber	Rural public payphone	0.85	0.28

Andrew Dymond makes a strong and convincing argument that it is sound national policy to have asymmetric interconnection charges for rural areas. He suggests that it is justified to have higher termination rates for calls originating in urban areas and terminating on rural networks, because it costs more to construct, operate and maintain networks in rural areas[119]. These higher termination rates should be accompanied by higher tariffs. The level of such charges should be based on cost. Dymond points out that a serious obstacle to implementing asymmetric charges is the lack of adequate costing information. As a first step he suggests using approximations that can subsequently be refined as regulators gain experience with asymmetric rates for rural terminations and tariffs.

Chile and Colombia already have asymmetrical interconnection rates for calls to rural networks.[120]

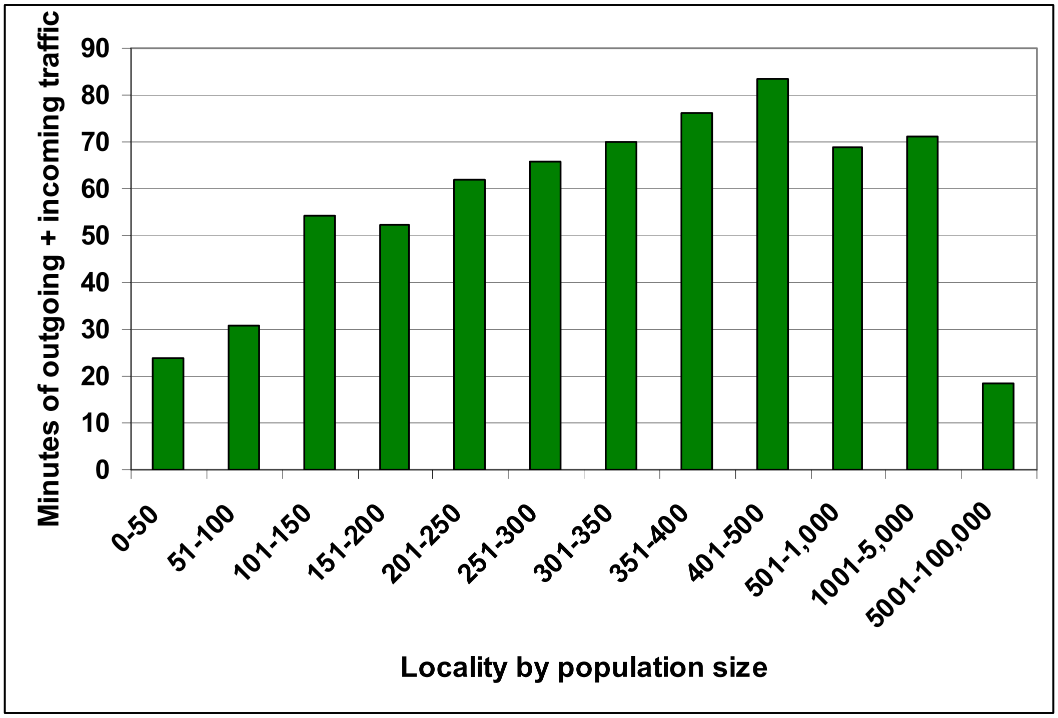
Dymond points out that asymmetric interconnection charges can have a significant impact in reducing the access gap, and consequently the subsidy requirements from universal access funds. Regulatel should undertake a comprehensive study and develop policies, guidelines,

[119] Dymond quotes ITU and other studies that suggest that a fixed rural network costs 6 to 10 times more than a fixed urban network per subscriber. See Andrew Dymond, "Telecommunications Challenges in Developing Countries, Asymmetric Interconnection Charges for Rural Areas, World Bank Working Paper No. 27", 2004.

[120] See Bjorn Wellenius, "Closing the Gap in Access to Rural Communications, Chile 1995 – 2002, World Bank Discussion Paper No. 430", 2002, and CRT Resolución 463 del 2001 por medio de la cual se modifica el Titulo IV y Titulo V de la Resolución 087 de 1997 y se dicta otras disposiciones.

costing methodologies (that can include benchmarks), along with model regulations and interconnection agreements for use in rural applications.

Figure VII.7: Average number of incoming + outgoing minutes of traffic per day in the 6,500 FITEL rural payphones distributed by size of locality



Source: FITEL

VII.5.7 Facilities and infrastructure sharing

Sharing of facilities such as towers, ducts and gateways and other equipment and resources reduces costs, especially for small rural operators. It also makes sense from an aesthetic/environmental protection point of view, and should be encouraged and receive the support of regulators and fund administrators.

VII.5.8 Recommendations: Regulatory policies and strategies for universal access

- *Policy-makers and universal access fund administrators should:*
  - *Review **spectrum-use policies** related to license-free spectrum, especially for rural applications, to facilitate the deployment of technologies that use these frequencies*
  - *Remove burdensome restrictions or prohibitions on **VoIP-based networks and applications**. They should encourage operators to deploy VoIP as a cost-effective means to expand affordable access, especially in rural and unserved area applications. Promoters should be encouraged to incorporate VoIP technologies into their projects.*
  - *Adapt **asymmetrical rules and regulations** pertaining to telecommunications services provided in rural and underserved areas, along the lines of those indicated in Box VII.6.*
  - *Implement a **simple, pro-competitive licensing regime** that encourages and facilitates the establishment of smaller, independent telephone operations in rural and underserved areas, especially where incumbent operators have chosen not to build networks. Subsidies should, where possible, be available to support such operators, if they have the technical, managerial, and operational capabilities to deliver telecommunications services cost-effectively to their communities. Support should not be limited to the technical aspects of the project. It should also be available to assist in the management, administration and commercial aspects of these undertakings.*
  - *Implement and enforce regulations with respect to maximum permissible delays in the signing of **interconnection agreements**.*
  - *Introduce greater flexibility in **quality-of-service and other standards** pertaining to networks and services in rural and underserved areas where the impacts are minimal and where stricter standards are an impediment to investment and development.*
  - *Introduce regulations and promote and facilitate **infrastructure and facilities-sharing**, including the use of rights-of-way not only among telecommunications operators, but also with other public service companies and operators. This includes electricity transmission and distribution, pipeline companies, public works ministries, and railways.*

- *Regulatel should:*
  - *Undertake a comprehensive study to determine the impact of asymmetric interconnection rates and tariffs for rural operators. The aim should be to develop policies, costing methodologies (that can include benchmarks), guidelines for termination charges and tariffs, along with model regulations and interconnection agreements for use in rural applications. Regulatel should develop a data base of information on its members. This would include rates, costs, regulations, interconnection agreements, etc., for rural areas.*
  - *Gather, analyze, maintain, and keep current a data base of its members' universal access regulations and policies. This would include spectrum use policies (use of license-exempt frequencies; use of the 450 MHz band, etc.), VoIP, licensing, quality-of-service and other standards for rural operators, and facilities and infrastructure sharing. Annex 2 of this report summarizes regulatory provisions related to these factors. It should serve as a starting point for establishing such a data base.*

VII.6 Conclusions: innovative strategies and best practices for universal access

The four broad areas of innovative strategies and best practices for universal access programs are summarized in Table VII.4. The next section shows how these strategies and practices have been applied in the new models and pilots in Latin America and elsewhere.

Box VII.6: Asymmetrical rules and regulations for universal access projects

Policy-makers should consider making rules and regulations pertaining to universal access projects in rural and underserved areas that are better adapted to the needs and circumstances of rural operators.

A. General

- Be more flexible with respect to coverage obligations for operators providing service in rural areas;
- Reflect the needs and particularities of rural and underserved areas with respect to spectrum assignments, fees, and conditions of use. For example, they should take in account that the potential of interference in rural areas may not be the same as in urban areas;
- Ensure that effective and timely regulator support is given to small rural operators in interconnection negotiations.

B. Quality-of-service requirements

- Permit refurbished equipment to be installed when an acceptable quality of service can be guaranteed;
- Take into account that it may not always be possible to guarantee the same quality of service in rural as in urban areas;

C. Tariffs and interconnection charges

- Incremental costs (common and opportunity costs) of rural terminations tend to be higher than urban terminations. More traffic tends to flow toward rural and underserved areas than in the opposite direction. Therefore, policy-makers should implement arrangements that include one or a combination of the following:
  - a special price-cap scheme that takes into account these asymmetries;
  - higher termination charges for rural terminations;
  - a calling party pays (CPP) arrangement, with the originating operator's tariffs regulated to prevent them from being set so high that it would discourage calls to rural telephones;
  - a plan that allows operators to charge more for calls to a rural telephone than to a local number, but require them to identify such calls by a special prefix similar to a long distance call or a call to a mobile telephone. That will ensure that callers know that they will have to pay more to make the call.

D. Dial-up Internet access

- Allow and promote the implementation of flat-rate fixed telephone pricing schemes, if they do not already exist.

Table VII.4 Overview of innovative strategies and best practices for universal access programs in Latin America

Innovative strategy, best practice	Sub categories	Status, applicability, conditions, features, etc.	Examples from pilots described in Chapter VII and Annex 3
a. Transmission technologies for local access and transport	2nd and 3rd generation mobile	Can be used for both mobile and fixed applications although they are less cost effective for the latter. Prices for 2G network equipment and handsets have fallen dramatically especially for GSM. New developments are extending the range of cell sites and therefore reducing costs.	Ruralfone (Brazil) Valtron (Peru)
	Broadband wireless access (BWA) including WiFi and WiMax	Large amount of interest in the development of BWA technologies; falling costs, especially for WiFi; extent of network reach is dependent on type of terrain and permissible signal strength; some non-line-of-sight systems are available; common use of IP transmission standards makes "plug and play" applications easy for both voice and data applications, and also for network control; can be used for both local access and transport.	Sopuchuy (Bolivia) Huaral (Peru) OmniGlobe QINIQ (Nunavut)
	450 MHz	Ideal for rural applications because of large cell radii; required frequencies not always available; limited availability of network equipment and handsets (mainly CDMA) means that prices are still higher than for GSM and for CDMA equipment operating in other more commonly used bands.	Valtron (Peru)
	Satellites	Still the only feasible backbone solution for many rural and remote locations; harmonization of standards and regulations, and aggregation of demand, can reduce costs.	Sopachuy (Bolivia) Rural paphones in Peru, Chile, Colombia, Guatemala, etc. OmniGlobe QINIQ (Nunavut) ITSO's GBSI initiative
	LMDS and MMDS	Older, less cost-effective access technology	Digital Way (Peru)
	Newer wireless technologies (UWB, Smart Antennas, Software Defined Radios, Agile and Cognative radios	Still under development.	

Table VII.4 Overview of innovative strategies and best practices for universal access programs in Latin America

Innovative strategy, best practice	Sub categories	Status, applicability, conditions, features, etc.	Examples from pilots described in Chapter VII and Annex 3
a. Transmission technologies for local access and transport	Wireline technologies (Fiber, Copper, Coax, PLC)	Only PLC is a newer technology that is still under development and has yet to prove its commercial viability.	Endesa (Chile)
b. Financing	Micro-credit	Credit requirements for individuals and micro-enterprises	Chalequeros (Bolivia) Grameen
	Between micro credit and venture capital	Advances in technology and service delivery methods are facilitating entry of small operators and service providers for whom micro-credit is not sufficient, but who do not have the size or requirements to qualify for regular loans. These operators require credit adapted to their very small size.	Enablis
	Foreign donors and lenders, loan guarantees, vendor financing, project finance, BOT, export bank and credit agency financing	More traditional financing methods that can be and are being combined with the newer more innovative ones.	Valtron (Peru) Ruralfone (Brazil) Televias Puyhuan (Peru)
	Universal access funds	Subsidies in conjunction with other financing methods.	
c. Business, commercial, service delivery practices and partnership arrangements	Business practices and commercial innovations	Telecenter and other projects that support not only communication objectives, but also other social and economic goals of the country and the community.	LINCOS (Dominican Republic, Costa Rica) QINIQ (Canada) Teleház (Hungary) CASI and CASIL (Uruguay) JCCE (Cuba) Puntos de Acceso (Venezuela)
	Service delivery and service offerings; marketing	Needs to be adapted to the locality, community, area or region being served. Small operators and service providers can more easily adapt their service delivery and service offerings to the specific requirements of the community and area they are serving. Requires strong familiarity with the community and area, and comprehensive market surveys.	Valtron (Peru) Huaral (Peru) Ruralfone (Brazil) OmniGlobe model

Table VII.4 Overview of innovative strategies and best practices for universal access programs in Latin America

Innovative strategy, best practice	Sub categories	Status, applicability, conditions, features, etc.	Examples from pilots described in Chapter VII and Annex 3
c. Business, commercial, service delivery practices and partnership arrangements	Management practices	Employment and empowerment of people from the community and area being served can pay large dividends in the long run.	Chancay – Huaral (Peru) Ruralfone (Brazil) Valtron (Peru) OmniGlobe model QINIQ (Canada) Televias Puyhuan (Peru)
	Partnership arrangements	Local partners are important in initiating, financing, operating, administering, and ensuring the sustainability of community-based projects.	*ticbolivia's* ICT for development initiative QINIQ (Canada)
	Procurement	Innovative procurement practices that are adapted to local circumstances can significantly reduce both construction and operating costs. This can include using proven, traditional technology, locally built equipment, outsourcing design, leased circuit capacity requirements, back office support, and maintenance. Procurement can also involve aggregation of demand for rural operators' services, especially from various government agencies and institutions in the community and area.	Ruralfone (Brazil) OmniGlobe model Valtron (Peru)
	Community radio and Internet-based broadcasting	In the case of radio, procurement practices can be adapted to specific community needs. Low cost deployment of both radio and Internet-based broadcasting.	CEMINA (Brazil) LINCOS telecenters (Dominican Republic)
d. Regulatory policies and strategies	Spectrum use polices VoIP Licensing Tariffs and Interconnection Facilities and Infrastructure-sharing	Regulatory policies and provisions for application in rural areas can significantly impact the operation of rural operators and reduce the amount of subsidies needed. However, these policies need to be carefully developed, implemented, and then enforced.	Peru, Chile, Colombia with respect to interconnection and tariffs for rural applications; Honduras for VoIP; El Salvador for license-exempt spectrum

VII.7 New models and pilots for universal access in Latin America

VII.7.1 Introduction

Research for this study has brought to light several interesting, well adapted and very promising models and pilots in several Regulatel member countries and elsewhere, that are applying the innovative technology, financing, service delivery, and business, commercial and partnership arrangements presented above. They are presented here and described in greater detail in Annex 3, with respect to the network and technology used, the services offered, financial aspects, business plan, management and administrative practices and regulatory aspects.

VII.7.2 Community telecommunications cooperative: The case of the Agrarian Information System (SIA) Project in the Chancay–Huaral Valley, Peru

This is a community initiated and operated network connecting 14 telecenters in this fertile 22,000 hectare valley north of Lima. It serves the 6,000 farmers that are members of the Junta de Usuarios del Distrito de Riego de Chancay-Huaral who initiated and partially financed the project. Its purpose is to give these farmers access to market and other information, such as the current prices for their products, the price of fertilizer and other inputs, the weather forecast, current laws and regulations concerning the agricultural sector and other information of relevance, such as the activities of the Junta. It also gives the 18,000 school age children, and teachers and administrators in 64 schools in the valley, access to the Internet.

The network is built using cost effective point-to-point WiFi links which connect the telecenters located in the premises of the local farmers' commissions. The communication system is VoIP based. The longest link is 20 km. The capital cost including 62 computers in the 14 telecenters and the telecommunications network was US$166,000. The project also received funding from FITEL, the universal access fund and the Ministry of Agriculture.

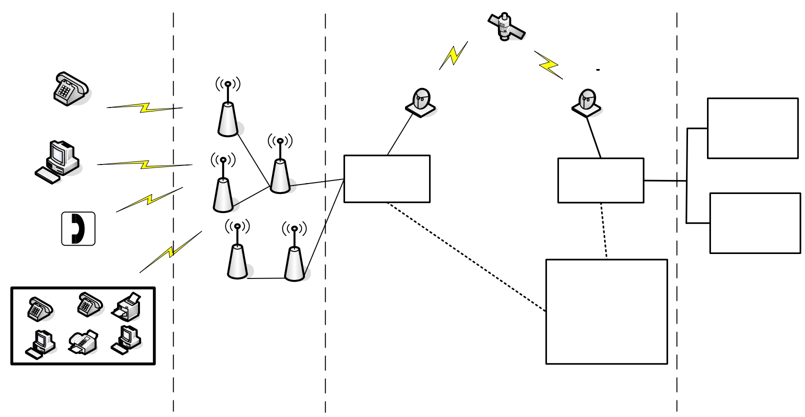
The social and economic benefits of the project so far have been the increase the efficiency of the farming community through access to current information on crops, prices for inputs such as fertilizers and seeds and current market prices for their products in Lima, the training of over 200 young people in computer and network hardware and software and giving access to and making computer literate the 18,000 school aged children in the valley.

VII.7.3 Community telecommunications operator: The case of the ACLO/IICD Sistema de Información Campesina–Indígena Project, Sopachuy, Department of Chuquisaca Bolivia

The main objective of this project, like the Chancay–Huaral Agrarian Information System Project, is to facilitate access to information that is of importance to farmers and their associations to improve agricultural production through the use of ICT (prices, clients for their products, commercial policies and consumer preferences and trends) through the Internet.

The network is based on a technologically innovative WiFi mesh network topology consisting of only three base stations each of which can serve 100 users in a range of 2–3 km. Coverage is thus provided to the village's 1,500 inhabitants. The mesh boxes which require about 4 watts of power are fed off an AC/DC converter connected to the local electricity network. They can also be fed off batteries. The customer premises equipment consists of an antenna (usually outdoor) and a modem which can be Ethernet wire connected to a computer, IP telephone or a "soft" telephone[121]. The network can be controlled locally and also globally at one of the supplier's (LocustWorld) control centres. The local network is linked to the outside world via a VSAT link (Figure VII.8). Each mesh-box costs US$500 (including one year maintenance and back up support) and the whole system including installation cost less than US$7,500.

Figure VII.8: WiFi mesh local access network with VSAT transport link



System operating costs are estimated to be about US$900–1,000/month (US$400 for the satellite link and US$500–600 for the other operating, administrative and staff costs). Financial sustainability is dependent, initially at least, on three or four partners (municipal government, economic associations such as agricultural producers, micro credit institutions, schools and churches, NGOs, peace corps, police and public security, other government institutions, small businesses and also some private individuals) being able to pay between US$250 and US$300 per month to support it.

VII.7.4 Privately initiated and operated regional telecommunications company: The Televias Huarochiri Pilot Project in Huarochiri Province, Peru

One of the most innovative projects designed to expand the public telecommunications network in areas with very low income is the rural telecommunications project in the small mountainous Province of Huarochiri, Peru, lying just east of Lima. The province has an area of 60,000 km^2, 60,000 inhabitants, four river valleys, and mountain peaks as high as 5,000 m. Its economy is mainly agricultural but there is also mining activity and electricity production.

The project, which was officially inaugurated on June 21, 2006, breaks with the traditional top-down approach of identifying and implementing subsidized universal access projects in Peru.

[121] Computer based software telephone.

Before it was implemented, there were 2,432 fixed lines (penetration = 4.1 %) located in only seven of the 796 localities and 179 public telephones located in 40 of the 796 localities. The service was considered to be inadequate and the current operators did not have any incentive to expand and improve the limited amount of service they were providing. Local entrepreneur Ruddy Valdivia was requested by local authorities to evaluate the unsatisfied demand in this small mountainous province and concluded that there was a valid business case for establishing a small, provincial telecommunications company which would provide a complete offering of telecommunications services including fixed and mobile, in the home and in public places, Internet access and cable television throughout the province[122].

The fixed and mobile telephone networks are built using CDMA 2000 1x (2.5G) operating in the 450 MHz band for the former and in the 800 MHz band for the latter. The public (pay) telephone and Internet access services that the new company, Televias Huarochiri offers are also provided on these two networks.

The cost of the whole system is less than US$1,500,000 of which about one-fifth was provided by FITEL. Estimated yearly operating costs are US$600,000. Income is derived from customer subscriptions, circuit leases, equipment sales and termination charges. Local telephone is charged at an unlimited use rate of S/50 (US$15.50/month). The business plan shows Televias Huarochiri becoming cash flow positive in the second year of operation.

A defining feature of this type of regional and community scale project is its ability to address the specific needs of the local population. The following initiative of Ruddy Valdivia illustrates this. The new company was obliged as a condition for getting FITEL funding to train its staff in customer care. Valdivia did not only this. He also invited his potential customers, entrepreneurs such as restaurant owners, innkeepers and others to the course assuming that improving their customer care skills would have a positive impact on their businesses and would make them more intensive users of Televias Huarochiri telecommunications service offerings. Another benefit of the new network is that it has like the Chancay-Huaral project brought the Lima market closer to the producers of dairy and agricultural products in the valley.

The scope of possibilities of this and similar entrepreneur driven projects is virtually unlimited and the social and economic benefits can be substantial even with a very small amount of investment. Indeed these small and medium sized local undertakings also have the potential to bring financial returns to universal access funds if, as recommended in Chapter VI, their structure is changed to allow them to make loans and take up equity in these companies. If vendors and financial institutions are prepared to loan them money why not the universal access funds?

VII.7.5 Televias Puyhuan Project in the Department of Junin, Peru

Televias Puyhuan is a project similar to the Televias Huarochiri project but located in the Department of Junin north of Lima. It has been operating since November 2005. The project is supported by USAid, the Peruvian Government and Motorola and Cisco. The local access network is built using Motorola's Canopy Broadband Wireless Access (BWA) system covering an area of 160 km^2 around the locality of Jauja and is providing access to a potential 16,000 people in this region whose economy is based mainly on agriculture and breeding.

[122] In the course of this research it even discovered two communities of between 100 and 150 people which were not even on the map.

Each antenna can offer connectivity up to 200 line-of-sight (LOS) subscribers in its 60^o arc in a range of between 3 and 8 km depending on the frequency band. The initial network cost US$120,000 and it is planned to invest another US$140,000 to increase capacity to serve up to 600 fixed telephone and Internet subscribers by mid 2007. Customers buy their own customer premises equipment.

Televias Puyhuan's has a simple flat fee pricing scheme with US$16.50 for telephone service, US$23 for Internet access or US$33 for the two combined. Its business plan shows it becoming cash flow positive when it has obtained 280 subscribers.

VII.7.6 Small Commercially Operated Regional Network: The QINIQ Broadband Network in Nunavut Territory, Canada

QINIQ is a commercially run regional network in Nunavut Territory in the Canadian Arctic (Chapter VII.2.2). Local access is provided by pre-WiMAX broadband wireless systems configured to provide non-line-of-sight (NLOS) coverage within 5 km of the base station. The 25 communities of Nanavut Territory are connected to the Internet and among themselves by a full mesh satellite network, enabling any site to talk to any other site on a single satellite hop. Bandwidth is dynamically allocated on a second by second basis allowing it to be effectively shared among all communities, based on demand to ensure that communities who need the bandwidth, get it when they need it.

About 95% of homes and businesses each of the 25 communities are covered by the non-line-of-site (NLOS) signals; however, in essence 100% of the people who wish to connect can connect. There are a handful of homes in two communities, Iqaluit and Pond Inlet, that have trouble getting the signal because they are in a weak coverage area. This is being resolved the use of external antennas.

SSI Micro (www.ssimicro.com), the small local operator chosen by tender to build and operate the network, does not sell to end users directly. Instead, broadband access services are offered in each of the 25 Nunavut communities by community service providers (CSP), local residents who have been selected to offer services to end users. The CSP sign up users, takes payments, provides technical support to their clients and performs various other functions. CSPs are a critical component of the QINIQ service offering. They are typically long-time Northern residents who understand the culture and language of their communities. They receive a 20% commission - 20% of the monthly service plan cost - paid to them by direct deposit to their bank account each month.

New subscribers acquire a non-line-of-sight (NLOS) customer premises equipment (CPE) which includes a modem, built-in antenna and transceiver in a small self-contained unit weighing less than 450 gm (Figure VII.2) with their subscriptions. These can easily be carried home, to the office or indeed to any of the 25 communities in the network. The modem needs simply to be connected to a power supply and to a computer (via an Ethernet cable). Because the system provides NLOS coverage no separate outdoor antenna is required within a 5 km range of the base station.

Prices vary from Cdn$60/month for the 256 Kbps down-link Internet connection (2 Gb download limit per month) to Cdn$400/month for a 768 Kbps down-link connection (20 Gb download capacity limit/month). There is a one time Cdn$50 registration fee and modem deposit of Cdn$150, which is fully refundable when the modem is returned in good working condition and the subscriber's account balance has been paid in full. The usage billing arrangement is purely prepaid.

This model has been successful in providing broadband connectivity to virtually the total population of 29,000 inhabitants living in 25 very widely dispersed communities in a huge territory - twice the size of Colombia - in Northern Canada. The explanation for this remarkable achievement is as follows:

- The initiative to build the network came largely from the local community, through the Nunavut Broadband Development Corporation (NBDC), a not-for-profit community based corporation (www.nunavut-broadband.ca/) which developed the project and continues to oversee it today;
- The contractor chosen to build and operate the network is a small local operator with experience in building and operating telecommunications networks in this environment;
- The operation is run on a purely commercial basis;
- The business model is sound, particularly in the important role played by locally-based community service providers;
- The billing concept is purely pre-paid;
- The bandwidth efficiency pricing plan is excellent;
- The pre-WiMAX technology used for the local access network is very cost-effective.

The relatively high prices are due to the high costs of operating a network in such a remote, extensive area and quite hostile climate and the generally high cost of all goods and services in the far North.

Because of the huge cost of travel among the 26 communities, the QINIQ network and its multi-cast capability are considered to be critical to the development of Nunavut, since through it people can meet more effectively at a distance and when people are impeded from traveling because of the weather, they can still attend via desktop videoconferencing.

VII.7.7 Privately initiated and operated local telecommunications company: Case of Ruralfone in the State of Ceara, Brazil

Ruralfone Inc., currently a privately owned San Francisco, California based company, selected the State of Ceara in northeastern Brazil to establish a telephone company. The choice of Ceara was based on the following purely commercially motivated grounds: (i) at the country level, the size of the internal market in terms of population and per capita GDP at PPP; the presence of local suppliers; and a favorable legal and regulatory framework[123]; and (ii) at the local level, a relatively low teledensity (approx. 7.5%), a high concentration of people, and lack of focus from the incumbent operators to adequately serve the towns.

Quixadá, the first of 17 towns which Ruralfone will build-out in through the end of 2007, situated 160 km from Fortaleza, the State capital, covers an area of 2,060 km^2 (37 inhabitants/km^2), has a population of 47,000 (16,400 households) and a per capita GDP equivalent of R$2,250. According to

[123] Getting a license was particularly easy. Ruralphone obtained its license in about nine months, with relatively little paperwork and at a cost of only US$ 4,100. Local bureaucracy and banking presents a much bigger challenge for the investors.

a 2000 census, 65% of households had an income of at least R$200/month. The Ruralfone model is based on a set of simple management, administrative, technological and commercial principles.

Aside from the management team of six, all of Ruralfone's staff is locally hired. Accounting, legal, regulatory, and auditing functions are outsourced locally. Everyone including expatriates are paid local wages;

Ruralfone's commercial plan is based on local town promotion and daily interaction between the locally hired staff and its local customers;

The network is based on standard, commercial, mature GSM technology (in this case GSM 1800) with readily available handsets and readily available, economically priced network equipment which is manufactured in Brazil and, therefore, not subject to the prohibitive import duties and taxes imposed on foreign manufactured equipment;

Ruralfone does not supply handsets and therefore avoids all aspects of stocking and subsidizing them and instead supplies only the SIM card. Customers acquire their own handsets which are ubiquitous. There is one rate plan, a simple pre-paid monthly plan (Plano Sem Controle) which costs R$35 (US$16) and which allows unlimited calling to any Ruralfone or other fixed line number in the town.

After 10 months of operation, teledensity in Quixadá had increased by 20%, and for Ruralfone the project had become cash flow and EBITDA positive. After 15 months, Ruralfone was clearly meeting the objectives of its business plan.. Four other towns will be built-out in 2006, and the remaining 12 in 2007. All 17 towns are projected to be in operation by December 2007, with a total of 34,500 subscribers (an average of 2,025 per town). The overall operation will be EBITDA positive in April 2008 (three years after launch). It plans to raise additional capital through a private equity offering in 2006.

In addition to these simple and innovative management, administrative, commercial and technology strategies, the project has so far been successful because:

- Costs have been kept to a minimum. Most goods (including the telecommunications equipment) and services have been acquired either locally or within the country;
- There have not been any difficult regulatory hurdles to overcome. Getting a license was convenient and fees were minimal;
- Interconnection and leased circuits present no particular problems. Tariffs are reasonable and arrangements with other fixed line, cellular and long distance operators are simple and without any particular problems. Interconnection agreements were obtained with 20 operators in 6 months. Ruralfone only interconnects with Telemar, which provides transit to all the other 20 operators with which it has an interconnection agreement. It also has a site sharing agreement to use Telemar's rights of way and towers.
- The regulator, Anatel, has been supportive.

The following do however remain of concern:

- Excessive banking and other local bureaucracy;
- High consumption taxes in the sector;

- It is not easy to find local investors and competitive financing from local institutions. The government should consider providing some fiscal incentives and a way to financially support such emerging rural operators.

VII.7.8 Broadband access systems integrator: OmniGlobe Network Model

OmniGlobe Networks is a broadband systems developer, integrator and service provider which offers system design, network build out, connectivity to the Internet and on going operations, maintenance, and back office support to small and medium sized local operators and service providers anywhere in the world. There are similarities with the LocustWorld WiFi mesh model presented earlier.

OmniGlobe works with local entrepreneurs, who have the basic technology and management expertise to operate local Internet access services. Together they identify demand and define a traffic model. OmniGlobe then does all the network design, engineering, installation and training and hands the project over to the local entrepreneur.

OmniGlobe and the local partner share in the monthly revenue and are jointly responsible for the technical management of the local network with OmniGlobe focusing on upstream technology issues and the local entrepreneur assuming responsibility for customer acquisition, local marketing, sales, billing, collection and other commercial matters. Through its network operations centre OmniGlobe can manage all its remote sites.

The local network consists typically of several 'pre-WiMAX' base stations configured in a star network with each 60^{o} sector having a typical range of 30 km (in clear line of sight conditions). The backhaul link to OmniGlobe's main satellite gateway is provided via 2 Mbps channels leased from various satellite operators. OmniGlobe's gateway and network operations centre offers IP Transit (connection to the Internet) and all the monitoring and back office support to the local operator.

The fixed wireless customer premise equipment (CPE) consists of a window mounted (internal) antenna with an optional external antenna for fringe areas connected to a transceiver and a modem. The CPE is connected via a simple Ethernet cable directly to a computer, which may also form part of a local area network with several other computers behind a router.

In a West African deployment, OmniGlobe with a local partner installed a satellite hub and wireless base station system with 6 wireless access points on one antenna (each covering a 60^{o} sector) on the roof of a three story building providing full 360^{o} coverage around the central site giving potential access to 90% of all people living within a radius of 5 to 10 km of the antenna. With each base station (60^{o} sector) capable of supporting a maximum of 250 subscribers this configuration can support up to 1,200 subscribers in the coverage area. The configuration is easily scalable. As subscriber numbers increase, additional equipment can easily be added and a higher density system deployed.

The local entrepreneur purchases the satellite and wireless network equipment including the CPEs from OmniGlobe, which in turn acquires these from specialized manufacturers of such equipment. The local entrepreneur may re-sell the CPE at cost, offer it free of charge, or seek a small margin. OmniGlobe leases and pays for satellite backbone capacity from satellite operators.

The cost for equipment, installation and training for a typical system supporting between 250 to 1,500 subscribers including satellite antenna, satellite terminal, wireless base stations and antennas lies between US$18,000 and US$40,000. (excluding the antenna structures, customs duties, shipping, taxes and travel for one engineer). The CPEs cost about US$400 each. The overall cost for a 250 subscriber system is about US$480/subscriber.

The local entrepreneur's operating costs consist of: (i) bandwidth capacity purchased from OmniGlobe, with the cost depending on the aggregate up-link and down-link speeds required with prices in the order of US$2,000 to US$4,000 per 2 Mbps down-link / 512 Kbps up-link speed capacity; (ii) remote technical support from OmniGlobe which covers system upgrades (firmware), network management, and provisioning; (iii) salaries, employee benefits, administration and selling costs; (iv) license and other fees; and (v) OmniGlobe's share of monthly revenues, if applicable, with the bandwidth costs amortized, and shared over a subscriber growth plan scheme.

The advantages of this systems integration and outsourcing model for providing universal access in rural, remote and underserved areas are the following:

- The system can be deployed very rapidly. The West African installation took only 8 to 10 weeks from the moment the contract was signed with the local entrepreneur to when it was ready for service.
- The local entrepreneur's initial capital requirements are minimal. These are less than US$100/subscriber for a typical 500 subscriber installation; if the CPE can be sold to the subscriber.
- The systems integrator provides system design, network build out, connectivity to the Internet and on going operations, maintenance, and back office support. It also provides training to the local team.
- Satellite bandwidth costs are minimized since the system integrator not only aggregates traffic, but is also able to optimize overall bandwidth requirements by commencing with a shared access scheme, as well as supporting bandwidth optimization software.

VII.7.9 Initiatives of incumbents and large operators: Example of Telefonica in Peru and Brazil

Two initiatives of an incumbent operator are facilitating access to basic telephone and Internet to low income users in underserved areas of Peru and Brazil.

In 2004, Telefonica del Perú selected 17 villages (average population density = 15 inhabitants/km^2) and developed partnerships with municipal governments, churches and private local entrepreneurs to operate the network and provide telephone and an Internet access service in their rural communities for students, entrepreneurs, public institutions and the population in general. Private entrepreneurs in their own locations were free to provide complementary services such as photocopying, scanning, and printing and sell other products such as food and office supplies to increase their incomes. Each location generally has four PCs and is open 15 hours a day, 7 days a week and charge between S/.1 and S/.3 per hour (US$0.33 and US$1.00). Average income from Internet access only is US$668/month.

Telefónica installed the communications equipment (VSAT antenna, solar powered battery, modem and router) at a cost of between US$10,000 and US$15,000 but charged each partner a flat one time starting fee of US$150. The partner was responsible for acquiring the computer(s), the router, furniture and other equipment and for doing any necessary site renovations.The average cost for this was S/.2,200 (US$730) most of which was for the computers[124]. The partner's operating expenses include salaries, electricity, rent and US$150/month to Telefónica to connect to the Internet (for a 128 Kbps up-link/ 56 Kbps down-link).

Benefits of the access points have been to provide Internet access to mainly students and young people who represent 63% of the users of the centers and telephone access for people not close to a payphone.

In Brazil Telefónica Brasil is offering a special tariff plan called "Linhas Economicas", ("Economic Lines") in certain areas of Brazil where there is no or very low demand. The plan has been designed for people with low incomes and customers who are at the point of getting disconnected because they have defaulted on their payments[125]. It is also offered to people who have difficulty in keeping up with regular payments. The plan is tailored to each particular group of existing and potential customers. Local calling to landlines is not prepaid and nor restricted. Long distance calls and calls to a mobile telephone are also prepaid but with a calling card which the customer can purchase at sales points, bakeries, newspaper kiosks, pharmacies, lottery sales points, post offices, and Telefónica offices. Each time the customer makes a long distance call or a call to a mobile he/she has to call a special access number and use a PIN number and a special code to charge the call to the calling card. The customer receives an invoice with his/her monthly calls to local fixed lines. In order to discourage medium and high-income customers from moving to this plan no special features such as caller ID, follow me and ADSL are offered on this plan. As a result, many more people are staying connected. The Linhas Economicas plan was launched in June 2004, and by February 2006 had attracted 2.2 million of Telefónica Brazil's 9.675 million residential subscribers.

VII.7.10 Telecenter models

There are many successful telecenter models in Latin America. The cabina pública, of which there are about 30,000 in Peru alone, is purely commercial. Others rely on one time or continuous subsidies from universal access funds or other sources. Many of these publicly run telecenters offer not only basic telephone and Internet access but also a number of complementary business and commercial services. More details on each of these can be found in Annex 4.

Many large-scale projects have run into financial, capacity, and bureaucratic difficulties. In Chile, only 20 of the 209 private telecenters which received funding in 2002 under the FDT's Programa de Telecentros y de Infocentros are operating today. (Non-commercial and public telecenters have fared better.) As a consequence, the Infocentros program in Chile has been suspended while Subtel examines the sustainability of these telecenters. In Argentina, about one-third of the 3,000 telecenters installed between August 1999 and June 2000 under the US$60 million Argentina@Internet.todos Program are no longer working. In El Salvador, less than half of the 100 telecenters implemented in the Infocentros Project are operating today.

[124] Usually acquired in the grey market.

[125] After 90 days of the default, the operator has the right to refuse to provide the service. Telefonica Brasil decided that under the condition of paying the instalments of the debt, the costumer could remain with access within the low-income plan. The monthly fee for a regular plan is R$ 38.13 (US$ 17.85), for a low-income plan it is R$ 28.70 (US$ 13.43).

These telecenters were partly financed out of the proceeds of the sale of Antel, the state owned telephone monopoly. The plan was to sell them under a franchising model at a cost of US$80,000 per franchise. However, the franchising model did not ensure enough cash flow to maintain them[126.] The project failed to develop a proper strategy to ensure the sustainability of these telecenters. It failed to take into account the legislative restrictions placed on these telecenters in regard to offering services to the government or government agencies. This severely limited the demand for their services.

These projects have often focused too much attention on quickly funding the construction and connection of the centers, and too little attention on such issues as management, training, revenues, maintenance, and locally relevant content.

Recently, a number of Regulatel telecenter programs have begun to incorporate the lessons of past errors, along with a better understanding of best practices. This is yielding the beginnings of a promising "second generation" of telecenter development. Francisco Proenza suggests that there are four key success factors to ensuring the viability of a telecenter. They are summarized in Box VII.7.

Box VII.7 Four key success factors in ensuring the viability of a telecenter[127]

1. The availability of interactive services, including voice, e-mail, chat, and possibly SMS and videoconferencing. Especially important is the availability of VoIP, which helps make voice communications accessible to poorer people. In Peru, 33% of all persons using services at the commercial cabinas publicas use VoIP - 40% of persons from the two lowest socioeconomic strata use VolP.

2. Leadership and local management. Strong dynamic leadership and management from private entrepreneurs, local governments, associations, or NGOs, have helped ensure success and sustainability.

3. The density of users in the vicinity of the center who know how to use the computer and the Internet, i.e., who have a minimum level of digital literacy. The nearby density of the digital literate population determines the potential market of the telecenters, and therefore the likelihood that the telecenters will be used often and survive economically.

4. Good quality connectivity to the Internet at a reasonable price[128].

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[126] Iniciativa de Integración de la Infraestructura Regional en América del Sur (IIRSA), Tecnologías de Información y Comunicación al Servicio de la Competitividad y la Integración Sudamericana, Plan de Acción, Banco Interamericano de Desarrollo, Diciembre del 2003.

[127] Francisco Proenza, "Ecuador: Hacia una estrategia de uso y aplicación de Tecnologías de Información y Comunicaciones (TICs) al servicio del desarrollo local", 4º Informe de la Serie Apoyo a la inversión en el desarrollo de tecnologías de información y comunicación para combatir la pobreza rural en América Latina y el Caribe Centro de Inversiones de FAO Roma 8 de febrero 2006.

[128] The shared satellite connectivity project, which IICD is running jointly with some local NGOs in Bolivia, is paying between US$200 and 250/month for a 512 Kbps (downlink)/128 Kbps (uplink) connection to the Internet per site, even though there are doubts about the actual speeds obtainable (Chapters V and VI). In India, as Proenza points out, n-logue Communications (www.n-logue.com) charges about US$30/month (US$110/month if a telephone is included) to provide connectivity to some 2,400 kiosks. However, the connection speeds are only 70 Kbps (downlink)/ 35 Kbps (uplink), and there is no satellite transport link necessary. N-logue uses corDect local access technology (Annex 5).

VII.7.11 Conclusions: New models and pilots

Table VII.5 shows in a matrix how the various innovative - and the more traditional - strategies and best practices presented above have been applied in these different models and pilots. This table should be used along with Table VII.4 for devising new models and adapting other approaches for universal access. The role for Regulatel in this area is indicated below.

VII.7.12 Recommendations: New models and pilots

New models for providing universal access and the role of Regulatel

- *Regulatel should lead and coordinate in the development of a platform to facilitate the dissemination of information on universal access projects. This platform should give special emphasis to those projects that result from demand-driven initiatives, and involve small entrepreneurs, suppliers and operators. It should facilitate interaction among these stakeholders and build links to technical, financial and other support mechanisms resulting from the other recommendations in this study.*

Telecenters

- *Telecenters should remain an important component of rural access programs, as they can deliver broad-based access to a range of information resources, technologies and other services, especially in rural, remote and underserved areas. Projects to implement telecenters should focus on sustainability and community involvement from the outset, and emphasize training and locally relevant information content, as well as financial and technical aspects. The four key success factors listed in Box VII.1 should be taken into account. Some outstanding models worth emulating are as follows: (i) The Red Cientifica Peruana (RCP) initiative of providing specifications and other information on the requirements for establishing a telecenter and providing follow-up technical support; (ii) The Hungarian Teleház; (iii) The Dominican Republic's LINCOS program; (iv) Brazil's GESAC Program, Acessa Program (Sao Paulo), and Digital Project (Pirai; (v) Uruguay's CASI and CASIL programs; (vi) Cuba's Joven Club de Computación; and (vii) Venezuela's Puntos de Acceso and CBIT initiatives.*

Table VII.5 Overview of innovative and traditional strategies and best practices that have been applied in each model and pilot

Model	Example (locations)	a. Technology innovations	b. Financing innovations	c. Business, commercial, service delivery and partnership arrangement innovations	d. Regulatory provisions and strategies
1. Community telecommunica-tions cooperative	• Agrarian Information System (SIA) Project (Chancay–Huaral Valley, Peru)	• Deployment of WiFi in point-to-point mode	• Partially financed by users	• Run entirely by locals; intensive effort to train and empower young people to operate and administer the network • Deployment of VoIP	• License-free spectrum if such policy is adopted by the regulator for WiFi.
2. Community telecommunica-tions operator	• Sistema de Información Campesina–Indígena Project (Sopachuy, Department of Chuquisaca Bolivia)	• WiFi mesh local access network	• Cost sharing among several local community organizations; some support from local and foreign NGOs • Network available for private customers.	• Shared satellite connectivity (demand aggregation) model • Only broadband	• License-free spectrum if such policy is adopted by the regulator for WiFi.
3. Privately initiated and operated regional telecommunica-tions company:	• Valtron Rural Telecommunication s Pilot Project (Huarochori Province, Peru)	• CDMA 450 for fixed • CDMA 2000 1x (2.5G) for mobile	• Vendor financing • Project finance • Partial support from universal access fund	• Training and empowering of locals who run the company; • Facilities sharing with electricity company • Possibility of sharing office space and billing with electricity company • Full service offering (fixed, mobile, public telephone, Internet access and kiosks, cable TV) • Service offering developed after extensive market survey; adapted to local requirements	• Special tariffs for calls between rural payphones and fixed • Facilities-sharing with local electricity company
4. Micro-operator	• Televias Puyhuan (Jauju, Peru) • Oportunet (Técapan, Guatemala)	• Pre-WiMAx local access	• Foreign donor organizations • Project finance • Local entrepreneur	• Local entrepreneurs • Franchising through a local not-for-profit organization and with the support of a small nationwide local telecom operator (in Guatemala) • All broadband	• In Guatemala, no licenses - only registration required

Table VII.5 Overview of innovative and traditional strategies and best practices that have been applied in each model and pilot

Model	Example (locations)	a. Technology innovations	b. Financing innovations	c. Business, commercial, service delivery and partnership arrangement innovations	d. Regulatory provisions and strategies
5. Small commercially operated regional network	• QINIQ Network, Nunavut Territory, Canada	• Pre-WiMAx local access		• Local contractor chosen to build and operate the network • Run on a purely commercial basis • Important role of the locally-based community service providers • Purely pre-paid billing concept • Bandwidth use efficiency pricing plan	
6. Privately initiated and operated local telecommunica-tions company	• Ruralfone (State of Ceara, Brazil)	• Use of off-the-shelf locally produced GSM 1800 network equipment • In-country procurement of most goods and services		• Simple tariff plan • Only local staff • No expatriate wages • Only SIM cards (no handsets) reduces costs	• Licenses easy to get and inexpensive • No difficulties in negotiating some 20 interconnection agreements
7. Broadband access systems integration and outsourcing	• OmniGlobe Networks (Global)	• Pre-WiMAX local access • VSAT backbone with aggregation of satellite capacity • Very rapid deployment of network (8-10 weeks)	• Revenue sharing between local entrepreneur and systems integrator/outsourcing company	• Outsourcing of design, engineering, installation, initial training, back-up support and acquisition of bandwidth along with internet connectivity • All broadband offering	• License-free spectrum, if such policy is adopted by the regulator for WiMAX
8. Initiatives of incumbents and large operators	• Telefonica (Peru and Brazil)				
9. Commercial telecenter models	• Cabinas publicas (Peru)	• Usually just a fixed line connection (ADSL or dedicated line)	• Self-financed by entrepreneur	• Operates in a very competitive environment • Serves the large majority of people that have no computer at home	• No telecommunications license required • Not regulated

Table VII.5 Overview of innovative and traditional strategies and best practices that have been applied in each model and pilot

Model	Example (locations)	a. Technology innovations	b. Financing innovations	c. Business, commercial, service delivery and partnership arrangement innovations	d. Regulatory provisions and strategies
10. Non-commercial telecenter models	• LINCOS (Dominican Republic and Costa Rica); Joven Club de Computacion (Cuba); Infoplazas (Panama); Compartel (Colombia); Puntos de Acceso and CBIT (Venezuela); GESAC (Brazil); Sao Paulo Acessa (Brazil); Pirai digital project (Brazil); Gemas da Terra Rural telecenters (Brazil); CAATEC (Costa Rica); CASIL and CASI (Uruguay).	• In rural areas usually VSAT and sometimes connected to a cellular network if within coverage area.	• Usually subsidized by UNIVERSAL ACCESS FUND or other government agencies but also partially self financing • In Venezuela, telecenters keep all monies made from telephone and Internet use, because operator providing connectivity has to provide this for free under universal access fund arrangements • In Panama, incumbent offers connectivity at half of normal price.	• Offer telecommunications services, including telephone, fax and Internet • Offer business support services, including photocopying, web hosting, advertising, translation, temporary office space, and clerical and technical consulting • Offer social services, including computer and Internet training, job listings, and local radio broadcasting.	

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VIII. BEYOND THE HORIZON: RECOMMENDATIONS FOR ACCELERATING UNIVERSAL ACCESS IN LATIN AMERICA

VIII.1 Introduction

Up until the early 1990s, telephone access in most Latin America countries was restricted largely to major urban areas. There was little competition, unreliable service, and long subscriber waiting lists. Today nearly every country in the region boasts of robust growth in both fixed telephone and cellular mobile services, and much broader access to public telephones in rural and peri-urban areas. Access to Internet services has grown steadily. Public and institutional projects to connect citizens, students, government, and businesses to Information and Communication Technologies, are expanding rapidly.

Today, investor interest among global technology and telecommunications suppliers, and national and local entrepreneurs, is as high as it has ever been. Prospects seem bright for a new wave of investment and growth, whether in further expansion of telephone and cellular networks, or in installing new broadband access networks.

The discussion, examples, and ideas highlighted in the previous chapters of this report illustrate the strengths of the various approaches that have been taken toward universal access, and the range of challenges and opportunities that remain. There is every reason to believe that the growth trends of recent years can be accelerated and spread to even wider areas and target populations, toward a goal of truly "universal" access. The keys to this are as follows: (i) continuing to emphasize the streamlining of policy and regulation to further encourage market forces and new entrepreneurial approaches; (ii) exploring new technologies; and (iii) designing and implementing tailored financial support mechanisms.

However, these ongoing processes and initiatives do not merely represent a fixed set of plans or programs to be applied in increasingly larger scale. Rather, they represent a constantly evolving mix of experiments and lessons, from which the most promising practices can be extrapolated and combined with new ideas and information, to devise ever mo re effective approaches to universal access policy. The previous chapter and the annexes provide a wealth of information on actual projects, mainly in Latin America. These pilot projects can provide a valua ble service to those who wish to learn from the many positive experiences gained through them.

The purpose of this final chapter is to look beyond the details of current or past experience, and to formulate a vision of next generation universal access options that policy makers and industry stakeholders can consider adopting and adapting.

Specific recommendations for national and local policy-makers, fund administrators, and regulators that are contained in the various chapters are summarized in Annex 1.

VIII.2 A New Vision

To construct a new paradigm of Universal Access policy and programs requires first the definition of a New Vision of ICT access. In the past, the targets of such policies were relatively modest by today's standards. They might have had a goal of providing a single public pay telephone for each village above a certain population, and even this goal typically required several years of sequential implementation. Liberalization and tariff reforms helped increase teledensity mainly in urban areas, and even there only incrementally (Figures VI.4, VI.9 and VI.10). Ultimately, the cellular revolution, and especially the introduction of calling party pays (CPP) and prepaid usage options, led to much faster market-driven growth than expected. Again, this occurred mostly in larger urban areas. Internet access has been largely an afterthought, although a number of promising telecenter projects and private cyber cafés have demonstrated growing interest, and some universal access programs have begun to place more emphasis on Internet services.

The New Vision that we propose represents a much bolder leap forward in ICT access. A confluence of technological advances, dramatic reductions in the price of telecommunications equipment, market interest, political and regulatory capacity, and community involvement are creating the environment needed to carry the telecommunications/ICT sector to new levels of growth and integration.

This vision is based on the very real experiences of numerous other countries, including the United States, Canada, the European Union, Japan, Australia, and Korea. Those experiences have demonstrated the value and impact of ubiquitous, high quality telecommunications and information services, and the viability of extending them to all corners of society. The economic and cultural barriers that perpetuated the digital divide between those countries and much of Latin America – as well as between the urban and rural populations within Latin America itself – are now proving to be increasingly obsolete. Telecommunications, like food, water, housing, and transportation, is becoming a basic necessity of modern civilization, and at the same time, an affordable and beneficial resource, which can sustain, support, and transform communities of virtually any size and location.

There is no longer any reason to restrict our vision of telecommunications and ICT expansion to second-best, low-tech, last generation choices, even for lower income and remote populations. On the contrary, the evidence suggests that the advances of recent years, and those that are imminent, can knock down virtually all remaining barriers to universal access to the full range of high-end ICTs. The section that follows presents a generalized picture of our proposed new vision, It demonstrates the scope of potential deployment, the feasibility of the ideas, and ultimately the steps that might be necessary to bring this vision to reality. Bear in mind that many variations and modifications are possible.

- <u>Network infrastructure, connectivity</u>: In our vision of the not-too-distant future, cellular mobile or fixed broadband wireless access footprints will blanket nearly each entire country, including remote regions. Base stations, or at least the towers or other antenna structures, and backbone connectivity will be shared by operators where it is not cost-effective to build them separately. Often, however, the backbone network will be owned by other backbone operators or systems integrators who will provide the required capacity, dynamically and on demand. In addition, they will provide switching, Internet access (IP Transit), system maintenance, billing, dynamic routing, and other back office type functions, that they make available to local access operators as a menu of options or as a package[129]. These access networks provide sufficient transmission power and capacity to allow all towns and villages within range to be connected with broadband transmission capability (>128 kbps). The range would be about 30 km, depending on the terrain and the associated propagation characteristics. Locally, lower power WiFi signals will be available at strategic locations. Backhaul will be provided via broadband microwave, fiber, coaxial cable, or satellite backbone networks, according to the economics of the location. The hubs of these networks might be located in larger towns, central to administrative regions but not necessarily. In a growing number of cases, these hubs or switches might are located outside of the region, outside of the country, or even on another continent. In these larger towns around the hubs, fixed-line telephone connections (wireless and wireline) will be widely available, linking to a switch either at the hub or in a distant location such as a provincial, departmental or national capital. In most larger locations, the option for high-speed fixed access lines will also be available, for businesses as well as residences, over either telephone or cable TV networks. In smaller towns, local fixed access connections will be linked to public telecenters and administrative locations, with household service available, but on a more limited basis.

- Services: In the larger towns, full service fixed telephone, mobile telephone, broadband Internet, cable TV, and other advanced multimedia ICT services will be accessible to all at market prices. Affordable public telephone and cyber café alternatives will also be available. Individual customers will generally rely upon their personal mobile phones for local voice telephone calls and text messaging. Businesses and institutions will use a combination of fixed lines, cell phones, and local area virtual networks for local and internal telephone calls. For long distance and especially international calling, the majority of customers will rely upon VoIP services – either from personal and business Internet connections, or via public access telecenters, cybercafés, VoIP hard or soft telephones, or VoIP-enabled public telephones. Some customers may have their own VoIP-compatible hybrid mobile devices. Call charges for these services will be low, about equal to local calls.

In some areas, BWA services may be available throughout all larger towns, and public connection to the Internet via these local wireless networks will be for free. These services will be financed by subscriptions, e-commerce and advertising revenues, premium services (including VoIP), and local administrations. The schools, government offices, and business community in the larger towns will share access to multiple high capacity connections on a commercial basis.

The picture in smaller towns and even more remote villages will not be much different. Cellular networks with full mobility and roaming, or with home-zoning or limited mobility functions, and wireless broadband data signals will be widely available, linking to the network hub and backbone. Because incomes are lower, fewer customers will be able to afford individual service, so there will be more emphasis on public access facilities. These will include both informal and formal resale of cellular, BWA ot VSAT based phone service, including officially designated 24-hour public telephones, typically utilizing fixed cellular, or BWA pay phone instruments. The local school and administrative offices will have computer and Internet facilities, and trained technicians able to operate and maintain them. These institutions will offer BWA to students, officials, and the public, in many cases supplemented by separate fee-based public access telecenters, that offer not only

129 OmniGlobe and LocustWorld are two examples of suppliers and systems integrators who offer these types of services, with options available to local access operators anywhere in the world. Most satellite operators also offer backbone capacity with IP transit services, in addition to their more traditional bandwidth capacity offerings.

access but also computer and Internet training. All of these facilities will allow for low-priced long distance and international voice calling via VoIP, and full-service Internet access. Where signals are transmitted via the radiofrequency spectrum, users who have computers with built-in or insertable modems can also obtain Internet access at little or no cost.

In addition to these voice and data services, many locations will also be served by locally originated radio and television broadcast signals, transmitted from a regional hub location. Broadcast programming will be a combination of locally produced material, and programs downloaded to the broadcast stations via the broadband Internet connection or more traditional signal broadcast transmissions. In many areas, cable TV connections will offer national and international programs, as well as local content. Other advanced audio and video transmission technologies, such as broadcast satellite, and Internet "streaming", will augment these choices for many consumers. There will be increasing use of digital audio file-sharing and storage applications (.mp3, iPod, etc.), and users will be able to post their own digital photographs and videos on-line to share with friends and family around the world. Users will have access to a full range of public service applications, including e-government, e-learning, and e-health, as well as innovative and valuable e-commerce functions to enable both employment opportunities and on-line transactions.

<u>Market structure and business sector development</u>: In most towns, many of the local telecommunications services will be locally owned and operated, either by independent community or regional network operators, or by subsidiaries or affiliates of national operators. Telecenters, pay phones, and public access services will be provided by small local businesses, public service agencies, NGOs, local business and trade associations, and government institutions. The backbone connections and cellular signals will be provided by larger national or regional wholesale network operators, that receive revenues from transit and interconnection traffic sufficient to cover their infrastructure costs, and may often partner with local access providers. Local and community services will generally be self-sustaining, in part due to revenue from public institutional users such as government and schools, which are funded by national or state budgets. Other self-sustaining sources of income will include incoming interconnection charges, investments and activities of content providers, advertisers, and other entrepreneurs, and local usage fees. The ICT sector as a whole will become a key source of new employment, economic growth, and diversification of business activity. In particular, it will help to integrate more remote locations with the national and global economy, slowing the decline of traditional sectors and reversing the trend toward urban sprawl, emigration, and the brain drain of talented youth.

VII.4 What is needed?

What combinations of government and industry and civil society initiatives, at the regional, national, and local levels, must be undertaken to bring about this new vision? How should available but limited financial resources be allocated? What technical deployments are most essential, in what size, scope, and locations? There is clearly no single answer to these questions: each country will confront a range of unique barriers and opportunities. Nevertheless, there are some key principles and high priority actions that can and should be followed by stakeholders throughout the region that can go a long way toward accelerating the establishment of truly universal Information Societies.

The most critical elements of this new paradigm are summarized in the following sections.

VIII.4 High-level planning and coordination

The goals of widely disseminating access to advanced ICTs and rapidly moving toward an integrated Information Society, go well beyond the mandate of telecommunications regulators and of the telecommunications sector. The role of telecommunications should be coordinated at the highest levels of public sector planning and policy with other key stakeholders and strategic efforts. Many developing countries have adopted poverty reduction strategies with the support of international organizations such as the World Bank and CEPAL. Policy-makers should consider developing similar multi-sector Information Society strategies, with an eye toward bringing together the resources and leading voices needed to implement them effectively. Some of the essential features of such a coordinated strategy should include:

- <u>Multi-sector participation and leadership</u>: Many ambitious projects have been hindered by a lack of cooperation among key agencies, and especially by a lack of leadership. Ideally, there should be a high-level coordinating committee or other institutional structure separate from the Universal Access Program or Fund administrator, with sufficient mandate and active participation to ensure common planning and sharing of resources and ideas. The various sectors and stakeholders that should be brought in include the following: (i) the national government departments responsible for telecommunications and ICTs; (ii) the regulatory authorities; (iii) fund administrators; (iv) small and large operators and service providers; (v) suppliers; (vi) education and health sector officials; (vii) broadcasters, cable TV operators, and participants from other media such as journalism, audio/video; (viii) energy and transportation infrastructure specialists; and (ix) civil society representatives involved with disseminating and applying ICTs for development purposes. The mandate and leadership of these planning efforts should be given the highest-level authority possible. In some, but not necessarily all, Regulatel countries, this responsibility may properly be assigned to telecommunications sector officials, given their technical and market expertise.

- <u>Coordination of policies and initiatives</u>: The main objective of such a coordinating committee should be to ensure that the initiatives of different agencies are not undertaken in a vacuum, but are built upon each other in complementary and cost effective ways. The goal is to avoid duplication of effort and resources. Telecommunications infrastructure projects should be planned with an understanding of other infrastructure investments such as electricity and roads. Information Technology programs, whether for schools, government offices, or communities, should correlate closely with network rollout plans, even if the financial and implementation mechanisms are under the control of different authorities. Municipally sponsored projects should dovetail with national or regional projects. This is not to say that all activities must be confirmed in advance under a single master plan, or that individual and local initiative should be stifled, but to ensure that there is an open forum for sharing resources, ideas, and experience as effectively as possible. Such coordination is especially essential in the realm of e-government programs, which are often hampered by limitations in technical personnel and other resources.

- <u>Demand aggregation</u>: Deliberate aggregation of both public and private ICT demand can create strong incentives for investment, particularly in more remote and under-served areas. Governments tend to be among the largest customers for telephone and ICT services, equipment, and applications. The trends toward implementing e-government systems can involve large new requirements for government network connectivity, including links to remote offices and local administrations. These projects, together with similar plans for ICT access and applications in schools, health clinics, and the like, suggest that new and high capacity network connections to many locations can be financed largely or entirely by payments from government resources. The market opportunity for potential suppliers - whether national or local operators - can be optimized by coordinating these types of plans in tandem with public universal access objectives.

- Capacity-building: Human resource capacity is an overriding prerequisite for the successful design and implementation of all ICT development programs and universal access policies. Coordination of training and capacity-building efforts in this area can be highly cost-effective. This is particularly true of technical training programs, such as those that are aimed at enhancing the capabilities of public agency staff to utilize computers, software, Internet, and other applications. However, capacity-building for regulatory authorities, policy-makers, local government officials, smaller entrepreneurs, and the public is also important to enhance the effectiveness and value of access projects across the sector. These programs should be instituted on a broad, inter-agency basis to maximize their impact and use of resources. They should also encourage the development of private and independent training and human resource enterprises.

The specific recommendations summarized in Annex 1 under A. Universal Access Programs and Funds, address this identified need for high-level planning and coordination.

VIII.5 Further unleashing of the market

In virtually all countries in the region, our analysis suggests that there is more room for progress - in some cases a great deal - in fostering market-based investments and entrepreneurship to help fill the remaining gaps in the delivery of both basic and advanced ICT access. With the ongoing developments in telecommunications technologies influencing economic conditions, the market frontier is continually being reduced. The lingering policy and regulatory barriers to further market-driven growth are typically not being removed fast enough to keep pace. To accelerate the opportunities for new players, from trans-national investors to local SMMEs, to invest in the expansion of ICT networks for underserved populations, governments must regularly re-evaluate the appropriateness of restrictions, obligations, procedures, and financial barriers to market expansion (Chapter VI). The sections that follow present some critical considerations to emphasize in the review of policy:

VIII.5.1 Ensure technological neutrality

Technological neutrality in the design and implementation of Universal Access policies is an important principle. Industry operators are often in the best position to determine the most appropriate and cost-effective technical means to provide services under different conditions. Technological neutrality is even more imperative in the current environment of rapid and uncertain technological change, particularly in the area of rural access technologies.

The role and potential of VoIP applications is one of the most prominent and critical examples (Chapters VI and VII) VoIP creates the potential for vast shifts in underlying service costs and pricing, to the advantage of rural customers and operators in particular. However, regulatory and licensing restrictions on this service can impede its development. These restrictions are often left in place principally to maintain the status quo for traditional operators – and they wind up damaging universal access prospects. Eliminating these barriers, and actively encouraging such "disruptive" technologies as VoIP can go a long way toward accelerating the realization of our Vision of a new Universal Access landscape in Latin America.

VIII.5.2 Reform and expand frequency access and small operator licensing

Lack of access to available radio spectrum is one of the most significant obstacles to rapid and competitive expansion of telecommunications networks, especially in rural areas. In many Regulatel countries, restrictions and barriers in the assignment and use of key frequency bands continue to hinder potential market initiatives. This involves basic allocation of frequencies, licensing restrictions, burdensome application and approval procedures, qualifying criteria, and fees. The prospects for integrating new broadband wireless technologies and expanded fixed wireless and mobile services will hinge greatly upon streamlining and eliminating many of these barriers.

The licensing process, and related market structure policy, should be tailored to encourage new entrepreneurs and independent local operators and investors to play an active role in expanding the scope of ICT access, especially in rural areas. In many Regulatel countries, the current licensing regime still inhibits or restricts the prospect of local entrepreneurship in the telecommunications sector.

VIII.5.3 Facilitate dissemination of new and adapted technologies

Telecommunications equipment manufacturers faced with stagnating sales in the developed world have been putting substantial effort into developing new technologies and adapting existing ones for markets in the developing world. Mature narrowband (2G) network and terminal equipment is being improved, made more rugged and inexpensive and generally more adaptable for use in rural and remote areas. Many large or medium-sized traditional manufacturers have been developing various types of wideband mobile (2.5G and 3G) and fixed BWA systems that promise to provide inexpensive, high-speed data and voice access to whole communities or large regions. In addition, small companies, many of which are local, have adapted, further developed and integrated existing technologies for use in specific rural and remote area applications. Many are using mass produced WiFi, VoIP and other proven technologies to provide innovative and affordable communications solutions for remote areas of Latin America.

This study has repeatedly demonstrated that there is great potential in achieving many universal access goals by promoting demand-driven, small scale, locally-initiated projects. A number of very promising initiatives are presented in Chapter VII and the corresponding Annex 2. Such projects do not have large visibility however, because they are so small. Small entrepreneurs and communities that are prepared to take the necessary initiatives to provide access, may not be aware of the most appropriate technology and source of that technology for their particular circumstances. The supplier may also be relatively small and quite new in the market, and may not be very knowledgeable about the region that is seeking to be connected. An important element of the new paradigm is the creation of a platform or environment which facilitates the spread of information on particular regional requirements and circumstances, and on the various possible technical and financial solutions which may be available. Such a platform should be tied in with other elements of the paradigm, such as specially targeted micro-financing possibilities, proposed regulatory adjustments and service and market innovations. It might be web-based, but would also encourage and facilitate meetings between stakeholders, and learning from actual experiences in the field. It could be used to neutrally evaluate the success factors of such small scale demand driven pilot projects and determine the extent to which they are replicable in other places where circumstances are different and if not what adjustments might be required. Regulatel would be the ideal coordinator and driver of such a platform for Latin America. The platform should also involve NGOs, academia and multilateral financing institutions.

VIII.5.4 Further streamlining and reform of regulatory processes

Effective regulation remains a cornerstone of telecommunications development policy, and regulatory oversight and implementation will be an even more critical component of a broad-based universal access strategy. Chapter VII.5 of this report discusses a number of regulatory measures that are central to achieving the universal access objectives in this vision. They include spectrum use policies, VoIP, licensing, quality-of-service and standards policies, tariff and interconnection regulations, and facilities and infrastructure-sharing. As more players, more diverse technologies, and a wider scope of services and applications become involved in an increasingly competitive landscape, the regulator’s job is to ensure that affordable access to high-quality services is achieved fairly and can be sustained.

- Interconnection: Procedures and standards for interconnection are a critical component of any telecommunications policy, and are especially essential for effective implementation of Universal Access programs. All of the operators providing network facilities and telecommunications services must be confident that they will be able to interconnect with each other on fair and efficient terms, with timely support and response to technical requirements. Where a range of alternative technological solutions will be used, the technical specifications for interconnection could become especially complex, requiring that the regulator engage actively with engineering specialists in the affected operators where any conflicts may arise. Of course, the financial terms of interconnection can make the difference between viability and failure, especially for small, rural operators. Some have advocated introducing “asymmetric” interconnection charges, so that rural operators will receive higher terminating payments than the must pay out in charges to other operators in recognition of the higher per unit costs of building and operating rural networks. This type of policy option should be seriously considered in the context of broader interconnection terms and conditions. Most important is to ensure that interconnection agreements are arrived at quickly and fairly whenever new operators enter the market, to reduce risk, speed up the launch of services, and generate needed revenues on a timely basis. The regulator has to ensure that large and small operators are treated equally in this respect.

- Facility and infrastructure sharing: Related to the issue of interconnection, is the need to promote facility and infrastructure sharing rights and obligations. New and smaller operators must be able to share, on an equitable but financially viable basis, available rights of way, towers, poles, conduit, building space and equipment. They must be able to lease dark fiber and unbundled network elements from larger and more established operators at cost-based prices and under non-discriminatory terms and conditions. These issues are often viewed primarily in the context of head-to-head competition between incumbent and new competitive operators, including access providers. This is especially true in larger urban areas and more developed networks and economies. In pursuing rural network access deployment, such facility and infrastructure sharing requirements can help encourage the very investments needed to connect previously unserved locations. Allowing a given operator to share space on microwave and cell towers to connect lower power wireless transmitters, will make implementation more financially viable. The same can be said of permitting a given operator to lease of excess backhaul transmission capacity at prices based on marginal costs. The larger infrastructure operators often end up benefiting through the new traffic that is generated for their networks by small local operators established in areas which these larger operators did not want to provide service.

- Prices: In a number of Regulatel countries, wholesale prices remain an important challenge. Excessively high prices for high capacity leased lines, can undermine the business prospects for firms and Internet Service Providers, particularly those serving small markets. While competition for retail services and the rise of VoIP are likely to continue to drive down most consumer prices, backbone and international higher capacity services are not nearly as competitive in many remote locations. Regulators should examine the rationale for these and similar excessive prices and introduce measures to ensure that prices are not prohibitive.

Annex 1.B.4 presents specific guidelines with respect to these and other regulatory policies and strategies for universal access.

VIII.6 The new mandate of the Universal Communication Fund

The role that universal access/service funds have played in the growth of telecommunications in Latin America over the past decade has been important, although not nearly as much so as the market forces highlighted above. The funds have helped to close some of the gaps not addressed by the market, especially in the most remote areas. However, in many cases, very large amounts of collected funds have remained unused for various bureaucratic and political reasons. Where funds have operated even partially many thousands of citizens and communities have benefited, and the lessons learned are valuable for countries that are still struggling to broaden access.

But to a large extent, the previous mandate of these public financing mechanisms is becoming outdated as a result of rapid changes in the telecommunications sector. Access to cellular mobile networks has spread to 90% or more of many countries' populations on a purely commercial basis, with room for the market to cover yet further segments. Demand for services beyond basic voice telephony is accelerating rapidly, just as new technologies are creating innovative and cost-effective means by which to deliver these services. As the objective of universal (community-based) access has begun to become reality, a new goal of concentrating on universal (i.e. individual) service presents itself. Where network access is available, regulators and fund administrators must begin to ask about the affordability of services for those on the lowest end of the income spectrum, and to consider mechanisms for supporting these users' needs.

While this report has highlighted many recommendations for further improving, streamlining, or realigning the activities of public UAFs/UNIVERSAL ACCESS FUNDs, it is useful to define a new mandate altogether for the role of these funds. Key dimensions of the next generation Universal Communication Fund (UCF) are as follows:

- Support for ubiquitous deployment of advanced technologies and services: The new UCF should become a leader, not a delayed follower, in ensuring that all populations have access to the most modern and effective networks, services, and applications available on the market. Section B of Annex 1 presents specific recommendations for innovative transmission technology strategies and practices for local access. The present view of this horizon includes broadband, wireless, multi-service platforms permitting full access to all functions and features of voice telephony. It includes Internet access, data transmission, e-commerce and e-government, multimedia entertainment, and interactive communications on a global scale. There should be minimal barriers and restrictions. As new capabilities come on-line, the vision should shift to encompass them. The system should be flexible and open enough to ensure constant adaptation, just as businesses and consumers must do. The overriding purpose of the fund should be to maintain a front-line position along the market frontier, continually assisting the expanding ICT industry to close whatever access and service gaps may arise, while reinforcing the sector's ability to push back the market frontier.

- Emphasis on market orientation, sustainability, entrepreneurship: The role of the new UCF must be seen clearly as augmenting and encouraging the market. It should partner with commercial ventures of all sizes. Its plans and functions should be approached with the same business-minded perspective, even while it emphasizes non-market benefits and objectives that the private sector may not address. The fund's purpose is not to supplant the market, but to encourage and help it, from the expansion of large telecommunications operations to the establishment of new, small enterprises. These, in turn, will be able to grow, innovate, and take the industry in new directions beyond what the fund's initial financial infusions could ever contemplate. The UCF can transform its role from one of primarily government subsidy to a strategic player in the evolving marketplace, by using at least a portion of its financial and human resources to act in the innovative way proposed in Chapter VI.3.4d. It would be more a kind of public-private financing institution, offering a range of venture capital instruments, loans, guarantees, grants, and micro-credit services, often in partnership or coordination with other public interest and private mechanisms (Summary of Recommendations, Annex 1, A.3 and B.2).

  This role depends heavily upon adequate technical capacity and acumen within the UCF administration. In this respect, the fund should not seek to over-reach its capabilities, or its position in the industry As discussed in Annex 1, Recommendations A.2, the fund administrators will generally need greater autonomy in deciding how money is to be disbursed. Where private or more well-established financial mechanisms exist, the fund should not compete with these nor otherwise distort the market. Where partnership with other financing agencies would further both groups' objectives, the fund may be able to play a more passive role, by contributing to a larger process. But where key gaps exist in access to start-up capital, commercial loans, consumer credit, risk mitigation, or there are other vital impediments to telecommunications sector expansion, the fund should be prepared to step in and help build commercial bridges between small entrepreneurs and sources of financing to create long-term sustainable financing (Annex 1, Recommendations B.2, Financing Innovations) .

- Decentralized, bottom-up planning and project definition: The success of community-focused projects depends critically upon the active involvement of stakeholders at the local level, from the planning to the implementation stages. Each fund-financed project should ensure that key local representatives and organizations are engaged and committed to following through with management or operation of new local and regional networks, school programs, and entrepreneurial ventures of all kinds. In many cases, the best approach will be to promote the economic and social development of the locality and the region, to foster small business opportunities, and to provide jobs, training, and income for women and men in the targeted communities. This objective implies that necessary capacity-building measures should be incorporated into projects, to help expand the options for local participation and long-term success (See below).

  As discussed in Chapter VI.3.3, project definition and fund disbursement can be streamlined and accelerated by encouraging local participants to identify and plan potential projects from the outset, rather than relying primarily upon top-down, centralized approaches. To the extent possible, the UCF should emphasize a bottom-up definition of objectives, needs, and opportunities, and make financing available according to general and flexible criteria, in much the same manner that commercial banks respond to market trends rather than try to create them (Annex 1). The fund must maintain ultimate control of its allocation decisions, and base them upon transparent and non-discriminatory principles and high-level development targets. But it should promote innovative, entrepreneurial thinking among those most likely to be directly affected by its decisions at the local level.

  It is also very important that national, regional and local universal access programs be coordinated with community organizations and NGOs that are striving to achieve similar goals (Chapter VI.4.5). This is not only to avoid wasteful overlap, but also to create an environment in which these organizations – and the Fund administrators - can learn from each others' experiences. The fund administrator or regulator can often be of great assistance to these smaller, less well-connected organizations (Annex 1, A.6).

- Target universal *service* goals, and open access principles: The time may have come - it is at least certainly nearing - when the UCF's policy goals should move beyond public, community-based access to communications facilities, toward our vision of true universal *service*, on the individual consumer or household level, and the individual institution or business level. The funds must begin to focus not only on infrastructure deployment and service availability, but also upon innovative measures to ensure that communications services are actually utilized by people, businesses, and institutions at all levels of society. This may require developing demand-side subsidy programs, along the lines of the Universal Access Fund models in North America and the European Union. In these subsidy programs, low-income households and key public institutions qualify for reduced-price or even free service - various means-tests ensure fairness and appropriate allocation of resources.[130]

[130] It has generally not been within the mandate of this study to examine or recommend such demand subsidy mechanisms, although there are a number of working models in place in the regions mentioned. Before such programs are introduced widely within Latin America, it may be more appropriate to review the impact of new technologies

One of the most promising features of the newer technology platforms, particularly BWAs, is that they offer the promise of much lower costs and prices for all manner of high-quality services, from international voice telephone to high capacity Internet based communications. Open access to public networks and services is an important component of universal access. Open access to WiMAX signals within a community implies that all users may connect to these networks for minimal charges, or even for free, if the local government underwrites the connections. With such systems and principles, actual use of services can be dramatically less expensive for most common applications. Then the UCF can focus its efforts on helping to expand demand and supply of related equipment such as computers, soft phones, and new integrated wireless devices needed to take full advantage of the technologies, as well as appropriate applications, content, and capacity-building (See below).

- Incorporate support for ICT applications, content, capacity building: The success of advanced telecommunications/ICT development programs will depend as much upon the quality of the information content and applications available via new networks, and upon the level of training and awareness of implementers, administrators, and users, as upon the availability and affordability of infrastructure and technical facilities. Other programs besides universal funds may often take the initiative in supporting some of these needs, and these must be coordinated with infrastructure and service financing projects. But there is a strong case to be made for incorporating such "soft" components into the mandate of the universal access fund as well.

It makes sense to expand the view of program financing to help launch and sustain enterprises that highlight innovative uses of technology, business practices, financing, and service provision, that can generate increased demand and economic benefits for local communities. This is particularly true when the fund is focusing on the activities of small ventures engaging in a variety of creative business plans, or other commericially-oriented enterprises. Service innovations might include the following: (i) human interest video and audio programming (news, entertainment, public affairs) transmitted via the Web over broadband links, and simultaneously on broadcast and cable TV facilities; (ii) instructional and informational interactive software applications for small businesses, farmers, mothers, students, the disabled, and other interest groups; and (iii) on-line discussion, research, and self-expression programs to encourage promotion and exchange of indigenous cultural legacies and local political initiatives. All of these and countless other ideas are likely to have both commercial appeal and social value worthy of some degree of financial backing by the fund.

As discussed above, human resource capacity is the lynchpin for training and capacity- building. There is a pressing need to reinforce personnel skills within the public and private sectors, and to educate consumers, user groups, entrepreneurs and small operators. Universal funds should strongly consider requiring that training programs be an integral component of their financing strategies. Such programs may include the underwriting of existing or new technical or management training initiatives by established educational institutions. They may include industry-based training to be introduced by service providers as an element of their business plans. The market value of such capacity-building may be longer-term in nature, and therefore, difficult for entrepreneurs and

mentioned in this section and throughout this report, to determine their effect in reducing affordability gaps for both voice and Internet services.

small businesses to justify within their tight budgets. For that reason, it is especially appropriate for public, shared industry through the universal fund mechanism.

There are a set of specific recommendations on business practices, commercial, service delivery and partnership innovations in B.3 of Annex 1. These recommendations relate to this general area of developing support for ICT applications, content and capacity-building.

VIII.7 Role of Regulatel

Regulatel can and should play a vital role in ensuring the implementation of this new vision for universal access in Latin America. As pointed out in Chapters VI and VII, and Annex 1 (A.7, B.2, B.4 and C.1), Regulatel should gather, analyze and disseminate among its members best practices with respect to policies, strategies, and applications in all areas of universal access programs and funds. That includes general policies, strategies and operation of universal access programs and funds, technologies, special regulations, innovative business practices and financing mechanisms, service delivery alternatives and partnership arrangements. It should create and maintain an up-to-date data base of relevant indicators. It should promote cooperation and assist in training of all stakeholders in areas of universal access.

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Annexes

ANNEX 1

SUMMARY OF SPECIFIC RECOMMENDATIONS

We recommend the following actions with respect to universal access programs and funds, innovative strategies and practices for universal access projects, and new models for providing universal access, and the role for Regulatel:

A. UNIVERSAL ACCESS PROGRAMS AND FUNDS

A.1 Universal access policy, strategy and coordination among stakeholders

- The design of universal access fund programs should take into account the attributes f successful programs indicated in Box VI.4 (Attached) [VI.3.6 a].

- Active participation of all stakeholders in the development and operation of these programs and funds is critical to their success. This includes the fund administrator, operators, manufacturers, regulators, the policy-makers, and state and local governments. It is therefore important that these stakeholders initiate and maintain an open and ongoing dialogue. Engagement of local activists, especially those involved in initiatives at the community level, should be encouraged. The small rural operators and local manufacturers of equipment for rural applications should not be excluded from this dialogue [VI.3.6 a].

- Policy-makers should encourage projects that are initiated at the local community level by private citizens, community groups, local governments, small and local entrepreneurs and NGOs. Policy-makers and fund administrators should learn from the experience of these projects and initiatives when they are developing broader-scale programs [VI.3.6 a].

A.2 Giving fund administrators greater autonomy to disburse funds

- Independent boards and commissions of universal access funds should have greater autonomy to disburse funds without having to seek further ex-ante project approvals from other government authorities. Projects receiving funding in this way would still be subject to reporting during construction and ex-post auditing once the project has been implemented as is the case with other government funded project (VI.3.6 b).

A.3 Restructuring universal access funds to permit venture-oriented financing of projects

- Universal access funds should be structured so that a portion can be used for micro-financing operations, including the offering of loans, equity participation in projects and the implementing telecommunications company, grants, or a combination of these operations. Application of funds out of the micro-financing budget item should be subject to somewhat different criteria with respect to risk - there would need to be some provision for occasional failures and defaults [VI.3.6 c].

- The staff of universal access funds should be trained to evaluate venture–oriented, entrepreneur-driven project proposals. The boards or commissions of these funds should then make decisions on financing these projects based on the evaluation and recommendations of the fund staff [VI.3.6 c].

A.4 Project design and implementation

- Policy-makers should take into account the attributes of successful projects as indicated in Box VI.5 (Attached) [VI.3.6 d].

- Performance indicators used in output based aid (OBA) schemes should be along the lines of the ones indicated in Box VI.7 (Attached) [VI.3.6 d].

A.5 Project follow-up and the timing of subsidy flows

- Fund programs must have provisions for and adequate resources to supervise projects during both their implementation and operation phases. Fund administrators should ensure that there are no delays in paying out approved subsidies [VI.3.6 d].

- Fund administrators and regulators should support the establishment of a centralized institutional framework for rural operators to obtain ongoing technical, management, procurement, and other assistance and support, following contract awards [VI.3.6 d].

A.6 Other financing initiatives

- For rural connectivity projects, governments and regulators should be prepared to assist in ensuring the following: (i) that the terms and conditions of contracts between satellite and other backbone operators, and operators of universal access projects, are clear, unambiguous and fully understood by all parties; (ii) that the responsible parties meet their obligations with respect to quality of service, response times, and liabilities; (iii) that the prices charged are cost-based; (iv) that bandwidth sharing ratios are clearly specified and respected; and (v) that there is provision for compensation if these conditions are not met [VI.4.6].

- Persons and agencies involved in Universal access funds, should be aware of the large demand in rural areas for combined telephone and Internet access. National universal access programs should build close relationships with community organizations and NGOs, such as the International Institute for Communication and Development (IICD). These relationships will help to ensure that community-based projects are well coordinated, that potential overlap is avoided, and that these projects can be rolled out quickly, without bureaucratic hindrances [VI.4.6].

- Fund administrators, regulators and larger, established operators should consider supporting small community-based projects, by giving them independent technical advice and legal support during project design, construction, and especially during contract negotiations with service suppliers [VI.4.6].

- Fund administrators should contemplate subsidizing the high cost of good quality satellite backbone capacity for such small community-based projects, if no other terrestrial alternatives are available [VI.4.6].

- Regulators, government officials and the telecommunications industry should support the GBSI initiative (Chapter VI.4.5) [VI.4.6].

- Government agencies, the telecommunications industry, and NGOs should encourage, support, and facilitate international cooperative and private satellite bandwidth aggregation and integration [VI.4.6].

- For small, community based universal access projects it is important to take into account the lessons learned as listed in Chapter VI.4.5 [VI.4.6].

A.7 The role of Regulatel

- Regulatel should gather, analyze and disseminate best practices with respect to:
  - Policies, objectives and strategies pertaining to universal access programs and projects;
  - The application of universal access funds to venture–oriented, entrepreneur-driven projects;
  - The application of bottom-up approaches for developing and initially vetting universal projects using the Ecuadorian FERUM and Salvadorian FINET models as guides;
  - The disbursement of funds, and the supervision and project follow-up in Regulatel member organizations;
  - The most appropriate technology for universal access, including results of in situ trials and pilot projects;
  - The promotion and facilitation of demand-driven and small entrepreneur-initiated projects;
  - Special regulations and licensing conditions that should apply to rural operators, including tariff regulations designed for the rural environment;
  - Programs to assist small rural operators in the management, administration, financing and commercialization of their projects;

  - New universal access models based on service, technology, financing, commercial and administrative innovations;
  - Information on multi-lateral funding of universal access projects in the 19 member countries [VI.3.6f].

- Regulatel should create and maintain a set of indicators based on international best practices in universal access fund programs that can help the 19 members measure the results obtained by their programs and define objectives to be attained. The set of indicators should also help provide a more objective way of determining if universal access goals are being met. The various indicators gathered and presented in this report should serve as a starting point for establishing a Regulatel universal access data base [VI.3.6f].

- Regulatel should implement training, exchange and cooperation activities to actively promote and extend the concept of universal service funds being used to finance venture–oriented, entrepreneur-driven projects [VI.3.6f].

- Regulatel can play an important role in this especially through its cooperation and annual summits organized with AHCIET [VI.3.6f]

A.8 Operators and manufacturers

- Policy-makers and fund administrators should ensure that there is an open and continued dialogue between them and operators, service providers and manufacturers on plans and strategies for universal access programs and funds. Regulatel can play an important role in this, especially through its cooperation and annual summits organized with AHCIET. It is important that this dialogue include the small rural operators and local manufacturers of equipment for rural applications. Regulatel can also act as the clearinghouse for information on multilateral funding of universal access projects in the 19 member countries [VI.6.2].

Box VI.4: Attributes of successful universal access programs and funds: BEST PRACTICES

Successful universal access programs and funds are characterized by:

- Clearly defined objectives, strategies and plans derived from public consultation with all stakeholders, that take into account the national ICT agenda and its role in the social and economic development of the country;
- Clear, solid and unambiguous legal and regulatory framework, including strong provisions that prevent funds from being used for other purposes;
- Consistency among the various pieces of legislation that concern universal access;
- Well-defined roles of the regulator and administrator;
- Clearly defined and transparent process and procedures for requesting and obtaining subsidies, whether through a minimum subsidy auction or other method;
- Strong and continued political and administrative support;
- An administrative and regulatory environment and fund structure that:
  - facilitates and actively promotes the deployment of new services and technologies, including new fixed and mobile broadband technologies;
  - encourages the development and involvement of small, independent, decentralized, community-based telecommunications companies and cooperatives;
  - encourages and facilitates the development of demand-driven, entrepreneur-initiated projects;
- Flexibility to adapt to changing circumstances, including new technologies, services, and delivery methods;
- Clearly defined funding obligations, with some flexibility to adapt to changing circumstances, but with any changes being subject to prior consultations with other stakeholders and with those most directly affected;
- Strong and effective leadership at both the policy and implementation levels, and a high degree of autonomy for the fund administrator;
- Transparent and participative process of identifying projects and awarding of subsidies;
- An effective mechanism for receiving and acting quickly on user complaints;
- Sustained, but not excessive, project supervision and follow up;
- Provision for pre-selection of bidders to ensure that only experienced operators and service providers can participate in bids;
- An efficient internal management characterized by minimal paper work, and an unencumbered decision-making process;
- A method and formula for disbursing funds that reduces the financial burden on operators receiving subsidies, but leaves the administrator with adequate means to control the implementation and operation of each project;
- Provisions for requesting and receiving essential data needed by the fund administrator to control, follow-up and plan projects.

Box VI.5: Attributes of well designed universal access projects: BEST PRACTICES

Well designed universal access projects are ones that:

- take into account:
  - Basic project parameters, such as availability of electricity, rights of way, local sensitivities, and the ability of users to pay;
  - Optimal backbone capacity requirements;
  - Other competing or complementary infrastructure projects;
  - The potential impact of competing technologies;
  - The particularities of the community and region to be served, including its topography, economic activity, income, population density, and local politics.
  - The cost to rural operators of various local, state and federal taxes, license, spectrum-usage and other fees, performance bonds, missed target penalties, borrowing, reporting requirements, and the transaction costs of administering the subsidies;
  - Operators' need for predictable cash flow;
  - The need for an optimum balance between public and private sector contributions and risk sharing.
- have clearly defined conditions and requirements imposed on operators and service providers, including quality–of-service obligations (e.g. the maximum number of rural stations that can be out of service at any one time; the maximum amount of time required to repair a station that is out of service), and a minimum set of qualifications required for administrators of rural telephones, telecenters and rural telephone companies;
- allow operators and service providers complete freedom to choose any technology they wish to deploy so long as it meets quality- of-service, interference and type approval requirements;
- permit other non-subsidized services to be provided;
- contemplate providing one stop shopping for all service licenses;
- have license conditions with enough flexibility to adapt to changing technologies and circumstances;
- have performance indicators that take into account the particular circumstances under which rural operators have to provide service;
- are accompanied by business plans that confirm their sustainability during the life of the project - each project should be subject to a cost-benefit analysis to determine its benefit to the people who will be served.

Box VI.6 Lessons learned and best practices from World Bank sponsored output based aid (OBA) universal access fund projects

- OBA has been effective in bringing infrastructure closer to the unserved;
- The use of OBA schemes has demonstrated that commercially sustainable operations are feasible in rural and low-income areas, and has led to accelerated deployment;
- OBA has increased overall investment in infrastructure;
- The use of OBA schemes leverages substantial additional private sector investment;
- The key to successful OBA is competition;
- OBA is no substitute for sector reforms;
- Successful OBA programs make use of coherent and adaptive results frameworks;
- Substantial outreach activities are required to ensure successful implementation of OBA;
- Sustainability of OBA programs is increased through small and predictable contributions by all sector players;
- Adequate due diligence needs to be conducted prior to the launch of an OBA program;
- OBA programs involve substantial administration - innovative approaches toward shortening and streamlining the OBA life-cycle are necessary;
- A complete set of operational guidelines and reference documents may need to be developed for OBA;
- The design and implementation of OBA in the ICT sector must constantly evolve as technology and markets change;
- The new generation of OBA ICT programs will need to focus on both supply-side and demand-side stimulation.

Box VI.7: Guidelines for performance indicators used in output based aid (OBA) schemes

Performance indicators for OBA schemes should:

- Focus on the needs of users in rural and remote regions, including when service needs or does not need to be available, what charges should be applied, and what means there are for people to pay;
- Be quantifiable and calculated according to a clearly defied formula, which diminishes or eliminates any element of subjectivity;
- Not be administratively and financially burdensome for the operator to gather and process;
- Have penalties that are in proportion to the cost and inconveniences suffered by users;
- Have have indicators designed to encourage the operator to improve quality and to invest;
- Take into account operational and maintenance difficulties and costs involved in accessing, operating and maintaining service in remote and difficult locations. They should, for example, recognize and make allowances for batteries that cannot be recharged until the sun returns, and for very remote stations where maintenance is very difficult and expensive.

B. INNOVATIVE STRATEGIES AND PRACTICES FOR UNIVERSAL ACCESS PROJECTS

B.1 Transmission technologies for local access

➢ Policy-makers and universal access fund administrators should support:

- The deployment of and experimentation with local access networks using new wireless and wireline technologies, including WiFi, WiMAX, SCPC DAMA and PLC;
- The use of second and third generation mobile technologies, including those operating in the 450 MHz band, as a fast and cost-effective means to deliver not only voice telephone, but also broadband service, in rural areas[131];

[131] There might be less need to subsidize cellular network rollouts, where overall returns to these investments make rural deployments profitable in any event. Conditions of the licenses should focus principally on ensuring that network coverage leads to practical public access wherever possible.

- The deployment and uses of new broadband technologies, at least on a trial basis. As the field evolves, a rapid shift in focus away from traditional narrowband and voice-only projects, toward full-service, high-capacity deployments, might well be warranted [VII.2.6].

B.2 Financing initiatives

The role of policy-makers and fund administrators

➢ Develop and incorporate a venture-oriented financing mechanism into their universal access funds, as described in Chapters VI and VII. Under this mechanism, the funds can be used for making loans, taking equity participation in projects or implementing telecommunications companies, offering grants, or a combination of the above [VII.3.4].

➢ Familiarize themselves with the various potential sources of financing. Help small entrepreneurs establish contacts with these various sources, and as much as possible, support rural operators in their efforts to obtain bank guarantees and financing [VII.3.4].

The role of Regulatel

➢ Determine the feasibility of creating public access facilities that piggyback on private commercial networks, such as those of banks or transport companies. Develop a model for Regulatel countries that accounts for the following factors: (i) the types of non-core ICT services that could be provided by the aforementioned private networks, and the extra costs and resources that would be required to establish and operate these non-core services; (ii) any regulatory and administrative impediments to such arrangements, as well as typical prices that would be charged to the public for these non-core services; (iii) what, if any, subsidies might be required; and (iv) what other national industries might be suitable for this model [VII.3.4].

➢ Regulatel should establish contact with the Enablis Enterpreneurial Network to explore ways of establishing this financing initiative in Latin America [VII.3.4].

B.3. Business practices, commercial, service delivery and partnership innovations

➢ *Policy-makers and universal access fund administrators should:*

- Encourage, and when appropriate, aid local entrepreneurs to adopt innovative business, administrative, marketing, service delivery, and procurement practices for their universal access projects. The case studies and pilot projects described in this report - especially in Chapter VII and Annex 3 - can serve as examples that can be replicated or adapted as necessary, to fit the particular circumstance. Universal access fund managers should develop information dissemination programs on such practices [VII.4.9].
- Make sure that government procurement agencies are aware of the impacts that their purchase decisions can have upon the emergence and expansion of market competition in markets as diverse as telephone services and equipment, computer hardware and

software, and technical support services. The development of public service content, such as Websites, audio-visual training materials, and educational software, should be linked to the enhancement of domestic businesses and employment in those fields. This could be accomplished, for example, through targeted outsourcing rather than in-house development. Government procurement rules should be adjusted accordingly [VII.4.9].

- Regulatel should create a repository of such innovative business, administrative, marketing, service delivery, and procurement practices for universal access projects [VII.4.9].

B.4 Regulatory policies and strategies for universal access

- Policy-makers and universal access fund administrators should:
  - Review **spectrum-use policies** related to license-free spectrum, especially for rural applications, to facilitate the deployment of technologies that use these frequencies;
  - Remove burdensome restrictions or prohibitions on **VoIP-based networks and applications**. They should encourage operators to deploy VolP as a cost-effective means to expand affordable access, especially in rural and underserved area applications. Promoters should be encouraged to incorporate VoIP technologies into their projects;
  - Adapt **asymmetrical rules and regulations** pertaining to telecommunications services provided in rural and underserved areas, along the lines of those indicated in Box VII.6 (Attached);
  - Implement a **simple, pro-competitive licensing regime** that encourages and facilitates the establishment of smaller, independent telephone operations in rural and underserved areas, especially where incumbent operators have chosen not to build networks. Subsidies should, where possible, be available to support such operators, if they have the technical, managerial, and operational capabilities to deliver telecommunications services cost-effectively to their communities. Support should not be limited to the technical aspects of the project. It should also be available to assist in the management, administration and commercial aspects of these undertakings.
  - Implement and enforce regulations with respect to maximum permissible delays in signing of **interconnection agreements**;
  - Introduce greater flexibility in **quality-of-service and other standards** pertaining to networks and services in rural and underserved areas where the impacts are minimal, and where stricter standards are an impediment to investment and development.
  - Introduce regulations and promote and facilitate **infrastructure and facilities-sharing**, including the use of rights-of-way not only among telecommunications operators, but also with other public service companies and operators. This includes electricity transmission and distribution, pipeline companies, public works ministries, and railways [VII.5.8].

- Regulatel should:
  - Undertake a comprehensive study to determine the impact of asymmetric interconnection rates and tariffs on rural operators. The aim should be to develop policies, costing methodologies (that can include benchmarks), guidelines for

termination charges and tariffs, along with model regulations and interconnection agreements for use in rural applications. Regulatel should develop a data base of information on its members. This would include rates, costs, regulations, interconnection agreements, et.,c for rural areas [VII.5.8].

- Gather, analyze, maintain, and keep current a data base of its members' universal access regulations and policies. This would include spectrum-use policies (use of license-exempt frequencies; use of the 450 MHz band, etc.. VoIP, licensing, quality-of-service and other standards for rural operators, and facilities and infrastructure sharing. Annex 2 of this report summarizes regulatory provisions related to these factors. It should serve as a starting point for establishing such a data base [VII.5.8].

Box VII.6: Asymmetrical rules and regulations for universal access projects

Policy-makers should consider making rules and regulations pertaining to universal access projects in rural and underserved areas that are better adapted to the needs and circumstances of rural operators.

A. General

- Be more flexible with respect to coverage obligations for operators providing service in rural areas;
- Reflect the needs and particularities of rural and underserved areas with respect to spectrum assignments, fees, and conditions of use. For example, they should take into account that the potential of interference in rural areas may not be the same as in urban areas;
- Ensure that effective and timely regulator support is given to small rural operators in interconnection negotiations.

B. Quality-of-service requirements

- Permit refurbished equipment to be installed when an acceptable quality of service can be guaranteed;
- Take into account that it may not always be possible to guarantee the same quality of service in rural as in urban areas;

C. Tariffs and interconnection charges

- Incremental costs (common and opportunity costs) of rural terminations tend to be higher than urban terminations. More traffic tends to flow toward rural and underserved areas than in the opposite direction. Therefore, policy-makers should implement arrangements that include one or a combination of the following:
  - a special price-cap scheme that takes into account these asymmetries;
  - higher termination charges for rural terminations;
  - a calling party pays (CPP) arrangement, with the originating operator's tariffs regulated to prevent them from being set so high that it would discourage calls to rural telephones;
  - a plan that allows operators to charge more for calls to a rural telephone than to a local number, but require them to identify such calls by a special prefix similar to a long distance call or a call to a mobile telephone. That will ensure that callers know that they will have to pay more to make the call.

D. Dial-up Internet access

- Allow and promote the implementation of flat-rate fixed telephone pricing schemes, if they do not already exist.

C. NEW MODELS FOR PROVIDING UNIVERSAL ACCESS

C.1 The role of Regulatel

➢ Regulatel should lead and coordinate in the development of a platform to facilitate the dissemination of information on universal access projects. This platform should give special emphasis to those projects that result from demand-driven initiatives, and that involve small entrepreneurs, suppliers and operators (Chapter VII; Annex 3). It should facilitate interaction among these stakeholders, and build links to technical, financial and other support mechanisms highlighted in this study [VII.7.10].

C.2 Telecenters

➢ Telecenters should remain an important component of rural access programs, as they can deliver broad-based access to a range of information resources, technologies and other services, especially in rural and underserved areas. Projects to implement telecenters should focus on sustainability and community involvement from the outset, and emphasize training and locally relevant information content, as well as financial and technical aspects. The four key success factors in Box VII.7 (Attached) should be taken into account. Some outstanding models worth emulating are as follows: (i) The Red Cientifica Peruana (RCP) initiative of providing specifications and other information on the requirements for establishing a telecenter andproviding follow-up technical support; (ii) The Hungarian Teleház; (iii) The Dominican Republic's LINCOS program; (iv) Brazil's GESAC Program, Acessa Program (Sao Paulo), and Digital Project (Pirai); (v) Uruguay's CASI and CASIL programs; (vi) Cuba's Joven Club de Computación; and (vii) Venezuela's Puntos de Acceso and CBIT initiatives (Annex 4) [VII.7.10].

➢

Box VII.7 Four key success factors in ensuring the viability of a telecenter

- The availability of interactive services, including voice, e-mail, chat, and ideally SMS and videoconferencing. Especially important is the availability of VoIP, which helps make voice communications accessible to poorer people. In Peru, 33% of all persons using services at the commercial cabinas publicas use VoIP - 40% of persons from the two lowest socioeconomic strata use VoIP.
- Leadership and local management. Strong dynamic leadership and management from private entrepreneurs, local governments, associations, or NGOs.
- The density of users in the vicinity of the center who know how to use the computer and the Internet, i.e., who have a minimum level of digital literacy. The nearby density of the digital literate population determines the potential market of the telecenters, and therefore the likelihood that they will be used often and survive economically.
- Good quality connectivity to the Internet at a reasonable price.

Annex 1

ANNEX 2

ANALYTICAL FRAMEWORK AND GAPS MODEL (SPREADSHEET)

1. Introduction: Model Purpose and Objectives

This report provides an overview description and explanation of the EXCEL-based Regulatel Telecommunications "Gaps Model" developed as part of this project. The purpose of the Gaps Model is to provide a basis for evaluating the economic structure of actual and potential telecommunications markets, particularly in relation to Universal Access and Universal Service goals. This model is intended to focus on two complementary levels of market analysis: "Macro" and "Micro". It seeks to serve as both a broad analytical evaluation method, and a policy planning and implementation support tool for regulators.

At the Macro level, the model's objective is to evaluate the large-scale trends in a given country or region's telecommunications market development. Specifically, the purpose is to quantify the extent of a country's progress toward closing the market and access gaps for telecommunications services, with particular emphasis on the geographic spread of access to rural and other traditionally underserved locations. The Macro model presents current access levels, and measures the extent to which current policies have already closed the respective gaps. It measures the relative costs and potential revenues associated with bringing service access to unserved populations. It serves as an aid for determining the relative economic attractiveness of expanding services into those areas.

At the Micro level, the model's objective is to provide similar information at a more disaggregated level, to assist policy-makers and regulators to allocate sector resources wisely. It examines the sizes and features of market and access gaps at regional and local levels, and assesses the comparative costs and benefits that are involved in assigning various priorities to different locations, projects, subsidy plans and regulatory decisions.

The Regulatel Telecommunications Gaps Model is only one analytical instrument that can be utilized in the analysis and development of alternative Universal Access policies and plans. It is not a substitute for more intensive local analysis by national experts. Moreover, the model is only as useful as the quality of the industry data it utilizes. Therefore, a high priority should still be placed on studying and obtaining market information for all affected areas. Ideally, the model can supplement and reinforce such "hands-on" research and analytical work by regulators, while contributing to the overall goals of institutional capacity building and national and international coordination in telecommunications policy.

2. Model Approach and Methodology

The fundamental approach taken in developing the model has been to define key parameters of both the supply and demand sides of telecommunications markets, based on the key economic and technical factors that are most likely to determine market viability for potential investors and operators. The model incorporates market data for each country or region that represents the underlying economic and physical structure of the market, especially geographic and demographic conditions. It then builds hypothetical, generalized network configurations to represent the investments that would be required to provide telecommunications service access to those locations where services are not currently available. It estimates the overall costs and likely revenues that would result from establishing networks and services in those locations.

The cost assumptions, technology deployment choices, and revenue estimates used in the model are all based on average industry data from a variety of sources and international experience. The model is purposely designed to allow a high level of flexibility in adjusting its assumptions, so as to facilitate the use of alternative estimates for each of these parameters. The goal is not to obtain precise and flawless forecast results, but to be able to examine the range of potential results under different hypotheses and assumptions, and to compare these across different countries and regions.

3. Description and Explanation of Model Components

This Section describes the various components of the model. The prototype version of the model was developed in an Excel spreadsheet, consisting of six separate sheets. In general, this configuration will be retained for all basic uses and adaptations of the model, although more fundamental modifications might be incorporated by different user administrations for more customized purposes. The preliminary cost and other assumptions utilized in the prototype model may be subject to variation and adjustment for specific country and market scenarios, although for inter-country comparison purposes it is preferable to retain the most shared assumptions possible.

The different sheets comprising the model are explained and illustrated in each of the sections below. Note that the sample data included for illustration do not relate to any particular market, and are simplified for explanation purposes.

3.1 Data Inputs

This sheet requires the input of market data on the locations to be modeled. Ideally, input data would be available for all major regional jurisdictions within the country, which could then be aggregated into national average conditions. In practice, frequently only national level data may be available, and even then it may consist largely of rough estimates. National-level or highly aggregated data are generally sufficient for macro-level estimates, while regional details are more critical for micro-level analysis. The same structure and data elements can be used at a sub-regional level to conduct narrowly focused micro-analysis.

The input data sheet included in the prototype model covers only one sample region. To utilize the model to examine other regions requires replicating this input form – and all comparable tables from each of the other sheets of the model - for each region. For practical purposes, a prototype of a large multi-region country is also provided with this report, that can be filled in and customized to provide such micro-level data and results.

The following is a sample data input sheet made out for an imaginary "Region 1":

Table Anx. 2.1 Sample Data: Imaginary Region 1

Region: Region 1 **Population** 2,000,000 **Area (sq.km)** 12,000 **Average terrain: (1-4)** 1

Population centres			ICT Access (% of total communities with access)					
Population size	Number of towns	% of popula-tion	Pay-phone	Tele-center	Cellular	Fixed lines	Internet	Broad-band
>500k	1	25%		100%	100%	100%	100%	100%
100 to 500K	1	20%		100%	100%	100%	100%	0%
20 to 100K	4	15%		35%	100%	90%	50%	12%
10 to 20K	20	12%		15%	85%	75%	20%	0%
5 to 10K	50	10%		10%	75%	60%	5%	0%
1 to 5k	80	8%		10%	60%	25%	0%	0%
0.3 to 1K	200	6%		5%	50%	5%	0%	0%
<0.3 K	400	4%		0%	20%	0%	0%	0%

The input data required for each region include the following:

Region: The name of the region.

Population: The total population of the region.

Area: The area, in square kilometers, of the region.

Average terrain: This indicates the approximate difficulty of the average terrain within the region. It varies from 1 to 4, with 1 being the most accessible terrain, and 4 being the most difficult. A factor of 1 assumes little or no impediment to network infrastructure construction. A factor of 4 would be appropriate for regions that include high mountains, dense jungles, or other key natural barriers. Factors 2 and 3 would fall somewhere in between. These are, of course, rough estimates, but are designed to take into account the estimated impact upon construction costs of terrain-related conditions.

Population centers: This section indicates a statistical breakdown of the cities, towns, and villages of the region according to population sizes, in the indicated ranges. The table asks for the total number of towns within the region that fall into each classification, and the percentage of the overall population of the region that inhabits each size category. This breakdown is very important for differentiating the geographic distribution of potential telecommunications users, and thus estimating the average costs of serving locations that fall into each group.

ICT Access (percentage of total communities with access): This section indicates the current degree of access to each type of Information and Communications Technology or service, within each geographic/demographic category. The percentage of communities with access simply means the proportion of towns in which the designated service is available. It is important to note that this does not show the level of penetration. I.e., it does not show the percentage of access on a subscriber-by-subscriber basis, but rather, does so on a town-by-town basis. The service categories for which access percentages are listed include:

- Pay phone: Indicates the presence of at least one public pay telephone within the community.
- Telecenter: Indicates the presence of a public access location for obtaining at least telephone *and* Internet connection. The term "telecenter" is used generically in this sense, to mean any such public access to these services within a community.
- Cellular: Indicates that there is access to a cellular telephone network signal within the community.
- Fixed lines: Indicates that there is access to private fixed-line telephone service, linked to the national public (fixed) switched telephone network.
- Internet: Indicates that there is private (i.e., in-home and/or institutional and business) access to Internet services.
- Broadband: Indicates that there is public (and potentially private) access to broadband transmission capability, and related high-speed Internet access.

Precise country data were not always available for the model runs conducted throughout this study. Many of the data inputs required estimation or extrapolation to allow for mutually comparable calculations of the degree of current service coverage. To simplify this process, those versions of the model include user-adjustable variables to estimate average population distributions and service coverage in smaller towns and villages in particular, as well as broadband service access in many countries.

3.2 Cost Assumptions

This module contains all of the underlying assumptions concerning cost components of the networks and services being modeled. All of the factors and assumptions included within the prototype model can be varied to test the effect of alternative levels for each item. The factors included represent the best available estimate of each component's unit cost, based on extensive supporting research from a variety of sources. For individual country analysis, many of these factors can be altered to reflect more precisely underlying economic conditions in the country or the experiences of national and regional telecommunications operators and technology providers. However, for comparative purposes across multiple countries, and for forecasts of longer-term market conditions, it may be preferable to retain constant assumptions concerning cost factors, to ensure consistent comparison of market conditions. (Also, note that, for simplicity of comparison and translation of source cost material, all cost and other economic data in the model are represented in equivalent U.S. dollars.)

The following elements are included within the Cost Assumption module:

General Cost Parameters: Basic sector-wide assumptions necessary for many of the cost calculations. These include the following: (i) Weighted Average Cost of Capital (WACC) and Amortization Period for capital investments; (ii) a maintenance operating expenditure (OpEx) multiplier to represent the estimated ongoing annual maintenance expense associated with network capital investments; and (iii) the Terrain factor multipliers associated with each level of terrain difficulty.

Network Component Costs: The estimated unit costs for each major component of network deployment and service delivery. The cost assumptions are associated with specific types of network and service architectures, which are considered most likely to be utilized and which offer highest cost-effectiveness for the delivery of various levels and classifications of services. In the prototype model, there are three main types of service configurations:

- Mobile Telephone: Cellular mobile voice telephone service available to the general public, i.e., sufficient signal quality and related service support to enable cellular phone usage within a given community;
- Public Telecenter: Public access to voice and Internet services through a public, community telecenter facility. This configuration is considered the minimum requirement to achieve Internet access in a community. Higher levels of service, including private and institutional Internet access, could also be available in such communities, but the telecenter service is considered a basic proxy for minimum level access;
- Broadband Access: The same telecenter minimum configuration as above, but with connectivity at broadband levels (at least 128 Kbps per connection).

The cost components included in this section of the model are based on the network elements required to provide these minimum service configurations. These components are summarized as follows :

- Backbone Network: Connection to the national or regional public telecommunications network backbone to interconnect traffic to all public switched communications services. In the prototype example, two principal alternative technologies are considered for backbone access: terrestrial microwave and VSAT. The cost table develops narrowband and broadband capacity costs for each category of community size, based on the cost per kilometer of a microwave solution, and a maximum cost per Point–of-Presence, which is the (distance-insensitive) VSAT solution. The raw cost data that generate these unit costs are listed in the further tables to the right. Again, these are broad estimates, which can be modified in various ways for sensitivity analysis, but they provide a reasonable foundation for estimating average backbone connectivity costs.

- Local Access Connectivity: Connection at the local end from the backbone to individual locations (towns) that are to receive services. These components are directly related to the different service configurations. The table provides baseline access costs for mobile, fixed (narrowband), and broadband network services. In the prototype, both the narrowband and the broadband configurations are based on wireless technology, which is viewed as likely to be the most cost-effective, at least for public access. In addition to network access, the facility costs of the telecenter option are also identified, on a per-site basis, along with a variable for the maximum population that a single telecenter can be expected to serve within a larger community.

- Equipment: These are the estimated average costs of end-user equipment and telecenter equipment at the local level, which are necessary to achieve the services to be provided.

The costs for cell phone equipment are represented as a percentage of revenues, because these costs will vary directly with the levels of user demand. By contrast, telecenter costs are relatively fixed per location.

- Service: These costs consist of two general components: Network Management and Interconnection. In the prototype, it is assumed that network management costs are incremental to existing operations, rather than requiring the full start-up costs of new Network Management Centers to serve typically smaller, rural locations. Therefore these costs are represented as a percentage of revenues, to provide a scale relationship between overall customer and traffic volumes and costs. Similarly, Interconnection costs are a direct proportion of service revenues, and these are also represented as such.

- Human Resources: These costs are for the personnel required to provide service at the local level. (Personnel costs for constructing and operating the network are implicitly included within the other cost components.) In the case of mobile phone service, this would typically be the retail service support personnel, such as vendors of phones and prepaid cards, and these costs would again be proportional to overall market size and revenues. In the case of telecenters, human resources would represent the management and staff of the telecenter itself, which is again considered fixed on a per-site basis.

3.3 Network Development and Costs

This section contains the main cost calculations. The model first determines estimated network deployment scenarios that would be required to bring each category of services to unserved locations. It then calculates the cost for each component of these hypothetical networks and services, on a per-location basis (i.e., per-town).

This section also contains a user-adjustable variable to indicate the "maximum population coverage of towns < 10,000". This variable can be set to any value up to 100%, to represent the extent to which existing networks (cellular, Internet, and broadband) are within practical reach of the population of smaller towns. This variable only affects the estimation of current levels of access.

The two main components of this sheet are explained and illustrated below:

- Network Deployment: The model first calculates the size of the areas and numbers of locations and population within each grouping without Network access, i.e., where the telecommunications backbone and local access connectivity are not available, and thus no service can be received by any customers. These figures are derived from the initial Input Data. The example below is for Cellular network deployment:

Table Anx. 2.2 Network Deployment and Costs

Population centres					Cell Phone Network			
Population size	Number of towns	Pop	Area		% access	towns unserved	pop unserved	area unserved
>500k	1	500,000	16		100%	0	0	0
100 to 500K	1	400,000	16		100%	0	0	0
20 to 100K	4	300,000	63		100%	0	0	0
10 to 20K	20	240,000	317		85%	3	36,000	48
5 to 10K	50	200,000	794		75%	13	65,000	198
1 to 5k	80	160,000	1,270		60%	32	73,600	508
0.3 to 1K	200	120,000	3,175		50%	100	66,000	1,587
<0.3 K	400	80,000	6,349		20%	320	65600	5,079
totals	756	2,000,000	12,000		totals	468	306,200	7,421

Baseline Average Cost per Town: This table calculates the annual cost per town for each of the cost components, for each population band, to provide each category of service. In the prototype model, cellular telephone service is treated as the "baseline" service: i.e., if no cellular signal is present, the cost to bring a cellular network to the town is first calculated. The subsequent services, Internet telecenters and broadband, are assumed to build-off of the infrastructure needed for the cellular network, specifically the backbone connection. This assumption can be varied on the final Results page. The cellular network cost development is illustrated below:

Table Anx. 2.3

Baseline (Cell Phone) Average Annual Cost per Town					
Backbone	Access	Equipment	Service	Human Resource	TOTAL
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$5,156	$48,847	$44,888	$314,213	$89,775	$502,878
$2,578	$21,167	$17,404	$121,826	$34,808	$197,782
$2,103	$20,353	$6,792	$47,545	$13,584	$90,378
$525	$20,353	$1,689	$11,824	$3,378	$37,770
$525	$20,353	$404	$2,825	$807	$24,914

The component costs for the subsequent network/service configurations are provided in similar charts within this sheet, and the costs shown are incremental to the baseline cell network costs, as appropriate.

3.4 Revenue calculations and assumptions

The next step in the process is the determination of expected revenues that would be earned by operators introducing new services in currently unserved locations. These estimates are based on highly generalized assumptions, derived from international and regional experience with consumer spending on telecommunications services. The underlying principle is that all populations will typically, in the aggregate, spend a fairly consistent proportion of their average income on telecommunications. While the exact percentages will vary under different conditions, it is reasonable to start with an assumption of broad society-wide income allocations as a basis for forecasting potential revenues from new services. The following factors determine the revenue forecasts:

- Allocation Factors: These factors determine the proportions in which average incomes are allocated to the different categories of ICT services. The first figure is the overall allocation of total income to all ICT services. The next three figures allocate the total ICT budget among different service categories. In the prototype, these include the following: (i) Public Telephone; (ii) Cell Phone, which is a proxy for all cell phone usage as well as private fixed line telephone services; and (iii) Internet, which includes either public Internet through Cyber cafés and Telecenters, as well as private and institutional Internet. The initial factors assigned for each category are broad estimates based on international experience. These can be adjusted by the user to reflect alternative assumptions. However, for comparative purposes across regions or countries, it may be useful to maintain constant allocation assumptions.

- Average Income: This figure represents the average per capita income for the country as a whole, expressed in equivalent US$. In micro-level applications of the model to specific regions, it may be desirable to obtain regional average income data, where available, and evaluate revenue prospects on a localized basis accordingly.

- Income Distribution Factors: These factors, highlighted in blue on the table, represent an estimation of the distribution of average per capita income among different size population centers. Again, it would be preferable to have access to actual disaggregated income figures for various regions, and population centers within regions. These prototype estimates attempt to represent the likely decrease in average income levels in smaller, rural towns as compared with large urban centers.

- Income Allocation per Capita: This portion of the table simply multiplies the various allocation factors by the identified income levels. The result is average annual per capita spending (i.e., revenue) for each category of ICT service. In the subsequent sheet, these figures are used to calculate expected revenues from the introduction of new services.

3.5 Annual Net Revenues per Community

This sheet brings together the results of the cost and revenue estimations, to produce annual net revenue forecast results for each of the services being modeled, broken down by region (where data are available) and by size of population centers. It also contains a variable for the "maximum addressable population" for each network. This represents a theoretical ceiling for the population that can be reached by investment in new networks (up to 100%).

The following examples show the results for the baseline Cell Phone market analysis, and for the incremental Telecenter/Internet market analysis:

Table Anx. 2.4

Cell Phone Market Results							
Current Market		**Average Net Cost per Town**			**Gap Results**		
Towns unserved	Pop unserved	Annual Cost	Annual Revenue	Net Annual Cost	Addressable Pop (total)	Uneconomic Pop (total)	Net Annual Deficit
0	0	$0	$0	$0	0	0	$0
0	0	$0	$0	$0	0	0	$0
0	0	$0	$0	$0	0	0	$0
3	36,000	$502,878	$897,750	-$394,872	32,400	3,600	$0
13	65,000	$197,782	$348,075	-$150,293	58,500	6,500	$0
32	73,600	$90,378	$135,844	-$45,466	66,240	7,360	$0
100	66,000	$37,770	$33,784	$3,986	0	66,000	$398,631
320	65,600	$24,914	$8,072	$16,842	0	65,600	$5,389,519
					157,140	149,060	$5,788,150

Table Anx. 2.5

Telecenter/Internet Market Results							
Current Market		**Average Net Cost per Town**			**Gap Results**		
Towns unserved	Pop unserved	Annual Cost	Annual Revenue	Net Annual Cost	Addressable Pop (total)	Uneconomic Pop (total)	Net Annual Deficit
0	0	$0	$0	$0	0	0	$0
0	0	$0	$0	$0	0	0	$0
3	195,000	$1,339,803	$2,067,188	-$727,384	156,000	39,000	$0
17	204,000	$190,309	$299,250	-$108,941	163,200	40,800	$0
45	184,000	$61,686	$91,233	-$29,547	147,200	36,800	$0
72	147,200	$40,325	$40,250	$75	0	147,200	$5,395
190	115,200	$29,529	$10,345	$19,184	0	115,200	$3,644,986
400	80,000	$27,143	$2,625	$24,518	0	80,000	$9,807,098
					466,400	459,000	$13,457,479

The calculations and results in these tables include the following:

- Current Market: These columns summarize the numbers of towns and population within each size band that currently do not have access to the service. These are directly derived from the data inputs and the network configuration calculations.

- Average Net Cost per Town: These are the summary results of the cost and revenue calculations from the previous sheets, showing the average annual cost and revenue per unserved town to establish the service, and therefore the annual net cost per town (revenue minus cost). A negative net cost figure implies that the expected average revenues from introducing the service would exceed the expected average costs.

- Gap Results: This table translates the net cost results into estimations of the size of the market and access gaps for each service, and for each community classification. Specifically, it treats towns that exhibit positive net revenue potential (i.e., negative net costs) as "addressable": that is, the market should theoretically be able to serve these locations without subsidy support, as they could achieve positive returns. Therefore, the populations that inhabit towns that meet this threshold are considered "addressable". This does not imply that all inhabitants of these towns could obtain service, but rather that these communities could be supplied access. The total addressable market is adjusted by the percentage selected in the variable at the top of the sheet. Those population centers in which introducing service would not, in itself, be profitable, are classified as "uneconomic". The third column then calculates, for those uneconomic groups, the Net Annual Deficit associated with providing service to those regions. This is equivalent to the annualized subsidy amount that would be required to permit access to be provided to those populations on a commercially viable basis. This is based upon the net cost results, and the current access levels. Note that there is no cost associated with the unaddressable portion of the population, as the default assumption is that these groups will not be reached by the necessary network investments, due to their remoteness from population centers, for example.

3.6 Summary Results

This sheet summarizes the results for each service and each region (as applicable), and for the country as a whole. As illustrated below, it provides the current level of access and the Market Frontier for each region. The Market Frontier is the overall access level that should be achievable by the market on its own, without subsidy. The final column presents the Access Gap in terms of the Capital Cost to achieve full access for all potentially addressable populations within towns and villages. Note that this is a different calculation than in the previous sheet, which expressed the Access Gap in terms of annual net costs; here, the annualized figure is translated to up-front capital cost, to show the amount of one-time subsidy or investment that would be required to close the access gap.

This sheet also includes a sensitivity variable relative to the level of shared (backbone) infrastructure between cellular and fixed (Internet) networks. The user can set this value from 0% to 100% to measure the difference in costs between levels of infrastructure sharing.

Table Anx. 2.6

Summary Results **Country**

Infrastructure shared % **0%**

Region	Cellular Telephone			Telecenter/Internet		
	Current Access	Market Frontier	Access Gap Capital Cost	Current Access	Market Frontier	Access Gap Capital Cost
National	**85%**	**93%**	**$20,864,984**	**54%**	**77%**	**$48,511,201**
Region 1	85%	93%	$20,864,984	54%	77%	$48,511,201
Region 2						
Region 3						
Region 4						
etc.						

ANNEX 3

NEW MODELS AND PILOT PROJECTS FOR UNIVERSAL ACCESS IN REGULATEL MEMBER COUNTRIES

Introduction

The increasing role of market-based development initiatives, along with advances and innovations in technology, financing, business, commercial, service delivery and partnership arrangements, represent the most promising future path for universal access projects. Initiatives such as competitive entry, technology-neutral licensing, creative service and pricing options, are giving suppliers and telecommunications companies both large and small increasing freedom and leverage to invest and compete.

The models and project pilots described in this annex are representative of this trend. They show how applying the innovative strategies and best practices presented in the Chapter VII can result in interesting and promising ways to provide universal access to rural, remote and underserved areas. The types of models and pilots are as follows: (i) a community telecommunications cooperative; (ii) a community telecommunications operator; (iii) a privately initiated and operated regional telecommunications company; (iv) a privately initiated and operated local telecommunications company; (iv) a micro-telco (v) a broadband access systems integrator; (vi) initiatives of incumbents and large operators; and (vii) various telecenter models. It is hoped that an examination of these models and pilots can lead to the development and implementation of effective, sustainable universal access projects that meet the needs and circumstances of the populations and geographical areas that are not now being adequately served. A summary table at the end of this annex indicates the innovative strategies and best practices that have been applied in each model and pilot.

The idea of both allowing and encouraging establishment of smaller, localized, independent telephone operators – both cooperatives and private businesses – is attracting interest in many parts of Latin America. Local entrepreneurs have begun to construct rural telecommunications systems that can offer a mix of voice and data services to the remote populations, with connectivity to national public networks, often via VSAT. They are accomplishing this by combining service and organizational innovations and technological advances, with financial support from government, donor, and private sources. Two examples of this type of local initiative are the Chancay-Huaral Agrarian Information System (SIA) cooperative in Peru and the ACLO/IICD Sistema de Información Campesina–Indígena initiative in Bolivia.

I.
Community telecommunications cooperative: the SIA project in the Chancay–Huaral Valley, Peru

Chancay–Huaral is a fertile but very arid valley situated 80 km north of Lima, covering 22,000 hectares and producing various types of fruits, vegetables and flowers (Figure Anx3.1). The Junta de Usuarios del Distrito de Riego de Chancay–Huaral is an association of 17 local commissions of farmers, whose main function is to control the storage and distribution of water for irrigation in the valley. The water comes from the mountains and is distributed by means of a system of canals with gates that are opened and closed as required. This is done manually by an individual in each area called a "sectorista". The times designated for opening and closing the various gates are coordinated centrally.

Figure Anx 3.1 : Chancay–Huaral Valley, Peru

The Chancay-Huaral Junta conceived the Agrarian Information System (SIA) Project about six years ago as a means of facilitating the flow of information on gate openings and closings, and of improving the collective efficiency of the 6,000 farmers in the valley by making basic and essential information available to them via the Internet. Inter alia, the SIA was intended to give small farmers access to market and other information, such as the current prices for their products, the price of fertilizer and other inputs, the weather forecast, current laws and regulations concerning the agricultural sector, and the activities of the Chancay-Huaral Junta. The project was also meant to give the 18,000 school age children, and the teachers and administrators in the 64 schools in the valley access to the Internet for the first time.

The network

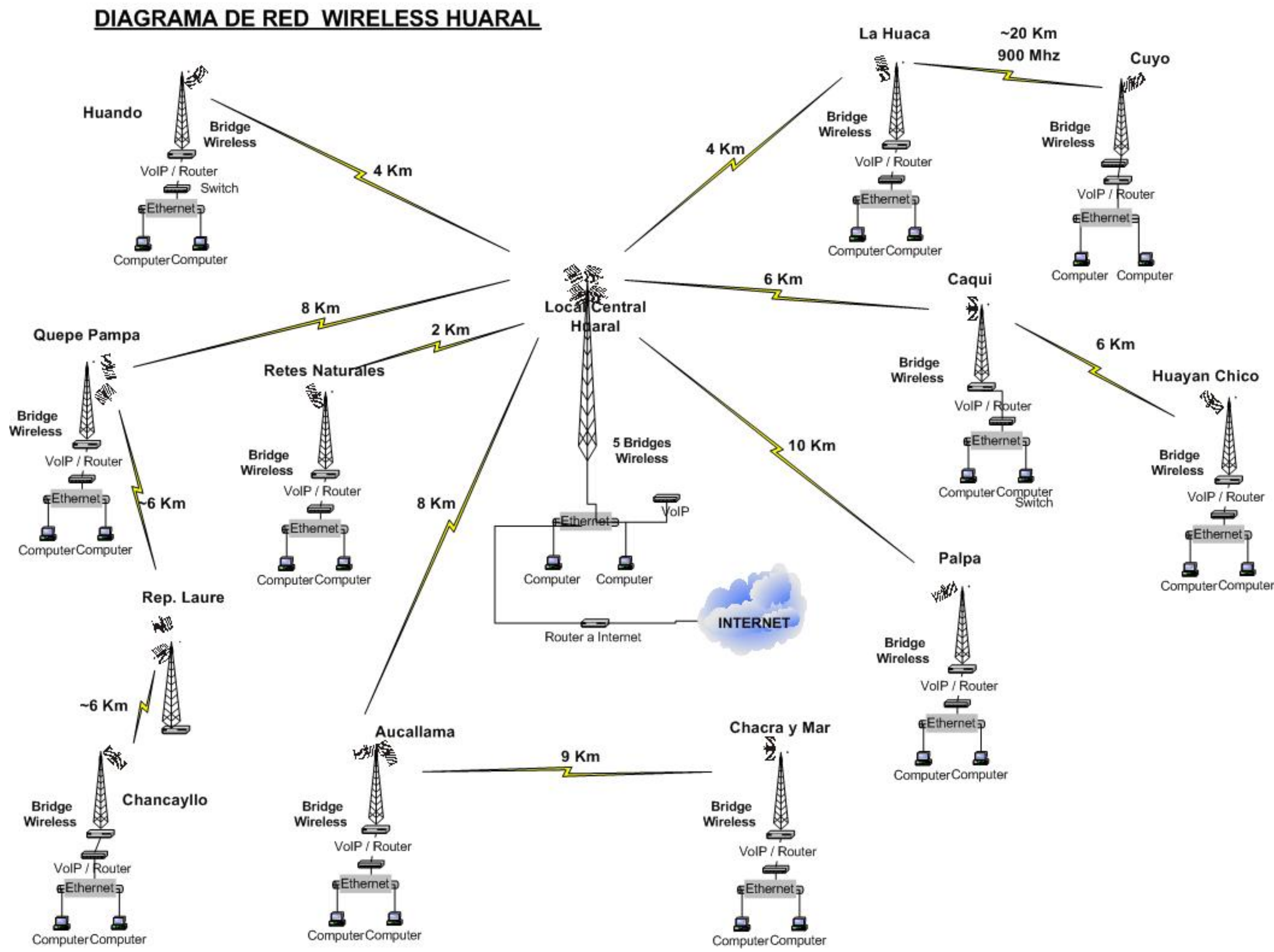
The network consists of 14 telecenters, 12 of which are interconnected via wireless point-to-point links using the WiFi standard in the 2.4 GHz band (Figure Anx3.2). These links are between 4 and 10 km. The transmission infrastructure (tower, antenna and radio equipment) at each site costs between US$1,200 and US$1,500. The longest link is 20 km. It uses a wireless connection, and operates in the 900 MHz band. The telecenters that are located in the premises of the local commissions each have up to five computers and one server using open source software. There are a total of 62 computers. The total cost of the project was US$166,000, which included the acquisition and installation of a small 2 KW water powered generator in Cuyo, a village that did not have electricity. FITEL, the Peruvian Universal Access Fund, provided US$105,000 under its new arrangements for financing of pilot projects. The Ministry of Agriculture contributed US$50,000, and the Junta itself contributed US$11,200. The Junta's contribution was used to buy 16 computers that were used in initial training, and then deployed to each site as servers. Technical assistance is provided by the Centro Peruano de Estudios Sociales (CEPES), a Peruvian NGO.

The Chancay-Huaral Junta took an active part in the construction of the network, including project supervision, installation, and rearranging commissions' premises to establish the telecenters.

Services

Initially the only service offered on the network was Internet access. In spite of having a VoIP platform, SIA did not have a license to provide public voice services. VoIP was and continues to be used for communications between sites for control and management. SIA has installed a PBX with a prepaid platform, which allows it to offer telephone services through Telefonica's PSTN, to which it is connected. The telecenters give priority use to farmers, and do not charge farmers for using the Internet. Children, who use the Internet to do school assignments, surf the web and to chat with friends in the valley, pay S/1–2 (US$0.33–0.66) per hour. The project is expected to become self-sustaining. Its web site is www.huaral.org.

Figure Anx 3.2: Chancay–Huaral Agrarian Information System Network



Successes and benefits of the project

The network is operated and maintained by a number of young people from the valley, who have been trained as technicians, web masters and administrators. Part of their responsibilities are to teach children how to use the computer and the Internet, and to help older people access online information, and send and receive messages. (Figure Anx3.3). Many of these telecenters workers have left the project and obtained employment elsewhere.

Among the benefits of this project are the following:

- Better access to information has increased the efficiency of farmers in the valley;
- There has been a strengthening of the organization of the irrigation system, the individual commissions, and the Junta;
- School aged children and their teachers have been given access to the Internet;
- A number of young people in the valley (about 150) have been trained as computer and network technicians, web-masters and administrators.

The success of this project has been due in part to the following factors:

- The idea for the project came from the eventual beneficiaries, the farmers in the valley;
- The Chancay-Huaral Junta leadership and partial financing for the project right from the start. The Junta's main goal was not to establish and run a communications network, but rather, to improve the organization and coordination of the valley's irrigation system. They saw the communication system as a means of improving the productive output of the Junta and its members, and as a means of providing access to the Internet for young people.
- The project received technical assistance from a local NGO, CEPES. That assistance included helping to design the network, and training technicians and web-masters.

Figure Anx 3.3: Administrators of the Telecenter at Chancay Bajo

II.
Community telecommunications operator: the ACLO/IICD Project, Sopachuy, Bolivia

Introduction

The ACLO/IICD[132] sponsored the Sistema de Información Campesina–Indígena (Spachuy) Project in the Department of Chuquisaca, Bolivia has the same main objective as the Chancay–Huaral project. It is intended to facilitate access to important information for farmers and their associations, and to improve agricultural production through the use of ICT. It also provides a simple and economical means of communication for residents of the Municipality of Sopachuy, which is in the Department of Chuquisaca and has a population of 1,500.

Technology aspects

LocustWorld (http://www.locustworld.com/) is a telecommunications company that produces MeshAP, a wireless mesh networking system. Recently, as part of the Sopachuy Project, the ACLO/IICD and the local community contracted LocustWorld to build a very simple and economical wireless mesh network based on IEEE 802.11b WiFi technology.

The system was completely installed and ready for service in 2 days. It consists of three base stations, each of which is a mesh box - a transmitter/receiver and a router - with an omni-directional antenna (Figure Anx3.4). One of the three is collocated with the village's ACLO funded information center, which is connected to the outside world by VSAT (Figure Anx3.5). The base stations are linked among themselves using meshed WiFi with a maximum transmission power of 200 mW[133]. The transmission capacity between meshes is 2–3 Mbps. Like in any packet-switched network, the signal can take any path among the three nodes. Computers, IP telephones, and Xten SIP (soft) telephones are connected to the mesh boxes either via a wireless network card or Ethernet wired connection. Each mesh box requires about 4 watts of power, and is fed off a 12–18 volt DC source obtained from the local electricity network via an AC/DC converter or from rechargeable batteries. A PC located at the satellite station serves as the soft switch for the SIP soft telephony system, which is used primarily as the local telephone network. The soft switch operates with Asterisk open source software. Soft telephone software can be downloaded onto local computers, which are equipped with an inexpensive microphone, speakers, and/or headset.

Each mesh box has the capacity to serve over 100 users in a range of 2-3 km. In practice, however, most meshes do not have that many users. The three mesh box system that was installed in Sopachuy can serve all of its 1,500 inhabitants.

[132] La Fundación Acción Cultural Loyola (ACLO) was created in 1965 with the objective of helping to improve the productivity and productive capacity in the agricultural sector and the training of farmer organizations in the municipalities of Sopachuy-Tarvita, Alcalá, El Villar y Presto in the Department of Chuquisaca. IICD (International Institute for Communication and Development) is an independent non-profit foundation, established in 1997 by the Netherlands Minister for Development Cooperation. Its sources of core funding are the Dutch Directorate-General for Development Cooperation (DGIS), the UK Department for International Development (DFID) and the Swiss Agency for Development Cooperation (SDC).

[133] Adjusted according to the signal strength requirements.

Figure Anx 3.4: Installation of Yagi (directional) antenna

Figure Anx 3.5: Installation of a mesh box at the telecenter, Sopachuy (The omni-directional antenna is located on top of the mesh box)

Capital costs

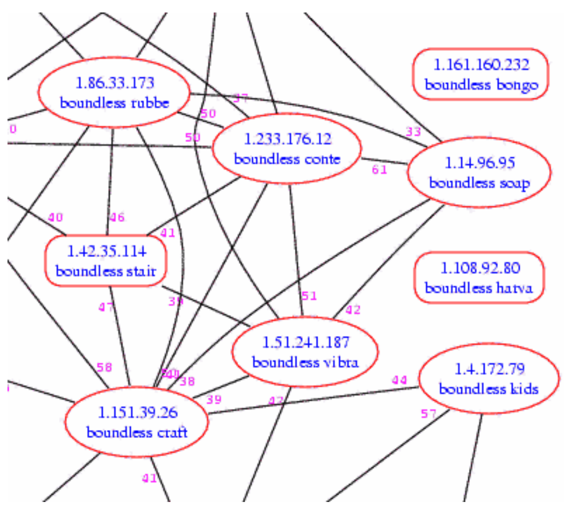
Each mesh boxes costs about US$500. They provide local access, infrastructure communications, voice support, high security and comprehensive centralized network management. They come with an external omni-directional antenna, but not with the tower. The whole WiFi mesh network in Sopachuy with three base stations cost about US$1,500 (without towers and installation), and could have been installed by a locally trained technician using simple instructions supplied by LocustWorld. The satellite antenna and transmission equipment, which came from another supplier, cost about US$3,500. The total cost of the whole system, including the WiFi mesh and the VSAT terminal antenna and associated equipment was US$7,000–7,500, including installation.

A wireless access point (radio and antenna), along with some cabling and a terminal (IP telephone), costs between US$100 and US$150[134]. It can be mounted on a roof, and if the signal is strong enough, it can be mounted on a desk or shelf in the house. If the configuration is used with several computers and telephones, a router would need to be added.

Network control

LocustWorld has three network management and administration centers that (two in the UK and one in the US) that provide ongoing support to all local networks that LocustWorld has installed anywhere in the world. Therefore, the WiFi mesh network - but not the VSAT network - can be managed either locally or remotely. Both the local and global monitoring stations can monitor the status and diagnose any mesh box, because each has its own IP address (Figure Anx3.6). The network administration centers provide technical support via the telephone or the Internet at a cost of US$100/year/mesh box after the first year - support for the first year is included in the price of the mesh box.)

Figure Anx 3.6 Typical configuration showing the IP address of each mesh box in a network



[134] Maple Leaf Networks, which built and operates a Wifi mesh network in Minnesota, charges its subscribers US$125 for a CPE that does not need an outdoor antenna and US$175 for one that does. See www.mleaf.net.

Financial viability and scope for commercial offerings

IICD estimates that the system operating costs are about US$900–1,000/month (US$400 for the satellite link and US$500–600 for the other operating, administrative and staff costs). Financial sustainability is dependent, initially at least, on three or four partners being able to pay US$250-300/month to support it. In the IIDC's 11 projects in Bolivia, its partners were typically the municipal government, economic associations such as agricultural producers, micro-credit institutions, schools, churches, NGOs, peace corps, police and public security, other government institutions, small businesses, and private individuals. The viability of the projects has depended very much on the commitment of these partners. Usually it has been the partners who have initiated the idea.

The Sopachuy Project is financed by a local agricultural producers' association, Asociación de Productores de la Cuenca de Rió Milanes, and the municipal government. There is also a private user, who pays to be connected.

The following are other potential sources of local revenue:

- Charging for broadband Internet services;
- Charging for telephony services such as national and international long distance, or using a pre-paid calling card service;
- Assigning voice mailboxes at telecenters, where people could come to check their messages for a small fee.

Administration and operation

Currently, the Sopachuy Network is administered and operated by the local partner organizations, including the municipal government. Operating costs are being met by the ACLO and the municipal government.

Conclusions

A detailed discussion of what has worked well and what problems have been encountered with this and 10 other IICD-sponsored community access projects can be found in Chapter VI.4.3.

The Valtron Project in the Province of Huarochiri, Peru provides an example of a business case for a small local telecommunications operation, utilizing currently available technologies.

III
Privately initiated and operated regional telecommunications company: the Valtron rural telecommunications pilot project in Huarochiri Province, Peru

Introduction

One of the most innovative projects designed to expand the public telecommunications network into low income areas is the rural telecommunications project in the Province of Huarochiri, Peru. The Huarochiri Project breaks with the traditional top-down approach of identifying and implementing subsidized universal access projects. It is demand-driven. It was conceived and promoted by a small entrepreneur, Ruddy Valdivia. On the request of local authorities, Valdivia evaluated the unsatisfied demand in a small mountainous province lying just east of Lima, that has a mixture of rural and urban populations[135]. Valdivia concluded that there is a valid business case for establishing a small, provincial telecommunications company that provides a bundle of telecommunications services, including fixed and mobile in the home and in public places, Internet access and cable television[136].

Figure Anx 3.7: A public payphone has been installed in Huachupampa village in the foreground

(Vicas, the village on the other side of the valley, lies within the FITEL target distance of 5 km from Huachupampa. However, it takes 4 hours by foot and 3-4 hours by car or truck (30km) to get there!)

135 Based on a survey of 960 households or 16% of all households in the province.

136 In the course of this research, two communities of between 100 and 150 people were discovered, that were not even on the map.

Figure Anx 3.8: San Juan de Iris is a typical village in Huarochiri Province, with 300 inhabitants, and currently only one satellite-based payphone

Geographic and economic situation of Huarochiri Province

The western border of the province lies only 40 km from Lima, the main market for many of Huarochiri's products. The eastern border lies 120 km from Lima. However, it takes more than seven hours to drive the less than 100 km from Lima to the provincial capital, Anchucaya. The province has a surface area of 6,000 km^2, four river valleys (cuencas), mountain peaks as high as 5,000 m, and an estimated population of just under 60,000 located in 769 population centers (Figures Anx 3.7 and Anx 3.8 and Table Anx 3.1). 64% of the total inhabitants live in urban areas. The population is projected to increase to 82,000 by 2015.

The economy is mainly agricultural, with the low lying areas producing fruits and vegetables, the middle lying areas predominantly engaged in cattle farming, and the higher lying areas producing mainly milk and cheese. There is also mining activity and electricity production. The province has a good road network, but not all arteries are interconnected. In some cases it is necessary to make a full day's journey, passing through Lima, and driving 200 km to go from one district to Anchucaya,

Table Anx 3.1 Distribution of population in the Province of Huarochiri, Peru

Size of population center	Number of population centers
> 1,000	8
between 500 and 1,000	11
between 300 and 500	9
between 100 and 300	60
< 100	708
Total	**796**

Source: Valtron

Before this project was implemented there were 2,432 fixed lines – a penetration of 4.1% - located in only seven of the 796 localities; there were 179 public telephones, served by Telefonica del Peru, the dominant operator in the country. Gilat-to-Home (GTH), the satellite-based rural operator had payphones installed in 40 localities. In total, 40 of the 796 localities had a payphone. The service was considered to be inadequate. The operators did not have any incentive to expand and improve the limited amount of service they were providing.

ICT service offering

The private rural telecommunications company that Valdivia established for the project was called Valtron. The service offering that Valtron proposed was the following:

1. Cellular mobile services. Given the high demand for cellular mobile services[137], Valtron proposed to provide 100 % mobile coverage to the 120 communities with 50 households or more using the 2 x 1.25 MHz of spectrum in the 800 MHz band. It planned to deploy a CDMA 2000 1x network with four base stations (BTS). Each base station was able to serve a subscriber base of between 1,000 and 2,000 persons. The BTS were also to serve as towers for the fixed wireless network operating in the 450 MHz band, and for the terrestrial backbone. Until recently, Peru did not permit mobile services in the 450 MHz band[138]. The service Valtron proposed was to be 100 % prepaid, and charged at a rate of S/0.90/min (US$0.28/min) for a local call. Customers would be able to recharge their telephones via the Internet or at Valtron's telecenters. Interconnection with other operators' networks would be in Lima. Valtron thought that it would be able to cover the whole province with its cellular network within about four months of the start of installation. The system was to be built so it could eventually be expanded into neighboring provinces.

2. Fixed telephone services were to be offered through a fixed wireless network using CDMA 2000 1x (2.5G) technology, operating in the 450 MHz band at an unlimited use rate of S/50/month (US$15.50/month). Valtron had also obtained 2 x 1.25 MHz in this band.

137 Farmers tending their cattle in pastures want mobile telephones as a means to advise each other about cattle thieves.

138 Valtron is the first company in Peru to offer a mobile service in the 450 MHz band.

Initially four base stations and a few repeaters were to provide coverage to the whole province. During a second phase, it was planned to add another four base stations.

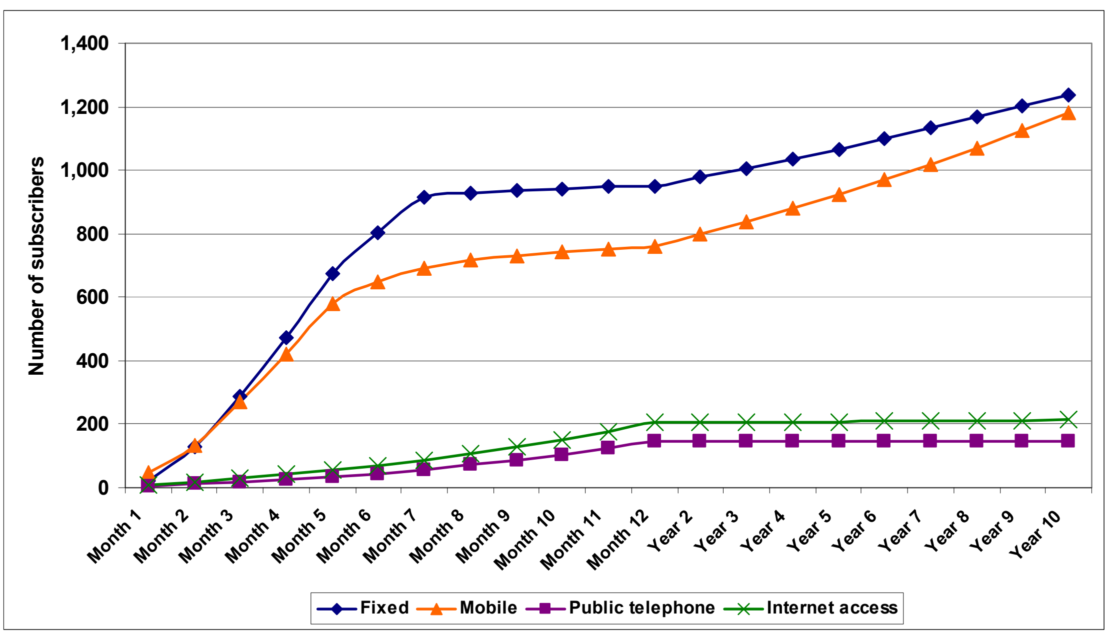
3. Public telephone services were to be offered using the CDMA 450 network to provide fixed wireless access.

4. Internet. Valtron planned to offer access via the same CDMA 450 fixed wireless network (125 Kbps down link speed for each carrier or 2 Mbps for 2 carriers) and via WiFi hotspots. There was no immediate plan to offer cable modem services, because of the relatively high cost of the terminal equipment. Valtron planned to offer an unlimited use tariff of S/100/month (US$ 31/month). It planned also have its own telecenters (cabinas públicas) and 199 Internet subscribers, including telecenters and private subscribers in five years.

5. Cable TV. Valtron's partner in the Huorochiri project, B&Q, operated a cable television service in the province over a coaxial cable (DOCSIS) system. B&Q believed that within this project it could triple its customer base from 1,000 to 3,000. However, it was reluctant to use wireless (MMDS), which is susceptible to having its signals stolen. B&Q and Valtron planned to offer news and sports using a satellite backbone.

According to its own projections, Valtron will have 950 fixed, 760 mobile and 165 Internet access customers and 150 public payphones by the end of the first year of operation. In 10 years, it expects that the fixed and mobile subscriber numbers will grow to 1,200 each. The Internet access and public payphone numbers are not expected to grow much beyond their first year numbers (Figure Anx 3.9).

Figure Anx 3.9: Valtron's Huarochiri Project: Projected 10-year subscriber numbers (fixed, mobile, internet access and public telephone)



Financial considerations

The planned total initial investment for components 1–4 was S/.4,232,744 (US$1,411,000) as shown in Table Anx3.2[139]. FITEL was to fund US$295,000[140], and the rest was to be funded by Valtron, and through vendor financing by ZTE, the supplier of the communications equipment. Valtron's calculations showed the project becoming cash-flow positive in the second year, with income derived from customer subscriptions, circuit leases, terminal equipment sales, and termination charges.

Valtron's business plan foresaw two types of costs: (i) Direct costs including interconnection and leased circuits, taxes, salaries and other charges; and (ii) Indirect costs, including spare parts, maintenance, Internet access, operations center costs, and awareness raising training. Toward the end of the first 10 years of operation, there will also be income taxes to be paid.

Table Anx 3.2 Huarochiri Project CAPEX

Item	S/.	S/.	US$
Communications equipment			
Transmission and switching equipment (MSC, BSC, OMC, BTS	1,478,603		492,868
Backbone link (Cerro Suche – San Isidro)	140,000		46,667
Terminal equipment	869,225		289,742
Sub total equipment (FOB)	2,487,828		829,276
Import duties (43%)	1,069,766		356,589
Installation	400,400		133,467
Total communications equipment		**3,957,994**	**1,319,331**
Operations center			
Communications tower	52,500		17,500
Preparation of technical office	35,000		11,667
Preparation and furnishing of commercial installations	70,000		23,333
Information system, billing and customer service equipment	70,000		23,333
Total operations center		**227,500**	**75,833**
Total CAPEX		**4,232,744**	**1,410,915**

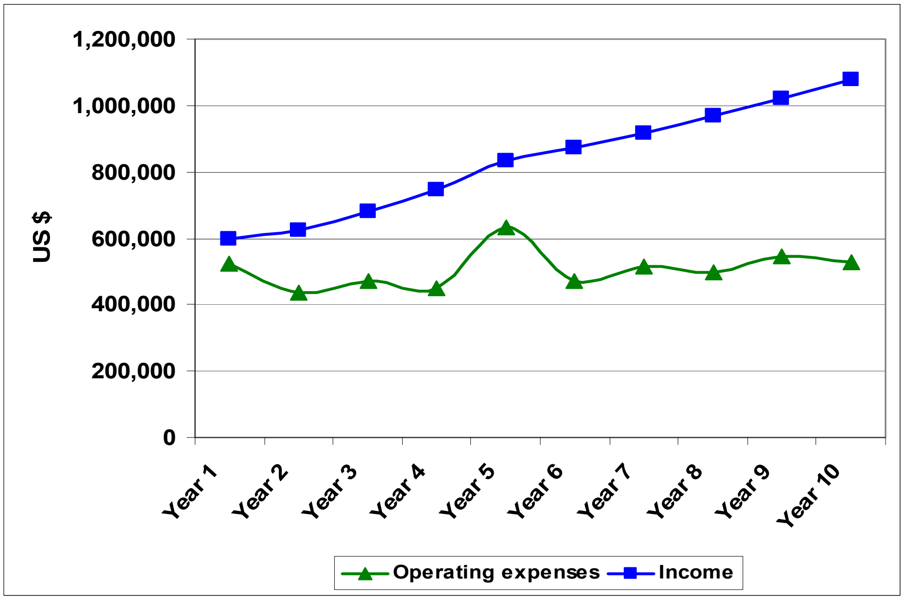
139 Component 5 is not part of the FITEL project as it falls outside the scope of telecommunications activities that can be funded out of FITEL resources.

140 The maximum amount that can be funded for a pilot project is US$295,000 of which management can be a maximum of US$75,000.

Source: Valtron

The projected annual operating cost is estimated to lie between S/.1,300,000 (US$433,000) and S/.1,800,000 (US$600,000) per year (Figure Anx3.10). Valtron calculated that the economic benefits of the project in terms of savings in time and transportation costs is about S/.1,700,000 (US$566,700) per year. The social benefits of the project are measured in terms of the net present value (NPV) of the project, which is about S/.45,000 (US$15,000) using a discount rate of 14%. The internal rate of return of the project is 14.34%.

Figure Anx 3.10: Huarochiri Project: Projected 10-year income and operating costs (in US$)



Source: Valtron

The project was approved by the Ministry of Transport and Communications on March 29, 2005, and Valtron was awarded spectrum in the 800 MHz and 450 MHz frequency bands and a subsidy of US$295,000 from FITEL. However, FITEL could not make any funds available until a three stage approval process had been completed, which was required for all publicly-funded projects under rules of the Ministry of Finance's Sistema Nacional de Inversion Pública (SNIP). This process involved the following: (i) developing a project profile and doing pre-feasibility and feasibility studies during the pre-investment phase; (ii) developing all technical aspects and project implementation steps during the investment phase; and (iii) designing the control and evaluation procedures during the post-investment phase. Contrary to SNIP, FITEL only required a project profile and a feasibility study. FITEL did not require Valtron to provide information on the technology to be employed or any detailed engineering evaluation. This underlined a fundamental difference between purely publicly-funded projects - to which SNIP rules apply - and projects that are mainly privately–funded, but require a start-up subsidy. Another difference between the two is the source of funds. Publicly-funded projects are financed out of tax revenues of the state. FITEL projects are funded out of mandatory contributions from telecommunication operators, with the understanding that the funds thus obtained will be used to provide telecommunications services in places where these operators would not provide these services under normal competitive conditions. SNIP approval was obtained in January 2006, and the network was officially inaugurated on June 21, 2006.

Valtron needed to secure financing for the remainder of the capital requirements. Some of this has come from the supplier in the form of vendor–financing, but only for buying the telecommunications equipment. Valtron had to secure bank and other loans to cover the rest. If the Enablis Entrepreneurial Network described in Chapter VII had been operating in Peru, and if Valtron had been a member, Enablis might have provided it with up to a 90% guarantee. In addition, Valtron would have been eligible to receive technical advice and other support in providing the required documentation to FITEL, the government, suppliers and the banks, and in establishing the company through Enablis' mentoring and coaching program.

As a rural operator, Valtron benefits from the special interconnection arrangements which apply to such operators (Chapter VII.6.7).

Conclusions: the social and economic benefits

Ruddy Valdivia has worked closely with local governments to facilitate obtaining necessary construction and other permits, and to ensure that the population is fully aware of the project and its implications. He conducted a detailed demand study to determine the potential market for each type of the five services he is offering.

Many population centers do not have electricity. Local authorities in at least 20 localities are developing plans to bring electricity to their communities. In other areas, the electricity distribution company and Valtron have discussed the possibility of sharing facilities and services, such as towers, rights-of-way and billing.

The uniqueness of this project is that it proposes a very cost-effective solution to build a network covering a whole province, and it offers five services for which there is an identified demand in a mixed urban/rural area. The geographic nature of the province is challenging – it has both low and very high lying areas. The project will provide local employment through the administrating and running of telecenters and through the operating and maintaining of the network.

One of the conditions for obtaining FITEL funding was that Valtron had to organize and offer courses in customer care to its new employees. Valdivia invited local entrepreneurs, such as restaurant owners and innkeepers, who he thought would benefit from this training. Valdivia believes this training will lead these local entrepreneurs into becoming more intensive users of Valtron's telecommunications service offerings. One impact from the Huarochiri Project has been to bring the Lima market closer to the producers of dairy and agricultural products in the valley. Savvy Lima consumers will soon be able to order local cheeses and Chirimoyas by picking up their telephones and ordering directly from the producer, at prices substantially lower than they are now paying.

These initial successes have inspired Ruddy Valdivia pursue the establishment in the Huarochiri valley of a technology and training center for the use of ICTs in rural settings. His goal is to attract not only people from Peru and the rest of Latin America, but also people from other parts of the world. Valdivia plans to establish similar networks in other provinces of Peru.

The Huarochiri Project has revealed the enormous potential of small-scale ICT projects in the social and economic development of rural, remote and underdeveloped areas of Latin America. There was nothing preventing the incumbent and other large operators in the country of extending their networks and offering the services that Valtron is now providing. Like Ruralfone in Ceara State, Brazil (described below), Ruddy Valdivia seized an opportunity that suited the size of the project and the underlying social and business objectives he had in mind, and realized it to the full. Ruralfone and Televias Puyhuan (also described below) are filling a void. Larger operators are not set-up to build networks and provide the types of locally-adapted services that these small entrepreneurs are able to do. Substantial social and economic benefits can result from these types of projects, even with a very small amount of investment. These small and medium-sized local undertakings also have the potential to bring financial returns to universal access funds, if, as recommended in Chapter VI, the structure of these funds is changed to allow them to make loans and take up equity in these companies. If vendors and financial institutions are prepared to loan money to these kinds of entrepreneurs, why not the universal access funds?

Figure Anx 3.11
Rural telecommunications entrepreneur Ruddy Valdivia (back-center) with his future customers

IV
Small community-based operator or micro-telco: the Televias Puyhuan Project in Jauja, Peru

Network configuration and technology

Televias Puyhuan, another example of a small community-based operator or micro-telco, built a local access network covering an area of 160 km^2 around the locality of Jauju in the Department of Junin, Peru. The economy in this region is based mainly on agriculture and breeding. Televias Puyhuan used Motorola's Canopy Broadband Wireless Access (BWA) system. This network could potentially provide access to a 16,000 people. The pilot project was built with the support of USAid, the Peruvian Government, Motorola and Cisco. It was officially launched in April 2006, although the system had been in operation since November 2005. The network consists of two towers (distribution head end): one with three 60^o sectored antennas or Access Points (AP), and one initially with a single 60^o degree antenna. Each antenna in the Canopy system can offer connectivity to up to 200 line-of-sight (LOS) subscribers in its 60^o arc. The typical LOS range lies between 3 and 8 km, depending on the frequency band (5 GHz for the former; 2.4 GHz for the latter), extendible to 16–24 km using passive reflectors (Figures Anx3.12 and Anx3.13). Typical aggregate throughput is around 6 Mbps.

Figure Anx 3.12: Signal coverage: Televias Puyhuan Projec, Peru

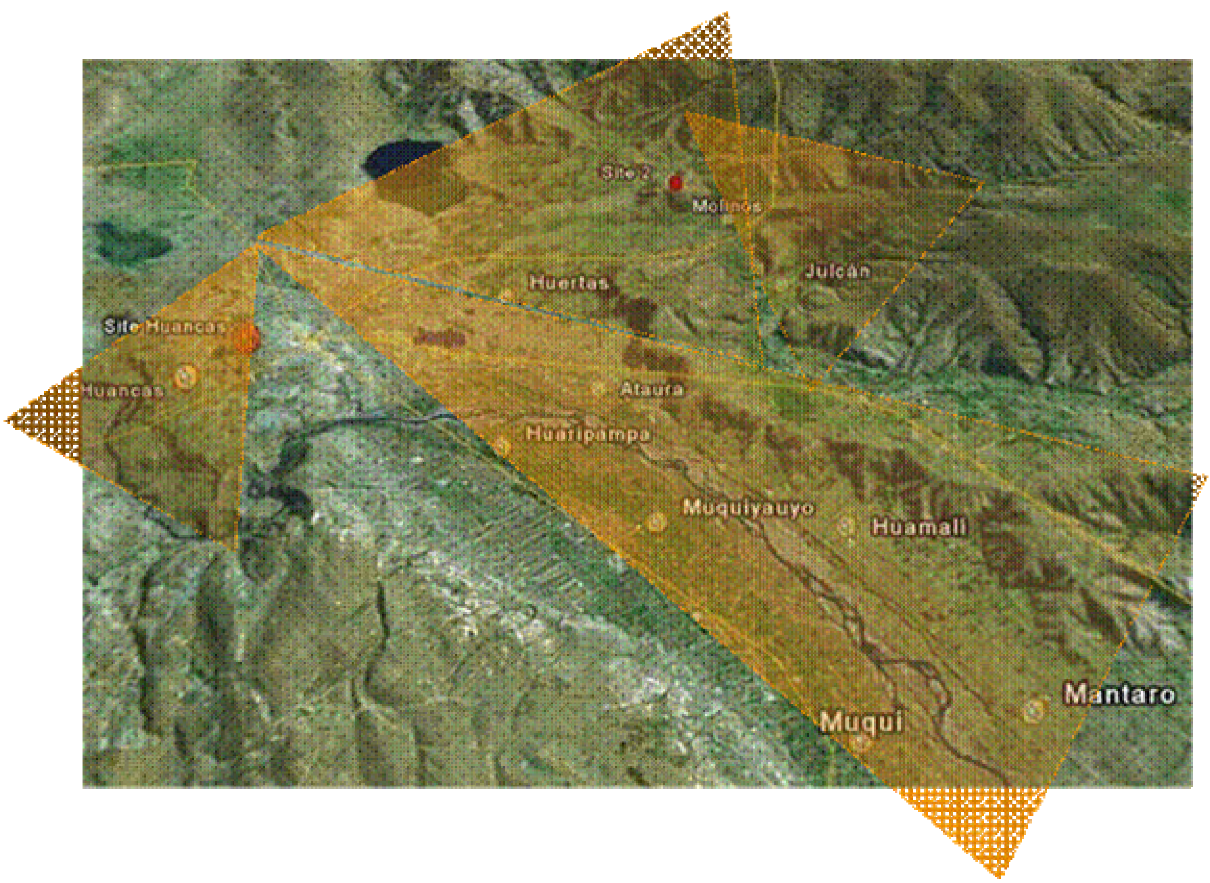
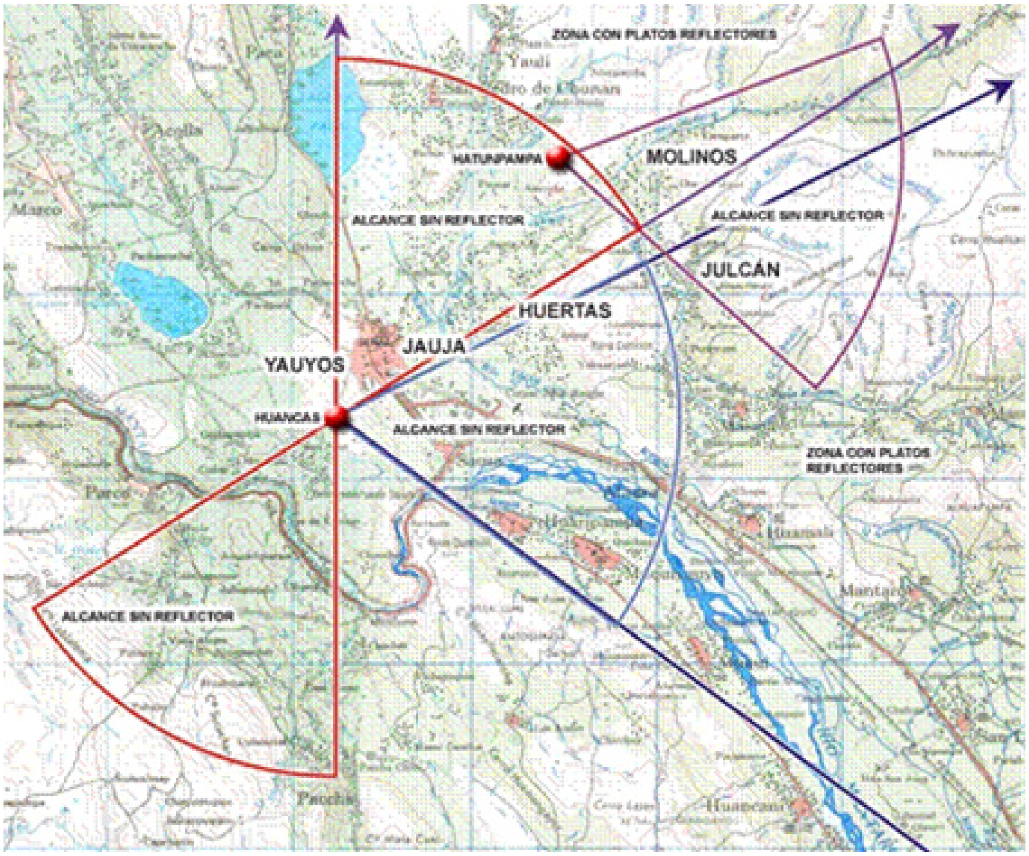


Figure Anx 3.13: Map of Jauja area showing signal coverage of Televias Puyhuan Network



Downstream, the network is connected by VSAT through the network of Telefonica del Peru to Internet and the domestic and international PSTN. Initially, Televias Puyhuan had a 1,024 Mbps down-link/ 256 Mbps up-link Internet connection, which costUS$133/month. It had four telephone access circuits, which cost US$70/month. Televias Puyhuan planned to increase this to a 2,048 Mbps down-link/ 512 Mbps up-link connection (US$845/month), and 30 telephone lines (US$527/month) by mid-2007. On the subscriber side, individual terminals are connected to the module antenna via copper (ADSL), WiFi or Ethernet cable.

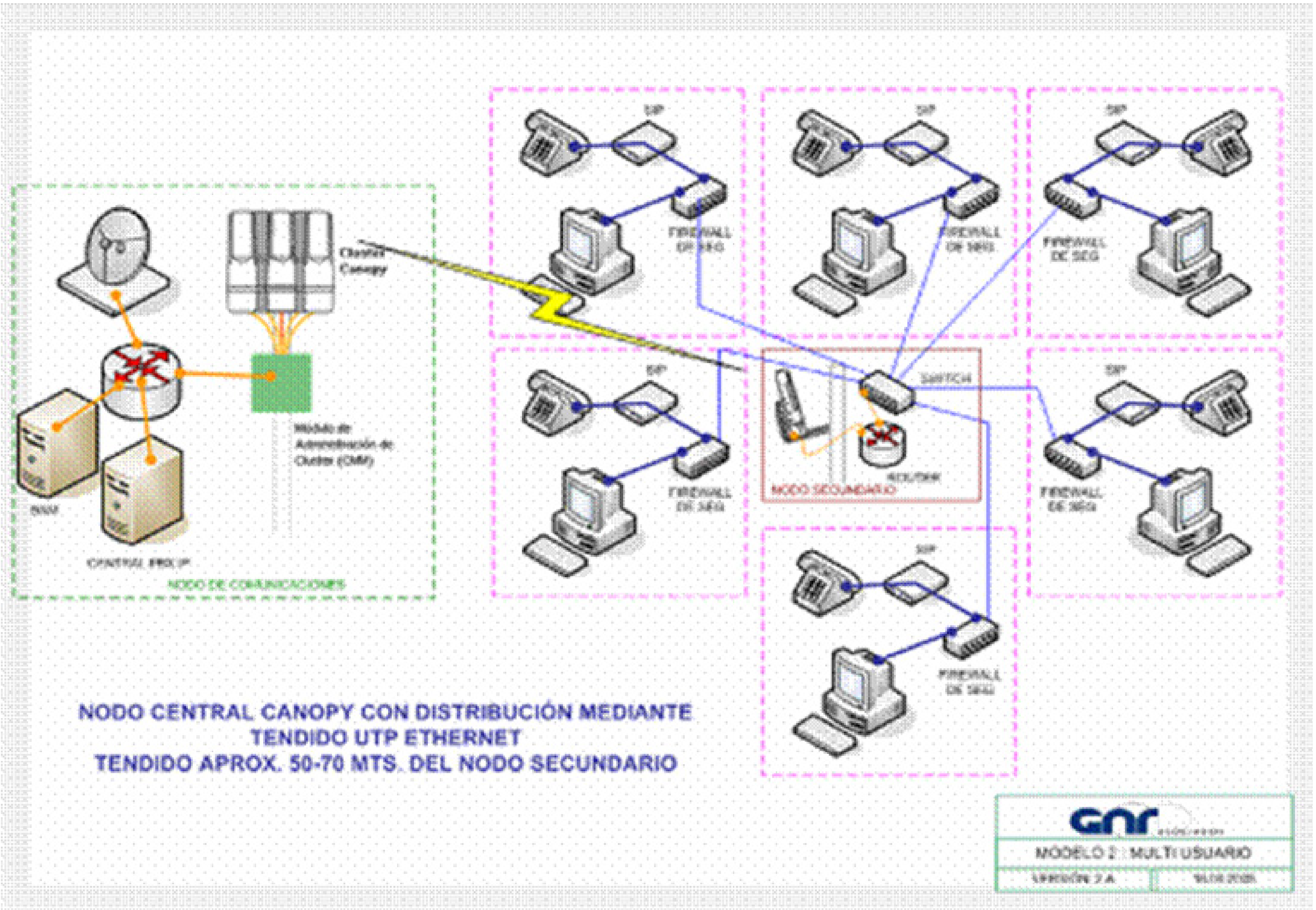
CAPEX

The initial network, which cost US$120,000, can serve up to 50 customers. Televias Puyhuan's plan is to invest another US$140,000 to increase capacity, to serve up to 600 fixed telephone and Internet subscribers by mid-2007. Users pay for their own customer premises equipment.

Regulation

Televias Puyhuan has a rural operator license, and is therefore subject to the special system of tariffs for the rural service described in Chapter VII.6.7 of this report.

Figure Anx 3.14: Network configuration: Televias Puyhuan Project, Junin, Peru



Pricing of telephone and Internet access services

Televias Puyhuan currently offers the following services: (i) local calling within its own network; (ii) calls to other phones in the Department of Junin; (iii) domestic and international long distance calls to cell phones; and (iv) broadband Internet access.

The simple flat-fee pricing scheme is as follows:

Table Anx 3.3 Televias Puyhuan's flat pricing scheme

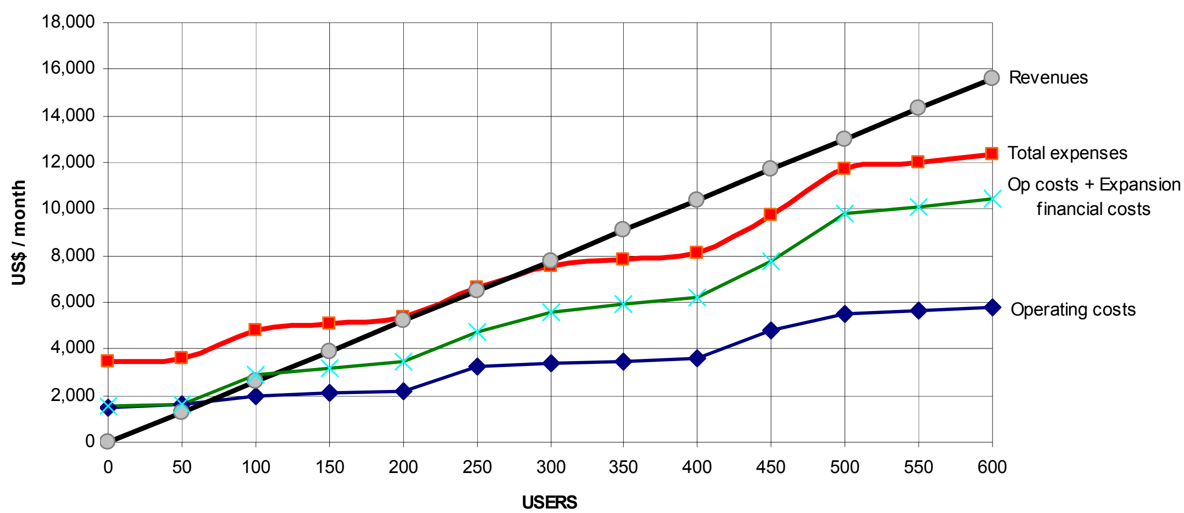
Service	S/. per month	US$ per month
Telephone	50	16.50
Internet Access	70	23.00
Telephone and Internet access	100	33.00

Business Plan

Prior to its official launch, there were 47 individual users (households, businesses and public institutions) connected in the localities of Huertas, Molinos and Huancas. The municipalities of Ataura, Muqui and Muquiyauyo and Mantaro Valley have also been covered, which provides an initial connection to the primary school in Ataura and the health facility in Huaripampa. Other important users are the regional education office (UGEL) and the Jauja emergency response network of the police, hospital, fire-fighters, the army and the civil defense office.

The project's business plan shows it becoming cash-flow positive when it has obtained 280 subscribers.

Figure Anx 3.15: Televias Puyhuan Project: Revenues and expenses (Break-even is at 280 customers)



V
Small commercially-operated regional network: the Qiniq broadband network in Nunavut Territory, Canada

Introduction

The QINIQ broadband network provides broadband connectivity to 29,500 people in 25 communities in an area of 5,180,000 km^2 in Nunavut Territory[141] of the Arctic region of Canada (Figure Anx3.16). It was constructed in 2005. The largest of these communities, Iqaluit, the capital, has 6,000 inhabitants; the smallest, Bathurst Inlet, has only 25. Grise Fiord, the northernmost settlement, lies at 78° North; the hamlet of Sanikiluaq on the Belcher Islands in Hudson Bay is actually further south than Ontario's northern border. Sanikiluaq has 815 inhabitants. The distance between Grise Fiord and Sanikiluaq is 2,253 km, or about a 10 hour plane ride[142] (Figure Anx 3.17). None of the 25 communities is accessible by road or rail; everything, from people to fuel to food, arrives by plane or sealift. Because of the inconveniences created by this physical isolation, Nunavut Territory has the highest cost of living in all of Canada. The traditional economy is based mainly on hunting and fishing, along with the production of Inuit art. Prior to the establishment of the QINIQ Network, people in these communities had sparse libraries, few or non-existent government services, minimal private sector development, and in most cases, extremely limited educational opportunities.

When the administrative territory of Nunavut was created in 1999, there was a satellite-based government communications network in place that provided limited connectivity to government offices in 11 of the 25 communities. However, this network was not generally accessible to the public even in the 11 communities that were connected, because the government service only connected government offices. Even most schools, college campuses and libraries were not connected in 1999. There was a handful of ISPs that offered local dial-up Internet services, but at exorbitantly high prices – ranging from US$25/month to US$400/month, depending on usage. Other communities had it worse - dialing through the phone infrastructure via satellite to a server in Iqaluit, Yellowknife, or the south, and paying hundreds of dollars per month for unimaginably slow connectivity (4 Kbs). It could take up to four hours to download a standard weekly Norton Anti-virus patch, at .40 cents per minute to the local phone company, *plus* the ISP charges for an account. It could take four hours to upload a single low resolution photo promoting Inuit art for sale. Not surprisingly, there was a high level of dissatisfaction with this communications infrastructure, and a strong push to bring better technology into northern Canada.

141 The area of Nunavut is greater than half of the entire area of Canada.

142 By chartered aircraft one could make it in about 10 hours with a stop in Iqaluit for fuel. However, if one were to take the commercial flights from Sanikiluaq to Grise Fiord, one would have to fly from Sanikiluaq to Inukjuaq, to Kuujuaq, to Montreal, to Iqaluit, to Resolute and finally to Grise Fiord. This would likely take about three or four days, assuming no weather delays, and cost about Cdn$6,500. Unsurprisingly, this is rarely done. There is one story where a local Sanikiluaq youth was funded to get to Grise Fiord for a Baffin Island region youth meeting. But he only made it as far as Iqaluit, as Grise Fiord was fogged in, and the plane did not fly there. The meeting was then convened in Iqaluit, and no representatives from Grise Fiord were able to attend.

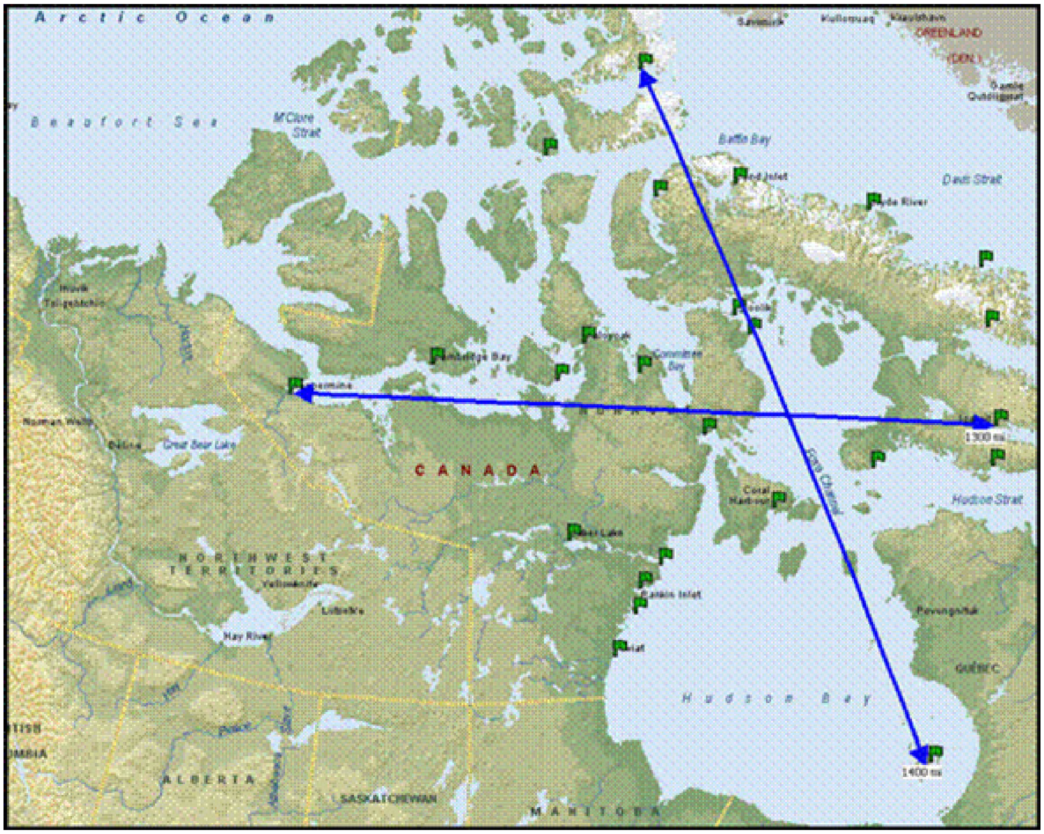
Figure Anx 3.16: Nunavut Territory, Canada

Initiative to establish the network

In 2002, Nunavut Broadband Development Corporation (NBDC) was created in response to an announcement by the Canadian government that it was establishing a large subsidy program to connect Canadians in remote and rural regions. NBDC was a not-for-profit community-based corporation (http://www.nunavut-broadband.ca/) created to ensure that communities, companies, organizations and individuals not served by the old government networks could get access to broadband services at affordable prices. NBDC represents the community, the private sector and ordinary citizens, and is made up of interested citizens who come from a wide range of backgrounds - the only requirement for membership is that one lives in Nunavut. It is controlled by Nunavut residents, and 62% of its current membership is Inuit. NBDC owns 100% of the shares of the operating corporation, NBDC Inc., which holds the assets of the QINIQ Broadband Network for the benefit of Nunavut residents, under the direction of the NBDC Board of Directors. The board has seven members, who represent all regions of Nunavut.

As one of its first functions, NBDC developed a business plan for a sustainable broadband network covering the 25 communities of Nunavut. It then selected, through a request-for-proposal process, SSI Micro (www.ssimicro.com), a Yellowknife-based small local telecommunic-ations operator, to design, build, operate and maintain the network.

Figure Anx 3.17: The 25 communities connected via the QINIQ Network in the 5,180,000 km^2 Nunavut Territory of Northern Canada



Network configuration

BWA base stations[143] in each of the 25 communities provide broadband non-line-of-sight coverage to the entire community. The largest station covers an area of about 10 km^2. Each base station is a pre-WiMAX BWA system supplied by NextNet operating in the 2.5 GHz licensed band - similar to the one in Figure VII.1. The 25 communities are connected via satellite links to a 100 Mbps[144] duplex IP gateway in Ottawa. The satellite capacity is leased from the privately-owned Canadian Telesat system, the only supplier with such a far northerly footprint. This raw capacity costs roughly 48 times as much as an equivalent terrestrial connection in southern Canada. The satellite dishes are 4.5 m in diameter, larger than in more southern locations, because of the low azimuth angle in these northern communities. Energy is supplied by the government-owned power company, which provides electricity produced in local diesel-fueled power plants in each community.

The entire network was installed in the period of one year between April 2004 and April 2005. The satellite earth station, base station, and communications equipment for each of the 25 sites was pre-assembled in Montreal. Then it was shipped via sealift and installed by SSI Micro

[143] Single base stations in smaller communities and multiple base stations in larger communities, but primarily for capacity, not coverage.

[144] Currently running at less.

technicians, who flew in once the equipment had arrived in late summer. Building concrete foundations and installing 4.5 m. 500 kg antennas proved to be quite a challenge, especially during the winter months, when temperatures easily fall below –30^{o} Celsius, and high winds are prevalent (Figure Anx3.18).

Figure Anx 3.18: QINIQ Network: Installation of 4.5 m antenna, communications shelter and wireless tower at Gjoa Haven, Nunavut, at 68^{o} North

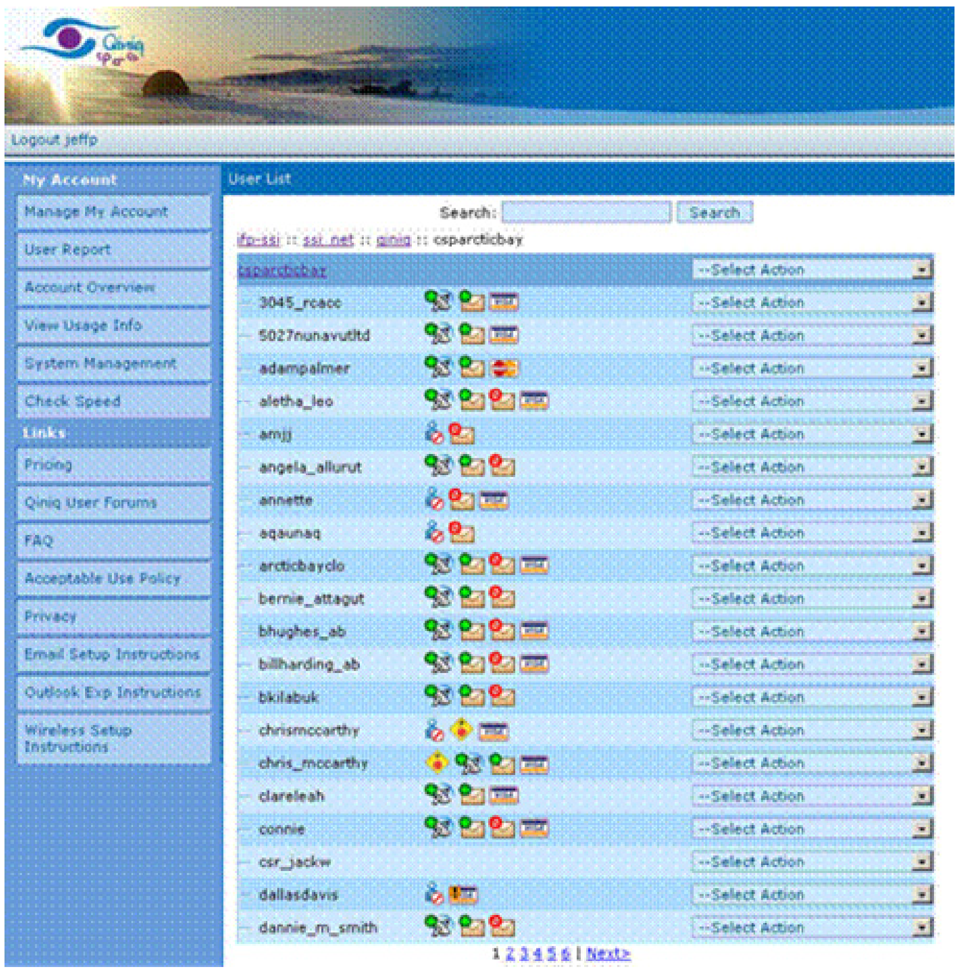
About 95% of homes and businesses are covered by the NLOS signals; however, in essence 100% of the people who wish to connect can do so. There are a handful of homes in Iqaluit and Pond Inlet that have trouble getting the signal, because they are in a weak coverage area. This is being resolved through the use of external antennas. There are other impediments to being connected, including inability to afford service, inability to afford a computer, inability to keep up with payments, being located in a heavily metal-clad building, lack of access to banks and credit cards, and lack of adequate technical support. NBDC has a mandate to develop ways to ensure that everyone who wishes to get connected can do so. NBDC is, for example, working with SSI to develop a low-cost communication device – essentially a set top box that people can use to have connectivity.

Network management

The QINIQ Network is managed centrally by SSI Micro: this includes maintaining the satellite (ground-based) infrastructure, the wireless networks, all back-end hardware, and the billing and management systems. All of SSI Micro's 23 staff are located at its headquarters in Yellowknife, Northwest Territories. Technical staff visit the sites on annual maintenance trips, but also rely on the community service provider for minor or emergency repair.

Figures Anx 3.19 and Anx 3.20 show, respectively, SSI Micro's centralized provisioning and billing management, and the traffic-shaping management systems. Figure Anx 3.19 is a screenshot of ARIA, a web-based Provisioning and Management System developed by SSI Micro. ARIA interfaces directly with the hardware and systems in the network to manage users and services. It also interfaces with external systems, such as credit card processing services for billing purposes. The uniqueness of this system is that it provides a single user interface for all functionality, which is critical in managing the network and services as they evolve.

Figure Anx 3.19: SSI Micro's Network Provisioning & Billing System

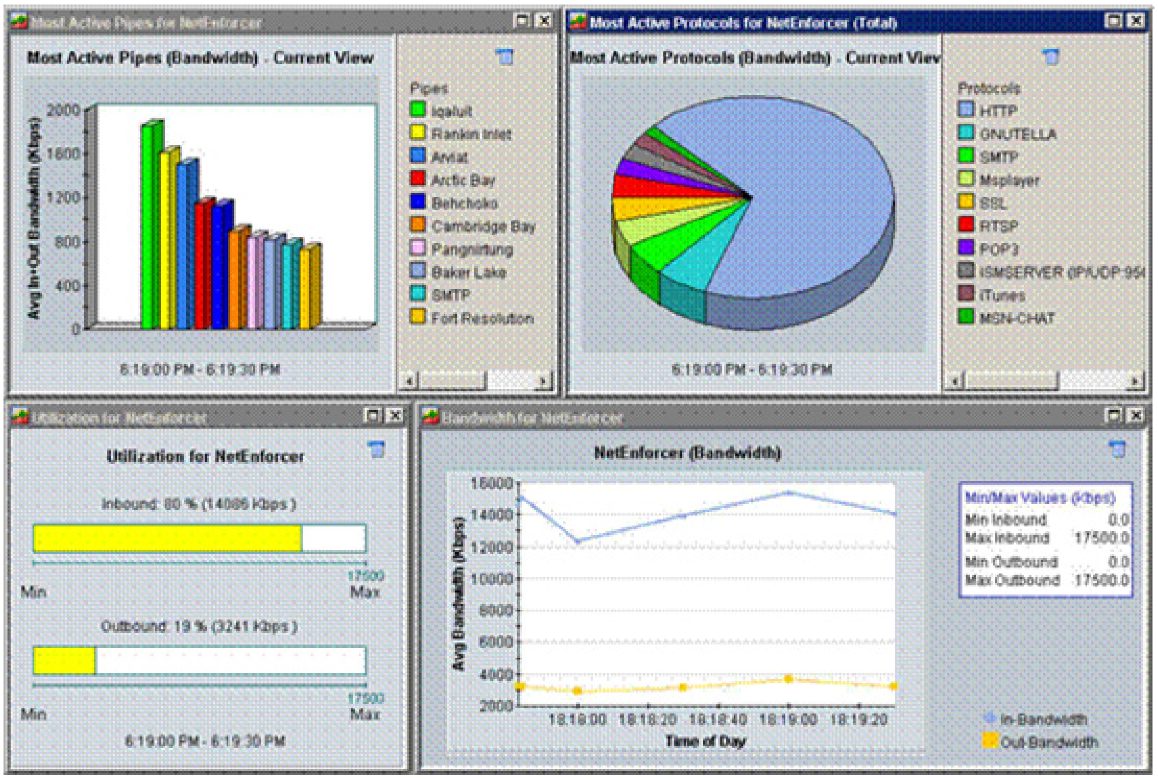


The screenshot in Figure Anx 3.20 is a view into the Network Traffic Shaping Sub-system, which dynamically controls bandwidth allocations on the network. The four windows shown indicate the following: (i) the top 10 communities by speed (top-left); (ii) the top 10 protocols (top-right); (iii) the current utilization of the satellite capacity (bottom-left); and (iv) inbound and outbound bandwidth over time (bottom-right). These are just four out of hundreds of real time views that this system can produce.

Using this system, the network manager can implement bandwidth usage rules by any combination of variables, including the following:

- source or destination IP or port
- protocol or application signature
- number of simultaneous connections
- min/max in/out bandwidth
- time of day

Figure Anx 3.20: SSI Micro's QINIQ Network traffic-shaping management system



SSI Micro does not sell to end users directly. Instead, broadband access services are offered in each of the 25 Nunavut communities by local residents known as community service providers (CSP). The CSPs sign-up users, take payments, provide technical support and perform various other functions. CSPs are a critical component of the QINIQ service offering - they give QINIQ clients the opportunity to deal with a local person, typically a long-time northern resident who understands the local culture and language.

NBDC realized early in its planning that the key to an overall successful project lay in the development of a local "people infrastructure", in the form of at least one local person in every community trained to install wireless modems, handle basic troubleshooting and collect payment for services. Each CSP brings a different skill to the QINIQ Network. Some are experienced Internet Service Providers. One owns a cable company. Another owns a construction company. One runs a Co-op. Another owns a hotel. Each community has a CSP with a unique background and a wealth of knowledge. By mid-November of 2004, all CSPs had completed a week-long workshop on the main tasks that they would be responsible for in their respective communities. SSI Micro and NBDC held a workshop that encouraged participants to develop ideas on how best to serve their communities. The CSP model was then further refined, the emphasis being on using the newly created network to create a community of CSPs with a strong, shared vision through conference calls and exchange of e-mails.

New subscribers receive a non-line-of-sight (NLOS) customer premises equipment (CPE), which includes a modem, built-in antenna and transceiver in a small self-contained unit weighing less than 450 gm (Figure VII.2). The CPE can easily be carried to the home or office. The modem needs simply to be connected to a power supply and to a computer, via an Ethernet cable. Because the system provides NLOS coverage, no separate outdoor antenna is required within a 5 km range of the base station. Although the range of the signal can extend up to 30 km in ideal conditions, SSI Micro's design criteria was typically no more than a 5 km radius using an omni-directional antenna. The modem/antenna can be placed on the desk next to the desk top or lap top computer. There is a one time Cdn$50 registration fee and modem deposit of Cdn$150, which is fully refundable if the modem is returned in good working condition and the subscriber's account balance has been paid in full. There is a one time Cdn$10 roaming charge each time a subscriber goes to a different Nunavut community and turns on the modem.

The billing arrangement is purely prepaid - subscribers pay one month in advance when they sign-up. Subsequently they receive an electronic invoice each month on the sign-up anniversary day. They then have seven days to make payment or the account is automatically suspended. The online billing system will try each night to collect on the account by processing the c/c or looking for cash/coupon on the account that will cover the balance. If it is unable to collect, it will send the subscriber a reminder each day until the subscription is suspended. The CSPs receive a daily report that notifies them of any account that is suspended or about to be suspended in the next seven days. This allows the CSP to warn subscribers directly, and account for the possibility that subscribers may not be checking their e-mail. If an account stays suspended for more than two months, SSI Micro applies the Cdn$150 modem deposit to the outstanding balance, and refunds any unused portion to the subscriber. This billing method has virtually eliminated bad debts.

In order to accommodate customers who insist on terms, NBDC, working with SSI Micro, developed a Central Payment Center (CPC). This is basically an underwriter for specific corporate or government accounts that require paper invoices and 30-day terms. Any customer who wants to use the CPC must first sign an agreement with the CPC operator, which is currently NBDC. The CPC then issues a coupon code that causes all charges to be transferred each month to the CPC account. The CPC pays the network and collects the charges, plus a 15% administrative fee from the client.

Many residents do not have bank accounts or credit cards. Only three of the 25 communities even have physical banks. To aid the QINIQ customers who have no bank accounts, NBDC accepts postal money orders from the CSPs. The customer goes to the local postal outlet, of which there is one in each community, and purchases a money order for the cost of setting-up their account, and then brings it to the CSP. The CSP then sends an email to NBDC that includes the postal money order serial number. NBDC then sends a coupon code to the CSP, who activates the customer's account using the coupon code. The CSP mails the postal money order to NBDC, which receives it seven to 21 days later.

Both the CPC and the postal money order service are creative ways that SSI Micro and NBDC have dealt with the widespread lack of access to bank services and credit – essentially finding ways of turning checks and cash into electronic payments. Moving paper around the Arctic is a slow process, particularly in the smaller communities, where mail often takes three weeks to be delivered.

CSPs receive a 20% commission (20% of the monthly service plan cost) paid to them by direct deposit to their bank account each month. Because many CSPs live in communities without a bank, they are allowed to accept cash payments from customers, and then use the balance in their commission accounts to make payments on behalf of those customers.

The government itself was not one of the targeted market segments, because of contractual obligations it had with the existing telephone company. However, many government and other public organizations have purchased multiple accounts for their staff, because of the advantageous coverage and pricing offered by QINIQ.

Service offering and prices

The services currently offered include the following:

- High speed Internet access with downlink rates of 256, 384 and 768 Kbps.
- Digital voice, using standard telephones or SIP-enabled (Internet) phones.
- Hotspots, using a simple QINIQ wireless modem and a hotspot device that allows local businesses, such as hotels, restaurants and airports, to provide their clients with affordable, broadband Internet access.

Prices vary from Cdn$60/month for the 256 Kbps down-link Internet connection (2 Gb download limit per month) to Cdn$400/month for a 768 Kbps down-link connection (20 Gb download capacity limit per month) [Table Anx3.4]. A digital voice service will be offered starting later in 2006.

These prices are relatively high in large part because of the high cost of satellite bandwidth in Northern Canada - Telesat is the only option available. Therefore, SSI Micro has set monthly bandwidth usage limits for each service plan, which is even more important than service speed. When subscribers reach the usage limit for the month, the system automatically notifies them via e-mail, and then rate-limits their account to a dial up equivalent speed (32 Kbps). Subscribers can then either stay rate-limited until the end of that fiscal month - at which point the usage resets for the next month - or they can log onto the portal and elect to purchase additional usage (in 1 Gb increments), or upgrade to the next highest service plan. If the subscriber purchases extra usage, the account restriction is automatically lifted and high speed is resumed. This Fair Sharing Policy (FSP) has had a dramatic and positive effect, because only 12% of the network's user-base would consume 90% of the bandwidth if there were no limits to usage[145]. After the FSP was enabled, SSI Micro saw a dramatic drop in peak busy time usage, because of rate-limited users. This ultimately benefits all users who are not over their usage cap.

[145] Taken from actual statistics gathered before SSI Micro implemented this feature.

Table Anx 3.4: QINIQ Network Pricing Plan (in Cdn$ ~ US$0.90)

Service/Plan	Qanniq	Masak	Piqsiq
Burst speed in Kbps	256	384	768
Speed restrictions apply after	2 Gb	5 Gb	20 Gb
Dynamic or static IP address	D	D	D/S
Included IP addresses	1	2	10
Included e-mail account	1	2	10
Monthly Charge	**$60**	**$120**	**$400**
Registration fee(one time)	$50	$50	$250
Modem deposit (reimbursable)	$150	$150	$150
Upgrade usage Cap (Gb/month)	$30	$24	$20
Roaming charge per landing	$10		
Extra e-mail address (per month)	$5		
Extra IP address (per month)	$5		
Anti spam service (per month)	$3		
Anti virus service (per month)	Free		

The costing model is based on usage, not on business users' cross-subsidizing residential users. Both residential and business customers can subscribe to a Cnd$60 per month package – which works fine for connecting one or two computers. A power user at home and a small business with five computers would likely opt for a larger 384 Kbps service at Cnd$120 per month. QINIQ makes no distinction between residential or business use, because it wants to encourage micro-businesses - which often operate from home - to use QINIQ to help them earn their income. QINIQ's mandate is to support economic development in Nunavut. Therefore, QINIQ encourages clients to use the most affordable network and its services offerings.

CAPEX and OPEX

The overall network equipment and installation cost for QINIQ was about Cdn$9 million (US$8.1 million). The Government of Canada covered Cdn$3.9 million of that amount through its BRAND program. Several Inuit organizations offered debt financing and loan guarantees (Cdn$3 million). The Nunavut territorial government contributed a loan of Cdn$777,000. The 25 municipalities contributed Cdn$650,000. In addition, there were contributions in kind and time from SSI Micro and other organizations and people. The Canadian government also provides a subsidy for 10 years to help defray the satellite bandwidth costs.

The 100 Mbps duplex IP gateway feed in Ottawa (IP Transit) costs approximately Cdn$2,500/month (US$2,250/month). This is equivalent to 20 Mbps of raw satellite capacity, which, depending on modulation and other overheads (TDMA vs DVB; carrier spacing), is equivalent to about 20 MHz of capacity of space segment. This is priced at about Cdn$120,000/month, bringing the total to roughly Cdn$122,500/month (US$110,000/month) for a 100 Mbps duplex connection, or 29 times the cost of equivalent terrestrial based backbone connectivity service in southern Canada. The average annual power costs per community - to power the equipment and heat and cool the communication shelter - amounts to about Cnd$700/month (US$630/month) per site for each of the 25 sites. That is another Cdn$17,500/month (US$15,750/month).

In addition, there is a large debt financing charge each month, because the Canadian Government's grant funding (Cnd$3 million) for this project only covered about 30% of the capital costs.

Finally, since the CSPs get 20% of the revenue each month, only 80% of the network revenue is available to cover the raw capacity costs, debt financing, and staffing and operation of the network.

Conclusions

After only 18 months of commercial operation, QINIQ surpassed its penetration projections for the 6^{th} year, with 36% of all households in the territory having gone online (according to the 2001 census data). This meant that about 15% of the total population of Nunavut had subscriptions.

There are only 14 public access sites (called CAP sites) in Nunavut, because establishing and running them is dependent on a Canadian Government program that has been slashed. All are free to end-users. Some of these sites use QINIQ, because they have managed to raise enough funds to pay for the connectivity, youth staffing, heat and light. They sometimes can use public space from the hamlet, although many communities simply do not have community space available - it is the highest cost item. Some public access sites are housed in schools or college campuses, where students share the terminals. In these cases, connectivity is achieved through the old government network, which for the time being has not been switched to the QINIQ network, mostly due to logistical and political reasons. NBDC has been working with the Nunavut body responsible for public access locations to find funding to assist in the development of sites in all the 26 communities.

There are some distance learning pilot projects, but they are in their infancy. Therefore, many school principals purchase QINIQ accounts themselves and take the CPE from home to their schools, using it for a faster connection to the Internet. But the QINIQ network will unfortunately be underutilized in schools until the Nunavut Department of Education develops a distance learning strategy, finds the funds needed to staff this initiative, and purchases QINIQ accounts that will allow multi-casting, and e-learning applications. Both public access and school connectivity were key reasons NBDC worked to get the QINIQ network built in the first place. Nevertheless, the financial and political realities in schools and government mean that the real benefits of QINIQ to these groups will have to wait until some of the issues are solved. In the meantime, there are many adults who on their own initiative, are using QINIQ to obtain further post-secondary education online. This should help create a group of people in these communities who will see the benefit of distance learning first hand. Over time, this should trickle down to primary and secondary schools.

Although the network backbone itself is ideally suited for tele-heath applications because of its single satellite hop (mesh) design and scalability, there are currently no such applications using it. Those applications are currently being done on the old government hub and spoke satellite-based network.

The QINIQ Model has had remarkably success in a large and forbidding area of northern Canada, with a widely dispersed population. This success is due to the following factors:

- The initiative to build the network came largely from the local community. The corporation that was formed for the purpose of developing and overseeing the project is not-for-profit and community-based;
- The contractor chosen to build and operate the network was a small local operator with experience in building and operating telecommunications networks in this environment;
- The operation is run on a purely commercial basis;
- The business model emphasized the role of locally-based community service providers, and included a purely pre-paid billing concept and a bandwidth efficiency pricing plan;
- The pre-WiMAX technology used for the local access network is very cost-effective.

The relatively high prices are due to the high costs of operating a network in a remote, extensive area with a forbidding climate, and the generally high cost of all goods and services in the far north. These prices cannot be expected to be comparable to prices for similar services in high density population areas in southern Canada and elsewhere.

Because of the huge cost of travel among the 25 communities, the QINIQ Network and its multi-cast capability are considered to be critical to the development of Nunavut. It enables people to communicate more effectively at a distance. When people are impeded from traveling because of the weather, they can still attend conferences via desktop videoconferencing.

Annex 3

VI
Privately initiated and operated local telecommunications company: Ruralfone in the state of Ceara, Brasil

Introduction

Ruralfone's business plan and concept are based on providing basic telephone services in non-metropolitan towns of between 40,000 and 100,000 people. It is a purely commercial undertaking. The Ruralfone concept is to establish operations in each selected town through local subsidiaries, with an EBITDA objective of more than 50%. The holding company, Ruralfone Inc., is currently privately-owned and based in San Francisco, California. It was incorporated in Delaware in May 2000. It has plans to raise additional capital in 2006 through a private equity, and its business plan includes an exit strategy.

Local Serviços de Telecomunicações Ltda. (LOCAL), Ruralfone's Brazilian subsidiary was incorporated in Fortaleza in May 2004. LOCAL obtained an STFC (Servico de Telefonia Fixa Comutada) license to offer fixed telephony services in all of the State of Ceara in northeastern Brazil. The State of Ceara has a population of 7.42 million, which is 4.4% of the total population of Brazil. LOCAL also obtained 2 x 5 MHz frequency in the 1800 MHz band to deploy a fixed wireless system. To begin with, LOCAL built a GSM-based wireless network in the town of Quixadá, and began offering telephone service in May 2005.

The selection of Brazil, and specifically the State of Ceara in northeastern Brazil, was based on the following commercially-motivated considerations: (i) at the country level, the size of the internal market in terms of population and per capita GDP at PPP; the presence of local suppliers; and a favorable legal and regulatory framework[146]; and (ii) at the local level, a relatively low teledensity (approx. 7.5%), a high concentration of people and a lack of focus from the incumbent operators to adequately serve the population. Quixadá is the first of 17 towns that Ruralfone will build-out in, through the end of 2007, Quixadá covers an area of 2,060 km^2 (37 inhabitants/km^2), has a population of 47,000 (16,400 households), and a per capita GDP equivalent to R$2,250. According to a 2000 census, 65% of households had an income of at least R$200/month. It is situated 160 km from Fortaleza, the state capital. The Ruralfone model is based on the following management, administrative, technological and commercial principles.

Management and local administration

LOCAL's core management team consists of six people: two expatriates and four locals. It is responsible for the overall management of the Brazilian subsidiary and training of local staff, who are responsible for the day-to-day operations of each local company. Decision-making is to the greatest extent possible left to the local company (Figure Anx3.22). Local companies are hired for the accounting, legal, regulatory, and auditing functions

[146] Ruralphone obtained its license in about nine months, with relatively little paperwork and at a cost of only US$4,100. Local bureaucracy and banking present a much bigger challenge for the investors.

Figure Anx 21: Location of Quixadá, State of Ceara, Brazil

Aside from the six member management team, all of LOCAL's staff is, and will continue to be, locally hired in the cities in which they will offer services. Today, in Quixadá, nine full-time employees are responsible for all technical, commercial, and administrative aspects of the day-to-day operation. They are paid local wages that compare favorably with those of people working in the town. All other operators offering telecommunications services in the town have no local staff in Quixadá.

Figure Anx 3.22: Meeting of Quixadá LOCAL staff

Commercial aspects

Ruralfone's commercial plan is based on local town promotion and daily interaction between the locally-hired staff (Figure Anx3.23) and its local customers. For example, most sales are done door-to-door. A LOCAL salesperson follows-up each sale by placing a phone call to new customers within a week to ensure that they are satisfied, and to answer any questions. LOCAL sales staff pay regular visits to their customers. There are additional activities organized to facilitate interaction between the company and its customers, such as a "Breakfast with LOCAL", where customers can discuss any issue related to the company's service. LOCAL contacts all customers whose credits are on the verge of expiring, and dispatches a salesperson to collect and recharge if requested. LOCAL's toll-free customer assistance phone line is answered by a person, not a machine, and LOCAL has a no-questions-asked refund policy.

Figure Anx 3.23: Service is marketed using this "speaker" van

Technology

The LOCAL Network is based on standard, commercial, mature GSM technology (GSM 1800, in the case of Quixadá), with readily available handsets and readily available, economically-priced network equipment. This equipment is manufactured in Brazil and is, therefore, not subject to the prohibitive import duties and taxes imposed on foreign manufactured equipment. Support is provided locally, in Portuguese.

Product and service offering

LOCAL does not supply handsets, and therefore avoids all aspects of stocking and subsidizing them and instead supplies only the SIM card. Customers acquire their own handsets, which are ubiquitous. LOCAL focuses mainly on one plan, a simple pre-paid monthly plan (Plano Sem Controle) that costs R$35 (US$16), and allows unlimited calling to any LOCAL or other fixed line number in the town[147.] This plan does not allow calling to a mobile phone[148]. Customers can

[147] Telemar's monthly minimum fixed line rate, R$39, allows for 100 pulses (pulsos), which provide an average of about 230 minutes of peak/off peak calling to fixed line customers.

[148] LOCAL also has a Plano Basico that allows calling to a mobile customer at R$1.10/min. With this plan, calls to a fixed line or LOCAL customer are charged at R$0.20/min. Mobile operators charge about R$0.80/min for a call to a fixed or local mobile customer, depending on the time of day.

make long distance calls, but are billed directly by the long distance operators, which send a bill at the end of the month[149]. Customers can use their terminals anywhere in the village where there is coverage from the single cell site. It is estimated that LOCAL customers make an average of ten 1.5 minute calls a day. At this rate their monthly bill with Telemar would be in the lowest cost scenario: about R$60.

Legal, regulatory aspects and interconnection

LOCAL has an interconnection agreement with Telemar and all other mobile and long distance operators that operate in its region. That includes Telebras, Claro, Oi, and TIM. The agreement is applicable to any town in which LOCAL will be deploying in the State of Ceara. Physically, LOCAL only interconnects with Telemar, which provides transit to all of the other 20 or so operators with which LOCAL has the interconnection agreement[150]. LOCAL also has a site-sharing agreement to use Telemar's rights-of-way and towers.

LOCAL's interconnection charges negotiated with interconnecting operators are shown in Table Anx 3.5 below.

Table Anx 3.5 LOCAL's interconnection charges

Destination of call	Rate per minute	
	R$	US$
Calls to a mobile operator (e.g. Claro, Oi, TIM)	0.41	0.20
Calls to Telemar's fixed line customers in Quixadá	0	0
Transit paid to Telemar for all calls to other operators	0.10	0.05

* as the traffic is quite balanced

LOCAL receives R$0.05/min (US$0.023/min) for national and international incoming calls to its customers.

Network build-out and business plan

Ruralfone's business plan projects that the Quixadá operation will be EBITDA[151] positive after nine months of operation, and attain Ruralfone's business objectives after 15 months. Four other towns will be built-out in 2006, and the remaining 12 will be built-out in 2007. Ruralfone plans for all 17 towns to be in operation by December 2007, with a total of 34,500 subscribers. That is an average of 2,025 per town. Ruralfone projects that the overall operation will be EBITDA positive by April 2008, and attain Ruralfone's business plan objectives by February 2009.

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149 Brazil has a call-by-call selection indirect access scheme for long distance calling. LOCAL has to do a simple credit check before allowing any of its customers to make long distance calls. It then sends the necessary subscriber data to the long distance operators. LOCAL is not responsible if the customer does not pay the long distance charges. Co-billing is mandatory in Brazil, which means that the local operators must include the long distance call in their bill, even though it is under the name of the long distance operator.

150 LOCAL did not experience any particular difficulty in obtaining interconnection with any operator. It was able to get agreement with all of them in about six months.

151 Earnings before Interest, Taxes, Depreciation and Amortization.

Ruralphone Inc. estimates that by the end of 2008, the company could be worth US$24 million (US$700/subscriber), based on similar transactions in Brazil.

Financing

Ruralfone Inc., the USA-based holding company, was established with an initial equity of US$695,765. It received a loan agreement from the USA Overseas Private Investment Corporation (OPIC) of US$3.375 million. Of this, OPIC paid-out an initial US$1 million. Ruralfone Inc. transfered funds - to establish the network and start operations - in the form of capital and loans, to the Brazilian subsidiary, Ruralfone do Brasil. The latter in turn, transferred funds to Local Serviços de Telecomunicações Ltda, the operating company. Local Serviços de Telecomunicações Ltda pays dividends on capital invested and interest on loans to Ruralfone do Brasil, which in turn pays dividends and interest to Ruralfone Inc.

Conclusions, observations and recommendations

After 10 months of operation, teledensity in Quixadá has been increased by 20%. The project has become cash flow and EBITDA positive for Ruralfone.

This model and the initiative have so far been successful for the following reasons:

- Despite the fact that Ruralfone Inc. is from outside the region - and indeed the country - the company's focus has been very much on the local community. The staff is all locally recruited, and the company has made a large effort to get to know the local population and their concerns, and generally become part of the community. Most of the decision-making is left to the local staff. From the outset, the company built-up a very good relationship with local government officials, who helped during the setting-up of operations, and also became one of the first commercial users of the services. That provided a good reference for the population.
- Costs are kept to a minimum. Most goods, including the telecommunications equipment, and services are acquired either locally or within the country;
- There have not been any difficult regulatory hurdles to overcome. Obtaining a license did not present any particular problem. Fees are minimal;
- Interconnection and leased circuits presented no particular problems. Tariffs are reasonable, and arrangements with other fixed line, cellular and long distance operators are sensible and straight forward. Interconnection agreements were obtained with 20 different companies in six months;
- The regulator, Anatel, has been supportive.

However, there are some issues that could be improved to make such initiatives even more attractive. They are as follows:

- Bank and other local bureaucracy are unnecessarily obstructive.
- There are high consumption taxes in the sector.

- It is not easy to find local investors and competitive financing from local institutions. The government should consider providing fiscal incentives and enacting policies that offer financial support to such emerging rural operators.

Ruralfone is exactly the type of undertaking that could receive debt and equity financing from universal access funds if they were restructured in a way that allowed them to provide this type of financing. It would be particularly appropriate and useful in Brazil, where FUST has accumulated nearly US$2 billion, without having been able to spend any of it.

VII
Broadband access systems integrator: Omniglobe Networks

Introduction

A different outsourcing model, which has, however, some aspects in common with the LocustWorld Model (Section Anx 3.3), is that of OmniGlobe Networks (www.omniglobenet.com). It is a broadband systems developer, integrator and service provider, based in Montreal, Canada. It offers system design, network build-out, connectivity to the Internet, and on-going operations, maintenance, and back office support to small and medium-sized local operators and service providers anywhere in the world.

Network design, construction and management

The local network consists typically of several 'pre-WiMAX' base stations configured in a star network configuration, with each 60 degree sector capable of delivering an average of 50 mw of output power (17 dBm). This correlates to a typical range of 30 km (in clear line-of-sight conditions), with maximum throughputs of up to 2 Mbps per subscriber in a shared access scheme[152]. The signal from each base station is transmitted through a directional 60 degree antenna with an effective isotropic radiated power (EIRP) of 3 watts, which can be increased to 12 watts with the addition of an amplifier module. The pre-WiMAX systems operate in the 5 GHz frequency band. All of the base stations in this configuration are connected through a switch to a satellite hub, which consists of a 1.8 meter dish and modulation/demodulation, coding and transmission equipment[153]. The backhaul link to OmniGlobe's main satellite gateway is provided via 2 Mbps channels leased from various satellite operators. OmniGlobe's gateway and network operations center offers IP Transit (connection to the Internet) and all the monitoring and back office support to the local operator (Figure Anx 3.24). A typical network configuration with two base stations mounted on an antenna pole, connecting with two 60 degree sector antennas is shown in Figure Anx3.25. In this topography, the subscribers are contained in the narrow 60 degree sector covered by each antenna. Furthermore, if there are subscribers beyond the typical range of an antenna, OmniGlobe can provide a separate satellite system sharing the same DVB-RCS satellite bandwidth at the distant location with its own subtending wireless or WiFi network, or extend the wireless network, by offering point-to-point wireless links to act as repeaters to the distant or uncovered location.

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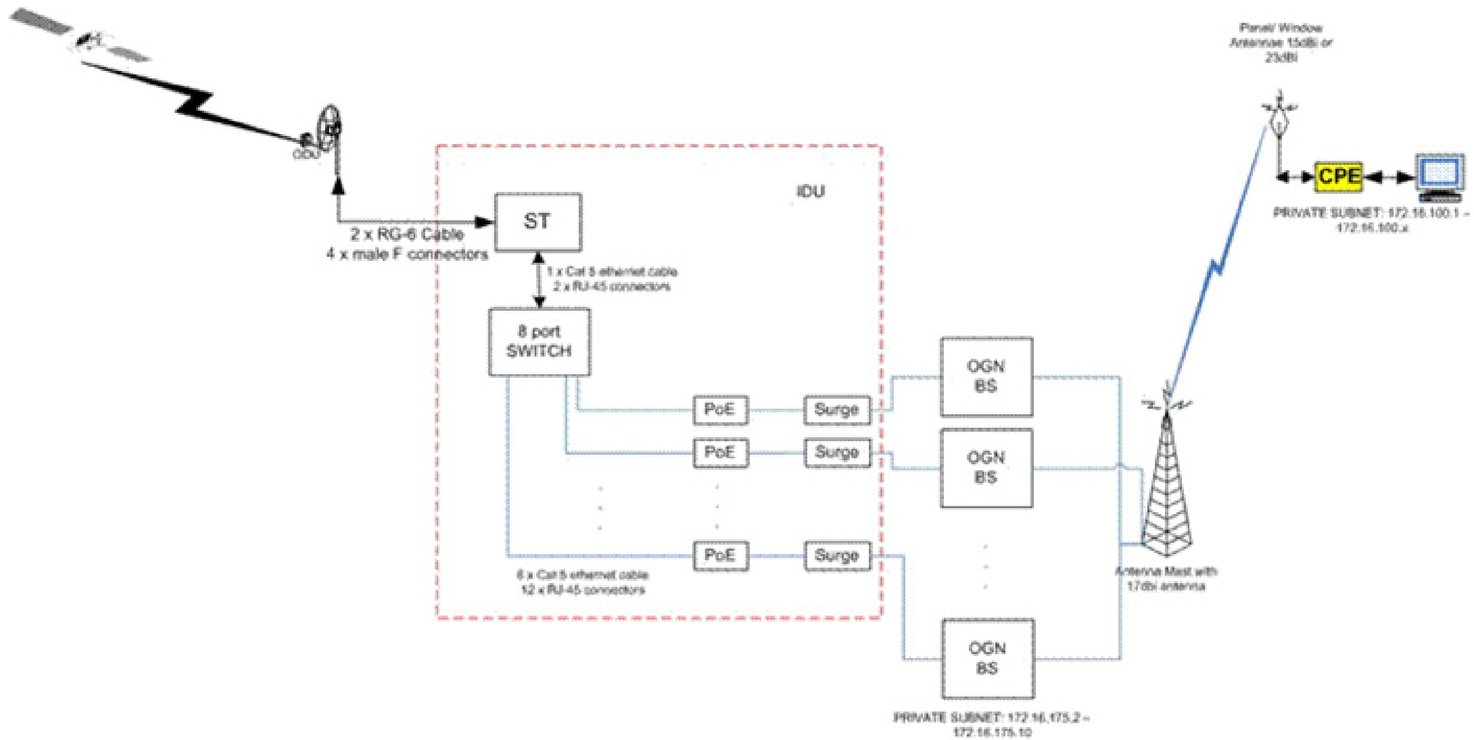
[152] Subscribers can be also grouped into different access classes, and further share the available site bandwidth based on their access class (e.g. residential share on a 50:1 basis; commercial on a 5:1 basis).

[153] Consisting typically of (i) an Out Door Unit (ODU), consisting of a Low Noise Block (LNB) and Block Up-Converter (BUC); and (ii) an In Door Unit (IDU), consisting of a DVB-RCS capable terminal. The forward link (i.e. toward the end-user) can deliver up to 45 Mbps of Time Division Multiplexed (TDM) Internet Protocol data. The return link system uses a Multiple Frequency Time Division Multiple Access (MF-TDMA) modulation scheme with a maximum capacity of 2 Mbps of IP data per channel. Backup power is typically provided by a 20 min. UPS, and a generator that is switched on manually when power drops.

Figure Anx 3.24: Typical network configuration showing DVB-RCS satellite transport and pre-WiMAX local access technology



ST = Satellite terminal

PoE = Power over Ethernet

Surge = Surge protector

OGN = OmniGlobe Networks

BS = Base Station (Note each BS requires its own antenna, typically mounted on one antenna tower.)

CPE = Customer Premise Equipment

Figure Anx 3.25: Typical WiMAX installation, with two base stations linked to two 60 degree sectored WiMAX antennas

In a West African deployment, OmniGlobe, along with a local partner, installed a satellite hub and wireless base station system with six wireless access points on one antenna on the roof of a three-story building. Each of the six base stations transmits over its own 60 degree sector, providing full 360 degree coverage around the central site, and giving potential access to 90% of all people living within a radius of 5 to 10 km of the antenna. With each base station capable of supporting a maximum of 250 subscribers, this configuration can support up to 1,200 subscribers in the coverage area. The configuration is easily scalable. As subscriber numbers increase, additional equipment can easily be added or a higher density system deployed. It is planned to eventually provide coverage to the whole of the city, which has a total population of 1 million.

OmniGlobe's overall capacity requirements and, therefore, satellite leased circuit costs are optimized among several distant hubs through the use of ETSI's (European Telecommunication Standards Institute) shared access, Digital Video Broadcasting - Return Channel Satellite (DVB–RCS) standard.

The fixed wireless CPE consists of a 15 dBi window-mounted (internal) antenna (Figure Anx 3.26), with an optional 23 dBi external antenna for fringe areas connected via a low loss coaxial cable to a transceiver and a modem[154]. The CPE is connected via a simple Ethernet cable directly to a computer (Figure Anx3.27). The computer does not require any special software, and may also form part of a local area network with several other computers behind a router.

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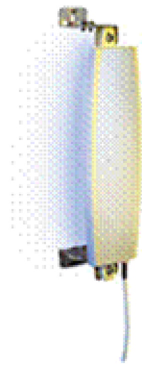
[154] Typically, 80% of the users can achieve adequate signal with an indoor antenna. In the future, a ruggedized CPE is planned, which can be installed externally, together with the external antenna, and thus improve the ability for signal to be received at the subscriber's premises.

Figure Anx.3.26: 15 dBi high-gain antenna



Outdoor medium-range antenna for 5.25 - 5.850 GHz frequency range. The antenna can be installed on the inside of the window using suction caps, or on the outside on a wall. It has an opening angle of 45 degrees, weighs 0.6 kg, and measures 330 x 93 x 21 mm.

Figure Anx 3.27: Customer premises device

The CPE offers robust and affordable wireless point-to-multipoint connectivity, which is ideal for metropolitan area networks, campus networking and last mile access. It operates in the 5 GHz spectrum. This product enables the instant creation of wireless WANs for enterprises, service providers and schools. It is powered by a wall mount AC adaptor, and connects to the antenna via a coaxial cable with connector. Its dimensions are 215 mm x 175mm x 40 mm, and it can be desk or ceiling mounted.

The typical residential data rate in another installation in a small, remote northern Canadian community (2,000 inhabitants) that is also served by OmniGlobe, is a peak 512 Kbps down-link/128 Kbps up-link. This results in a long-term statistical average data rate per residential user of around 4

Kbps. The business data rate requirements are 1 Mbps down-link/ 256Kbps up-link. There are 55 residential and 10 business customers. The total amount of data transmitted each month averages between 50 and 70 GigaBytes[155]. To serve these combined needs, the DVB-RCS shared bandwidth offered is 2 Mbps download and 512 Kbps upload to one location, as well as another 1 Mbps down/256 Kbps delivered to a second remote location, beyond the area covered by the WiMAX network.

The network can be managed either locally or centrally, the latter through OmniGlobe's network management and administration, which provides support to all local networks. Like in the LocustWorld Model, both can monitor the status and diagnose problems with any satellite terminal, base station or CPE, because each has its own IP addresses and supports the Simple Network Management Protocol (SNMP). The network administration center provides ongoing technical support to the local operator via a Voice over IP service (such as Skype) or the Internet.

Administrative aspects

OmniGlobe works with local entrepreneurs, who have the basic technology and management expertise to operate local Internet access services. Together they identify demand and define a traffic model. OmniGlobe then does all the network design, engineering, installation and training, and then hands the project over to the local entrepreneur. OmniGlobe and the local partner may share in the monthly revenue, and are jointly responsible for the technical management of the local network. OmniGlobe focuses on upstream technology issues, and the local entrepreneur assumes responsibility for customer acquisition, local marketing, sales, billing, collection and other commercial matters. Through its network operations center OmniGlobe can manage all of its remote sites.

The local team for a 100 subscriber site consists typically of a project manager, a secretary, and a lead technician in addition to the local entrepreneur. A larger site may require several additional full or part-time technicians, and an outside technical consultant with Linux and wireless systems experience. The local entrepreneur serves as the head of the team and as the prime interface with OmniGlobe. Once trained, the local team can install a similar system for another site, including the satellite hub. They can configure the network and carry out the necessary antenna alignments as the local partner expands service into new regions. In Sierra Leone, for example, the local team was able to do this in three weeks, after the installation of the first hub was completed with the help of an OmniGlobe engineer, remotely.

Typically, the local entrepreneur will obtain spectrum and other licenses if needed, and lease or build facilities for the antenna hub, base station installations and offices. The entrepreneur will need to find reasonably, but not necessarily highly trained technical support personnel familiar with LAN and IT networking.

Today these local entrepreneurs no longer have to offer full ISP services such as e-mail and web page services traditionally offered by ISPs, because subscribers are increasingly using free web-based email applications such as Hotmail, Yahoo, and Google, or purchasing commercial grade web-based e-mail solutions. Therefore, the local entrepreneur can focus on delivering Internet access with simplified monthly billing requirements.

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[155] There are bandwidth demanding commercial applications (e.g transfer of voluminous accounting data) and a high number of computers connected to their individual access.

Financial aspects

The local entrepreneur purchases the satellite and wireless network equipment, including the CPEs from OmniGlobe, which acquires these from specialized manufacturers of such equipment. The local entrepreneur may re-sell the CPE at cost, offer it free of charge, or seek a small margin. OmniGlobe leases and pays for backbone DVB-RCS satellite capacity from satellite operators.

Typical network acquisition, installation and operating costs are as follows:

CAPEX

The cost for equipment, installation and training for a typical system supporting between 250 to 1,500 subscribers is between US$18,000 and US$40,000 (excluding shipping and taxes)[156]. The CPEs cost about US$400 each. As the subscriber penetration grows, additional base station units and CPEs can easily be purchased on an as-required basis[157]. The overall cost for a 250 subscriber system is about US$480/subscriber.

OPEX

The local entrepreneur's operating costs consist of the following:

- Bandwidth capacity purchased from OmniGlobe, with the cost depending on the aggregate up and down-link speeds required. The local partner can either pay the monthly bandwidth fees, which include Internet access, or this cost can be amortized over the number of subscribers, in which case revenue is shared with OmniGlobe. Prices are about US$2,000 to US$4,000 per 2 Mbps down-link / 512 Kbps up-link speed capacity[158]. The total monthly satellite backbone bandwidth cost that the local entrepreneur pays to OmniGlobe for connecting the remote northern Canadian community mentioned above is about US$3,000/month for an aggregate of 2.5 Mbps shared down-link and 640 Kbps shared up-link. However, bandwidth costs do vary, depending on the region being served. For example, the cost for DVB-RCS bandwidth is less expensive in North America than in West Africa.

- Remote technical support from OmniGlobe, which covers system upgrades (firmware), network management, and provisioning. As new base stations and CPEs are purchased, OmniGlobe manages the configuration prior to shipping to the local entrepreneur. The remote support cost charged by OmniGlobe for managing the network, including maintenance, operation, and back office support, is dependent on the quality of the local team. A rough estimate would be about US$15,000 for the first year, for a small team of 2-3, supporting an implementation of from 50 to 1,000 users. This can cost around US$1,300/month to US$2,000/month.

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[156] OmniGlobe specifies and configures this equipment, which is generally off-the-shelf, but requires regular firmware upgrades. OmniGlobe provides these firmware upgrades typically two to three times per year.

[157] This includes satellite antenna, satellite terminal, wireless base stations and antennas, cabling, engineering, training, system design and installation. It does not include the antenna structures, which are not expensive. For example, a satellite dish mount can be built for under US$200. WiMAX poles are also very inexpensive. Travel for one engineer (around US$2,000), customs duties, shipping and local taxes are not included.

[158] OmniGlobe buys bandwidth and IP Transit and resells it to the local partner.

- At the start of an operation, the local entrepreneur may purchase second level ongoing support covering any daily technical issues that may arise, such as subscriber's losing signals and networking issues, which the local team cannot resolve. As the local team gains expertise, its need for such second level remote technical support diminishes.

- Salaries, employee benefits, administration and selling costs. In the case of the remote Canadian community, this could equal about US$80,000 per year, based on local salary conditions.

- License and other fees;

- OmniGlobe's share of monthly revenues, if applicable, with the bandwidth costs amortized, and shared over a subscriber growth plan scheme.

Revenues

The local entrepreneur can derive revenues from the following:

- Standard Internet access services offered to its customers, including telecenters, Internet cafés, public institutions, and commercial and individual customers. Depending on competitive conditions, this is sold at US$30/month to US$60/month for a 512 Kbps down-link service and US$200/month to US$300/month for a 1 Mbps down-link service;
- Leasing or selling the CPE;
- Offering IT support services to businesses, governmental organizations, and NGOs;
- Offering VoIP telephony services, including national and international calling where this is permitted;
- Reselling Internet access to other ISPs, Internet cafés, etc.
- Selling video conferencing capabilities;
- Selling public IP addresses.

In the future, the network may also offer the following:

- local audio streaming of popular local radio stations;
- backhaul for local cellular mobile operators via the DVB-RCS satellite link.

Advantages of this model

The advantages of this model for providing universal access in rural, remote and underserved areas are the following:

- The system can be deployed very rapidly. A system such as the one established in West Africa took only eight to 10 weeks from the moment the contract was signed with the local entrepreneur, to the point at which it was ready for service.

- The local entrepreneur's initial capital requirements are minimal. They are less than US$100/subscriber for a typical 500 subscriber installation, if the CPE can be sold to the subscriber. The revenue obtained finances the subscriber growth, as more CPEs are ordered.
- OmniGlobe, as the systems integrator, provides system design, network build-out, connectivity to the Internet, and on-going operations, maintenance, and back office support. It also provides training to the local team.
- Satellite bandwidth costs are minimized. OmniGlobe not only aggregates traffic, but is also able to optimize overall bandwidth requirements by using with a shared access scheme, as well as supporting bandwidth optimization software.

Conclusions

The OmniGlobe Model is suitable for the recommended financing option presented in Chapter VI.3.6, namely, that a portion of universal access funds be set aside for loans and equity for micro-financing operations. The equity or loan would be made available to the local entrepreneur.

VIII
Initiatives of incumbents and large operators: Examples of Telefonica in Peru and Brazil

The following illustrates two innovative models of a large national operator facilitating access in underserved areas and lower income sectors. Both models were undertaken on the initiative of the operator - there was no obligation imposed by either the regulator or the universal access program administrator to undertake these or similar initiatives. In Peru, Telefonica del Peru, the incumbent fixed line operator, is facilitating access to the Internet in isolated communities through its Llaqt@red telecenter initiative. In Brazil, Telefonica de Brasil, the fixed line operator in Sao Paulo State, has devised a rate plan that makes it easier for low income people to obtain and maintain a basic telephone service.

Llaqt@red telecenters in Peru

Except for Lima (231.8 inhabitants/km^2), Peru has a very low population density (21.7 inh/km^2), with many isolated communities. The population density in rural areas is 15.8 inh/km^2. In 2004, Telefonica del Peru implemented a project called Llaqt@red, or People´s Net in Quetchua. Llaqt@red provides telephone and Internet access, using the marginal capacity of Telefonica's existing hubs and VSATs. The objective of the initiative is to connect low density, isolated communities, especially those in rural areas.

For the initial pilot, Telefonica del Perú selected 17 villages with an average population density of 15 inh/km^2. It developed partnerships with municipal governments, churches, and local entrepreneurs, to operate the network and provide telephone and Internet access service for students, entrepreneurs, public institutions, and the population in general[159] (Table Anx3.6). Private entrepreneurs were encouraged to provide complementary services, such as photocopying, scanning, and printing, and sell other products, such as food and office supplies. Each telecenter generally has four PCs, and is open 15 hours a day, 7 days a week. They charge between S/.1/hour and S/.3/hour (US$0.33/hour and US$1.00/hour). The average income from Internet access only, is US$668/month.

The communications equipment consists of a VSAT antenna, solar-powered battery, modem and router. Telefónica installed this equipment at a cost of between US$10,000 and US$15,000. It charged each partner a flat one-time starting fee of US$150. The partner was responsible for acquiring the computers, router, furniture and other equipment, and for doing any necessary site renovations. The average cost for this was S/.2,200 (US$730), most of which was for the computers[160]. The partner's operating expenses include salaries, electricity, rent and US$150/month to Telefónica to connect to the Internet - through a 128 Kbps up-link/ 56 Kbps down-link.

[159] VoIP is not offered.

[160] Usually acquired in the grey market.

Table Anx 3.6 Location of Llaqt@red telecenters, populations and partners

Item	Department	Locality	Population	Partner
1	Lima	Pacaran	1,610	Parish
2	Arequipa	Yauca	1,685	Private
3	Tumbes	Cancas	2,021	Private
4	Ayacucho	Laramate	3,062	Private
5	La Libertad	Buldibuyo	4,164	Private
6	Cusco	Andahuaylillas	5,541	Private
7	La Libertad	Bolivar	5,741	Private
8	Ayacucho	Quinua	5,964	Private
9	La Libertad	Vijus	6,886	Private
10	Pasco	Huayllay	8,293	Private
11	Ayacucho	Chuschi	9,680	Municipality
12	Amazonas	Lonya Grande	10,330	Private
13	San Martín	Nuevo Progreso	11,630	Private
14	Puno	Lampa	12,940	Private
15	La Libertad	Tayabamba	13,594	Private
16	Pasco	Yanahuanca	17,281	Private
17	San Martín	San Jose de Sisa	18,352	Private

Source: Telefónica del Perú

The employees of the centers are generally students with some computer and Internet skills. The average age of the employees is 27. They are able to teach basic skills to those who are using a computer or accessing the Internet for the first time.

Each entrepreneur receives a manual with a guide to the proper management of the business. The manual helps the entrepreneur to understand the product and the market, to choose the right location, to study competitors, and to elaborate a business plan. This information is also posted on the Internet.

The benefits of the access points have been to provide Internet access, mainly to students and young people, who represent 63% of the users, and to provide telephone access to people not close to a payphone. Telefónica carried-out a user survey of its 17 sites that provided the following information: (i) 80% of users have been children and teenagers; 15% have been adults; 5% have been teachers; (ii)

Web searches and school work have accounted for 62.5% of computer use; e-mail, chat and games have accounted for 29%; work has accounted for 8.5%.

For Telefónica, the idea of Llaqt@red is not to make a profit, but rather to provide access to poor local communities while using up some spare capacity in its network. It has considered the pilots to be successful and is presently studying the possibility of taking the concept into other countries in Latin America where it is operating. The localities targeted by Llaqt@red do not have cabinas públicas, the very successful, privately financed and run telecenters, of which there are over 30,000 in Peru. The main objective of Llaqt@red has been to help small local entrepreneurs, who do not have even the relatively small amount of capital required to establish a commercial telecenter. This initiative aims to generate demand, and to help and train these entrepreneurs to become self-sufficient.

Linhas Economicas – Brazil

In Brazil, Telefónica Brazil is offering a special tariff plan called "Linhas Economicas" ("Economic Lines") in areas where there is little or no demand. The plan was designed for people with low incomes, and for customers who are at the point of getting disconnected because they have defaulted on their payments[161]. Telefónica Brazil also offers the plan to people who have difficulty in keeping up with regular bill payments. The plan is tailored to each particular group of existing and potential customers. Local calling to landlines is not prepaid or restricted. Long distance calls and calls to a mobile telephone are prepaid, but with a calling card that customers can purchase at sales points, bakeries, newspaper kiosks, pharmacies, lottery sales points, post offices, and Telefónica offices. In order to make a long distance call or a call to a mobile telephone customers must call a special access number (*015), and use a PIN number and a special code to charge the call to the calling card. Customers receive an invoice with their monthly calls to local fixed lines. In order to discourage medium and high income customers from moving to this plan, it offers no special features, such as caller ID, follow me and ADSL.

The Linhas Economicas plan was launched in June 2004, and by February 2006 it had attracted 2.2 million of Telefónica Brazil's 9.675 million residential subscribers. Implementation of the plan has resulted in fewer customers' defaulting on their payments. Telefónica Brazil has been able to reduce the allowance for doubtful accounts (ADA). In December 2004, the ADA was 8.41% for regular residential lines[162]. It was only 3.39% for customers with a Linhas Economicas account. Fewer customers are cancelling their subscriptions or having them terminated. For the 12-month period ending in December 2004, 59.4% of regular line customers who were connected at the beginning of the year were still connected. For customers with a Linhas Economicas account the figure was 65.8%[163]. Table Anx3.7 indicates the percentage of new subscribers who have continued with the Linhas Economicas and Linhas Classicas tariff plans after 3, 5, 7, 9, 11 and more than 12 months after starting their subscriptions. For example, after 11 months, 70.5% of customers who subscribed to Linhas Economicas the previous August were still on the plan, as opposed to 63.6% of customers who subscribed to the regular plan.

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[161] After 90 days of the default, the operator has the right to refuse to provide the service. Telefonica Brazil decided that under the condition of paying off the debt in instalments, the costumer could remain with access within the low-income plan. The monthly fee for a regular plan is R$38.13 (US$17.85) for a low-income plan it is R$28.70 (US$13.43).

[162] ADA M+5 (% net ARPU).

[163] ADA and termination/cancellation are higher due to the default agreements mentioned above.

Table Anx 3.7 Percentage of subscribers who have continued with Linhas Economicas and Linhas Classicas tariff plans x months after beginning their subscriptions

Linhas Economicas							
	New lines	M+3 (%)	M+5 (%)	M+7 (%)	M+9 (%)	M+11 (%)	M>12 (%)
August	107.635	95,7	93,1	85,7	77,7	70,5	65,8
September	121.819	95,7	93,6	85,6	79,6	71,6	
October	115.139	95,6	93,3	87,4	77,3	71,7	
November	90.065	96,3	93,6	88,3	77,4		
December	82.377	96,6	94,2	86,4	79,3		
Average (%)	103.407	96,0	93,6	86,7	78,3	71,3	65,8
Linhas Classicas							
August	59.746	91,0	84,2	76,8	69,0	63,6	59,4
September	49.299	90,6	82,8	74,8	68,1	61,9	
October	59.152	92,0	83,7	75,6	66,0	60,4	
November	59.584	93,0	84,3	77,2	66,2		
December	59.696	93,0	84,1	75,7	67,4		
Average (%)	57.495	91,9	83,8	76,0	67,3	62,0	59,4

Source: Telefónica Brazil

ANNEX 4

TELECENTER MODELS

Introduction

The definitions, objectives, and institutional arrangements of telecenters vary widely throughout Latin America. In general, they are at venues open to the public, and offer access to telephone, computer, Internet, and other communications and information resources. They are sometimes run on a purely commercial basis, and sometimes linked to broader economic and social development policy goals and supported by public institutions, NGOs and funding organizations. Table Anx 4.1, which is taken from the study on telecenters in Latin America and the Caribbean by Proenza, Bastidas-Buch and Montero, presents a useful classification of telecenters found in Latin America. Generally, these can be distinguished by the way in which they are administered, and by the types of services that they provide.

This Annex presents examples of different types of telecenter models that Regulatel countries have implemented with a certain degree of success.

Table Anx 4.1: Schematic classification of telecenters

Type	Services	Management-Administration	Examples
Commercial	The basic service is computer plus Internet connection. Called a cybercafé when a cafeteria or bar is present, but these other services generate only a small part of the income (<20%).	Private business	Cabinas Publicas in Peru. Cybercafés in Bolivia, Argentina and elsewhere
Franchise	Seeks to stand out by improved quality, faster connection, more and better services, atmosphere and comfort.	Private business	RCP proposal for Peru and El Salvador
NGO	Wide diversity of services, orientation, and target group, depending on location and orientation of promoting institution. Services include Internet combined with training and development activities. Hours of Internet may be subordinated to use of machines for other uses by NGO staff.	NGO or development project (dependent on grants from private businesses for initial computers and software).	CDI en Brasil. El Encuentro - Chile Unidades Informativas Barriales - Colombia LINCOS in Costa Rica and Dominican Republic, AEDES in Cotahuasi, Perú; Gemas da Terra Rural telecentres (Brazil); Infoplazas (Panama); CAATEC (Costa Rica)
University	Many terminals (30 to 100) mainly for students but also available to general public. Specialized technical support available. Academic courses in computers and preparation of contents easy to organize.	University	Universidad Nacional San Agustín (UNSA), Universidad San Antonio Abad del Cusco (UNSAAC)
School	The school opens its doors to the community after class hours. Services tend to be many and varied (Internet, e-mail, content preparation).	School	Leo Usak – Canadian Arctic; Casi (Uruguay); Fundacion Omar Dengo (Costa Rica)
Municipal / State	In principle, can include a wide range of services (public and private).	Municipal government directly, in partnership with other entities, or entrusted to private enterprise	Infoplazas in Pedací and Penonomé in Panamá. / Villanet in Villa El Salvador in Perú / Amic@s in Paraguay; Sao Paulo Acessa (Brazil); Pirai Digital Project (Brazil); CASIL (Uruguay)
Multipurpose	Rural: Access to Internet, e-mail and related services. Commercial web hosting to community, telephone booths, sales of working materials and stationery, internet café, training courses.	Administrative board representing donors, service suppliers and community members.	Valle de Angels and Santa Lucía; LINCOS (Dominican Republic and Costa Rica); Joven Club de Computacion (Cuba); Teleház (Hungary); Puntos de Acceso (Venezuela); GESAC (Brazil); Compartel (Colombia);

Cabinas Públicas - Peru

The concept of establishing community-based, public telecenters ("cabinas publicas" in Peru) has now become a mainstream element of universal access policies in dozens of countries. Some of the earliest, highly publicized telecenter initiatives began in Latin America, notably led by the Red Cientifica de Peru (RCP), which launched its first cabinas publicas in 1994. It is estimated that there are now about 30,000 cabinas públicas in Peru. This model has been replicated in La Paz, Bolivia, Buenos Aires, and Quito, Ecuador, but not in Sao Paulo or Santiago, Chile.

What began as a very basic services offering by an NGO to a private community, has evolved into a very successful small business model. RCP was the first ISP in Peru. It was established as a consortium of academic institutions and NGOs. One of its main goals was the democratization of the Internet. RCP used its academic members to train technicians and administrators, and to establish some simple guidelines for setting up and running commercial telecenters. A number of other factors contributed to making this a very successful, purely commercial model[164]. These include the following:

- The presence of a large informal sector in Peru's economy. The cabinas públicas were implemented first in Lima alongside other, similar informal businesses, such as computer repair and software pirating.

- The presence of many educated people with few other job prospects.

- Low entry barriers. Only a permit to run a commercial establishment was required. There were no licenses, registry, or other requirements imposed by the telecommunications regulator or other authorities. The original investment - mainly for the computers, network equipment and furniture - was in the order of about US$10,000. Operating costs - Internet access, personnel costs, maintenance, and rent - were about US$1,000/month.

- The introduction of competition in the telecommunications sector. This occurred in the late 1990s, and quickly increased the number of ISPs, and put pressure on the price that these cabinas had to pay for Internet connectivity. Prices to the public decreased, dropping in the space of one year from about US$1.40/hour to US$0.70/hour, between 1999 and 2000. It had become cheaper for people to access the Internet in the cabinas than from at home.

- Because of the relatively low fixed line telephone penetration rates in Peru, the cabinas became the only accessible means of communications for many persons, especially those in the lower socio economic strata. In 2001, only 5% of the population in stratus E used the Internet at least once a month. But of those who did, 91% accessed the Internet from a cabina publica and only 2% from their homes (Table Anx 4.2).

[164] Francisco J. Proenza, Roberto Bastidas-Buch, Guillermo Montero, "Telecenters for Socioeconomic and Rural Development in Latin America and the Caribbean, Investment Opportunities and Design Recommendations, with special reference to Central America", FAO, IADB, ITU, Washington, May 2001.

Table Anx 4.2: Percentage of people in each socioeconomic stratus in Lima that connect to the Internet from each of five different places, 2001 (Note: Some users may connect from more than one place)[165]

Place from where Internet is being accessed	Socioeconomic strata (A = highest, E = lowest)				Sex	
	A	B	C	D/E	Male	Female
Cabina pública	**59**	**77**	**88**	**91**	**77**	**90**
Work	22	29	14	6	24	11
School	21	17	16	16	15	19
Home	53	17	2	2	14	8
Home of a friend or family member	10	4	4	9	9	2

Source: Apoyo Consultoria

LINCOS and CTCs in Costa Rica and the Dominican Republic

The concept for LINCOS was inspired by research at MIT's MediaLab. The first five LINCOS were built and placed in rural communities in Costa Rica, with the help of the Entebbe Foundation.[166]

LINCOS are self-contained units that include six computers, some peripheral equipment, a connection to the Internet via a VSAT link and a back-up power generator or batteries. They are also equipped with a 25 watt radio transmitter. The objective in Costa Rica was to use these LINCOS to provide ICT-based training in rural communities. The project in Costa Rica was by all accounts successful, but has not been expanded because it received no further financial support.

The LINCOS that have been deployed in the Dominican Republic (Figure Anx4.1) are similar to those in Costa Rica. The first five LINCOS in the Dominican Republic were installed in 2000. There are now 24. Initially, LINCOS were established and operated with the support of a special directorate within the Presidency. In addition to providing technical and training support, the special directorate subsidized each LINCOS at a rate of RD$25,000 (US$8,250)/month. It is estimated that LINCOS generate between RD$8,000 and $12,000 (US$2,640 and $4,000)/month in charges for various services. Local councils (Consejo de Apoyo) consisting of about 20 community leaders representing education, religious groups, unions and the agricultural sector were established in order to ensure that the LINCOS were properly incorporated into, and met the requirements of their communities.

[165] Plan de Acción, Integración de la Infraestructura Regional en América del Sur (IIRSA), Banco Inter-americana de Desarrollo, Diciember 2003

[166] Fundación Costa Rica para el Desarrollo Sostenible http://www.entebbe.org/es/index.html

Figure Anx 4.1: LINCOS located in the Municipality of Bohechío, Province of San Juan de la Maguana, Dominican Republic

LINCOS in the Dominican Republic offer the following services:

- Telephone access (in some, but not all cases).
- Internet access at R$10 (US$0.30)/hour.
- Training in various MS Office software.
- Photocopying.
- Banking.
- Local radio station for transmission of information of interest to the community (preventative health matters; social, cultural and religious activities, and regional matters of particular interest to the community).

Many of these services are the same as in the Hugarian teleház described in the previous chapter.

Some observations and experiences gained from LINCOS are as follows:

- About 1% of the population uses the LINCOS.
- Most users are males between the ages of 15 and 30. Very few people over 40 use them. Women have been much more reluctant to use these telecenters - especially in rural areas, mainly it appears, because they have been intimidated by the new technology.
- The favorite activities of young LINCOS users are online chatting, and downloading music and burning it onto CDs.
- In a few cases, LINCOS have been used for commercial activities, especially to market and sell local agricultural and handicrafts.
- Some communities have expressed strong disappointment at having no telephone in their LINCOS.

- The radio stations in some LINCOS have been quite innovative, developing local programming, promoting interaction with call-ins, and even raising and resolving local issues. Some radio stations have sold advertising as a means to supplement income. However, there is a danger that these stations will simply become commercial stations like all the others. It is therefore important that their prime purpose of serving the community not be overlooked. In other LINCOS the radio stations have not been very active or innovative.
- It is important to have continual professional and technical support in the telecenters. Left to themselves, users tend to quickly lose interest after the novelty of being connected wears off.
- It is crucial to provide adequate training to the people in the community who will be called upon to establish and run the LINCOS.
- The selection process for local councils (Consejo de Apoyo) does not always result in the best people being chosen. Many are either not interested, or not properly qualified.
- The directorate that was set up to run the program was not as effective as it should have been.
- Unreliable power supply has been a big problem. In order to solve this problem, later versions of LINCOS have been supplied with AC/DC converters and UPS batteries. LINCOS with gasoline-powered generators could sometimes not afford to refuel their generators. The LINCOS in Samaná found an original solution to this problem. In exchange for serving as a payment center for the local electricity company the latter supplies it with free electricity.

Then INDOTEL and Depridam (Despacho de la Primera Dama de la Republica) took over responsibility for the LINCOS program. They implemented a new telecenter concept, Centros Tecnológicos para el Desarrollo Comunitario (CTC), that focuses on rural and on underserved urban communities. CTCs have the following objectives:

- Empowering people in ICT.
- Providing training in ICT as a means of human development.
- Creating services based on ICTs, and facilitating access and connectivity.

Selection of 135 communities to receive CTCs was based on the following:

- A maximum of 80% of the households are below the poverty level;
- A minimum of 70% of the population are literate;
- The Human Development Index is at least 0.25;
- There is a potential to develop economic activity in agriculture, fishing, handicrafts and ecological tourism.

The CTCs are financed by the Universal Access Fund (FDT). The national treasury contributes funds for the construction of the centers, and the Ministry of Industry and Commerce contributes funds for the solar energy component.

Infoplazas - Panama

Panama's Infoplazas are community telecenters that are located in rural and suburban areas. They are sources of information about regional social, economic and commercial activities. They offer training in computers and technology. These Infocenters frequently employ university students from the region, generally on voluntary basis.

The Infoplaza model is based on a concept promoted by the Inter-American Development Bank (IADB), from which it receives financial support. Local support is provided by the Fundación Infoplazas de la Secretaria Nacional de Ciencia Tecnología (SENACYT), other government departments, local and municipal governments, NGOs, civil groups and private enterprises.

Members of each Infoplaza provide space, furniture, electricity, air conditioning, security, four PCs and the salaries of the administrative personnel. For a period of two years, SENACYT provides six PCs, a server, the communications equipment to connect to the Internet, a colour printer, Microsoft software, training and technical advice on installing, operating and maintaining the center.

Cable & Wireless Panama, the incumbent, provides connectivity at half the normal monthly cost. This consists of the following: one ADSL connection with a down link speed of 256 Kbps; two frame relay connections - one at 128 Kbps and the other at 64 Kbps; and two dial up connections at 56 Kbps.

It is estimated that there are 27,000 users of the Infocenters each month, 90% of whom are primary and secondary school students. The foundation's annual budget supported by the IADB is US$1.2 million.

Compartel - Colombia

In several phases between 1999 and 2004, Colombia's Compartel Program installed 4,440 telecenters, of which 3,000 are in schools and 774 in public institutions. These telecenters are benefiting an estimated 5.2 million people, of whom 2.5 million are school children. More information is available at: (http://www.compartel.gov.co/)

GESAC - Brazil

Brazil's GESAC Program (http://www.idbrasil.gov.br/) has installed 3,200 telecenters with 18,000 computers using LINUX OS license-free software. These telecenters offer access to more than 4 million people in 27 states. The GESAC program is coordinated by the Federal Communication Ministry. It is targeted toward the C, D and E social classes.

State of Sao Paulo's Acessa Program - Brazil

The State of Sao Paulo's Acessa Program (http://www.acessasaopaulo.sp.gov.br/) has deployed more than 200 telecenters and Internet access booths, with an average of 10 computers per center. These telecenters serve mainly the C, D and E social classes. By the end of 2006, 80% of the cities in Sao Paulo - about 500 cities - should be served. There are three types of telecentres deployed in the Acessa Program. They are as follows: (i) Community Infocenters installed in the

Sao Paulo metro area in partnership with community centers. (ii) Municipal Infocenters installed in partnership with city governments; and (iii) Internet Access Public Booths implemented in partnership with state government sectors – these are deployed in public places with high traffic, such as train and metro stations, government offices, and public restaurants. The first two types of centers have up to 10 computers each, depending on the size of the city or community. The Internet Access Public Booths have between 10 and 38 PC's, depending on frequency of use. The program has not been further expanded since a change in minister.

Joven Club de Computación y Electrónica (JCCE) – Cuba, Conectividad a los Centros Bolivarianos de Informática y Telemática (CBIT) – Venezuela, CASI and CASIL - Uruguay

A particularly successful initiative in Cuba has been the Joven Club de Computación y Electrónica (JCCE) (http://www.jcce.org.cu/). This program has deployed nearly 600 telecenters - including 5 mobile units - that offer free IT instruction to anyone who requests it. Thus far, the JCCEs have trained nearly 900,000 people. Each center has an administrator, five instructors, and at least 10 computers and peripherals. The JCCEs also serve as places to confirm technical and professional qualifications in IT, develop specialized software, and identify talented young people for careers in computer science, IT, web development, and communications. In addition, Cuba has put computers in all schools and universities and implemented a comprehensive e-government program that includes health, culture, and social security.

In Venezuela, computer labs will be installed in 323 schools under the Conectividad a los Centros Bolivarianos de Informática y Telemática (CBIT) Project. This project is being implemented jointly with the Ministry of Education. The universal access fund will pay for the entire project, including the access and transport network. The goal is to incorporate ICT teaching and use into the public education system, by offering teachers and students access and training in computers and the Internet. Each CBIT will have access (downlink) at 384 Kbps. Each lab will have either 20 or 40 computers, a server, and two printers, with facilities for teaching including a computer screen and a VCR. It is estimated that the project will benefit more than two million students directly, and that an additional one million people will have access to the labs.

The Centros de Acceso a la Sociedad de la Información (CASI) and Centros de Acceso al Sistema de Intermediación Laboral (CASIL) in Uruguay have similar objectives to the JCCE in Cuba and the CBIT in Venezuela. The CASI offers free access and education in computers and the Internet to local populations. The CASIL was implemented jointly with the Labor and Social Security Ministry. It offers a job search service in nine different locations.

Piraí Digital Project - Brazil

The Piraí Digital Project (http://www.pirai.rj.gov.br) is coordinated by the City of Pirai in Rio de Janeiro State, Brazil. It has a network based on WiFi technology, that covers the whole city. The distribution is as follows: (i) 39 telecenters in public buildings, with a total of 145 computers; (ii) 20 telecenters in schools, with 188 computers serving up to 6,300 students; and (iii) 20 PoP's in public libraries and third sector organizations, with a total of 66 computers. Each telecenter has an average of 220 users per day. The network uses license-free LINUX OS software and is centrally managed. The project was designed to integrate the ICT needs of the public sector, business, education and third sector organizations. It offers Internet, E-mail, discussion groups, news, agenda, document management, e-learning, hosting, messaging, and public services (e-govt). In 2004, the project received the Premio Latinoamericano de Ciudades Digitales from the Instituto para la Conectividad en las Américas (ICA) and Asociación Hispanoamericana de Centros de Investigación y Empresas de Telecomunicaciones (AHCIET).

Sao Paulo City Portal Coordination - Brazil

The Sao Paulo City Portal Coordination was created in January 2001, with the purpose of decreasing the digital divide in this city of 10 million and providing an interface with citizens

(http://portal.prefeitura.sp.gov.br/cidadania/coordenadoria_governo_eletronico). As of June 2005, 122 telecenters had been opened, that serve the overall community, but with an emphasis on poor areas. The Sao Paulo City Portal provides the means for accessing public municipal services. In partnership with several NGOs, telecenters have been set up in refurbished public buildings in areas with low household income. In each center, there are monitors to help the public access the portal, and 10 to 20 computers - 75% for e-learning and 25% for general use. More than 100,000 people have been trained through this program.

The project developed two interesting technological tools: (i) Sacix: a tool to distribute GNU/Linux OS in the telecenters, with a typical configuration of one server and 20 clients. This architecture allows one PC to act as a server to 20 dumb terminals without HD and small size memory. Sacix reduces operational costs, and creates important cost savings in each telecenter; and (ii) Waram: a content publishing tool which allows portal update and access, using free-software.

Gemas da Terra Rural Telecenters Network - Brazil

Gemas da Terra (Gems of the Earth - http://www.gemasdaterra.org.br) is a non-profit NGO with a network of telecenters located in underserved rural communities of Brazil. Gemas da Terra manages the network, and provides access to training for community social entrepreneurs and technical support throughout the development of their telecenters. Support is provided to rural communities with less than 2,500 inhabitants. There are more than 10,000 communities of this type in Brazil (about 80% of Brazilians live in urban areas). The Gemas da Terra pilot project started in November of 2001, in five rural communities in northeast Brazil. UNESCO provided the computers, and the Brazilian Ministry of Communications provided the Internet via satellite. The community associations provided the space to house the telecenters and covered the ongoing expenses to maintain them. Gemas da Terra developed a Rural Telecenter Guide that describes the methodology for creating and managing a community telecenter from inception to a multi-functional and self-sustainable entity. There are still many steps needed to be implemented in order to bring the Gems of the Earth Telecenter Network to full operation.

Annex 4

ANNEX 5

TECHNOLOGICAL OVERVIEW: WIRELINE AND WIRELESS BROADBAND ACCESS TECHNOLOGIES

The following is a brief overview of the various wireline and wireless technologies that are currently available or that are being developed, to allow broadband (high speed) transmission over transport and local loop access networks. The emphasis here is on local loop access networks, which basically connect subscribers[167]. The summary indicates the range of data transfer speeds that are available for each technology. There is no commonly agreed upon definition for broadband. But for our purposes, a technology that permits data transmission rates from the user to the network (up-link) of greater than 100 Kbps, and from the network to the user (down-link) of greater than 1 Mbps, can be considered to be broadband.

Wireline

Digital subscriber line (xDSL, where x stands for asymmetrical [A], very high bit rate [V], etc.) uses the copper loop of the telephone network from the home or business to provide high speed data access. It can provide speeds up to 52 Mbit per second. Basically, data traffic is transmitted over the same copper pair as voice telephony, but in a different frequency band. The data channel can be connected directly to a data network or to the Internet. In its more common and economic version, ADSL-Lite, it can support down-link speeds of up to 1.5 Mbps and up-link speeds of up to 384 Mbps.

Integrated Services Digital Network (ISDN) allows voice and data to be transmitted simultaneously over the copper local loop to provide end-to-end digital connectivity. The voice and data are transmitted over bearer channels (B channels) at rates of 64 Kbps, or in some cases 56 Kbps. A data channel (D channel) handles signaling at either 16 Kbps or 64 Kbps, depending on the service type. There are two basic types of ISDN service. The first, Basic Rate Interface (BRI), consists of two 64 Kbps B channels and one 16 Kbps D channel for a total of 144 Kbps. BRI meets the needs of most individual users. The second, Primary Rate Interface (PRI), consists of a typical 23 B channel and one 64 Kbps D channel structure for a total of 1536 Kbps. PRI is meant for users with greater capacity requirements. In Europe, the PRI service option has 30 B channels and one 64 Kbps D channel for a total of 1984 Kbps (E1). In order to receive ISDN, customers need to install an ISDN terminal adapter and router in their premises. They must be located not more than about 5 km. from the telephone company's central office switch. ISDN has seen limited deployment, and is being largely displaced by broadband Internet services such as xDSL and cable modem, which are faster, less expensive, and easier to set up and maintain. ISDN is generally used as a backup to dedicated lines, and in locations where ADSL, cable modems and wireless options are not available.

Coaxial cable systems, when built with Data over Cable Service Interface Specification (DOCSIS), can support downstream speeds of up to 30 Mbps and upstream speeds of 3 Mbps.

[167] Transport networks connect access networks.

Building these systems with DOCSOS gives, inter alia, the usually unidirectional cable TV networks bidirectional capability.

Fiber optic cable systems can support speeds in the Tbps range. Fiber optic cable is of superior quality than coaxial cable because it has no crosstalk, no electromagnetic or radio interference, and is less expensive to maintain.

A dedicated line is a single, discrete, end-to-end wireline (copper, coax, fiber) usually symmetric (same speed in both directions) connection between the customer and telephone company. This wireline is dedicated for a specific application (e.g. data) with a guaranteed bandwidth availability and near-constant latency. This makes it more expensive than connections that use the public switched telephone network. Dedicated or leased lines are available in a variety of speeds including 64 Kbps, 128 Kbps, 256 Kbps, 512 Kbps, and 2,024 Kbps.

Power Line Communication (PLC) systems use low voltage (120–240 volt) and medium voltage (< 69 Kvolt) electrical power transmission lines to transmit voice and data. They can offer connections at speeds similar to ADSL. PLC has the advantage of using existing infrastructure.

Wireless

Radio-in-the-loop (RLL) systems are based on cellular mobile technologies that, in their Third Generation (3G) versions, support speeds of up to 2 Mbps. These provide a wireless replacement for the fixed paired copper cable. The two dominant Second Generation standards GSM and CDMA (IS-95A) were designed primarily for voice communications[168]. Both have migration paths to wideband that can be used for both voice and data communications. (Figure Anx5.1)

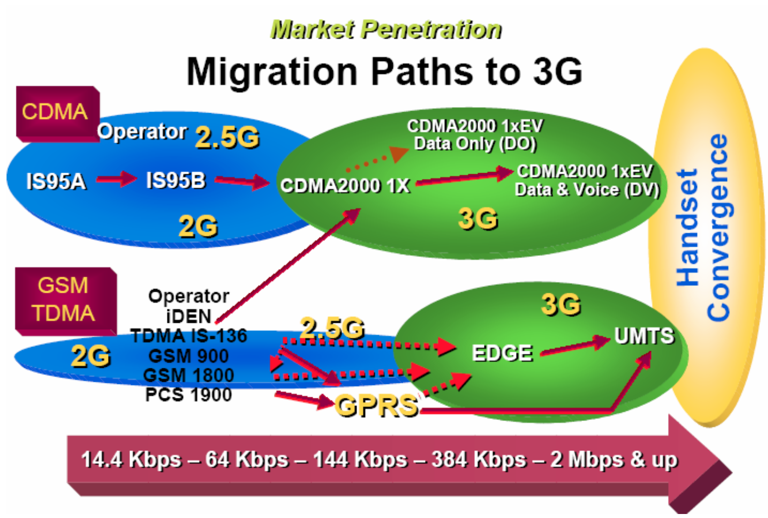
Technological advances have made it possible to increase cell sizes by 30%, reduce interference, reduce transmission power requirements, increase throughput capacity and improve speech quality. This has been accomplished through a combination of using newer GSM base station designs that do not require shelters or long cables between the antenna and transceivers, and employing speech encoding methods such as AMR[169] and bit error rate reduction techniques such as SAIC170. The overall impact has been to reduce significantly the cost of base stations for rural applications.

[168] The most common second generation analog standards are AMPS (Advanced Mobile Phone System) and NMT (Nordic Mobile Telephone System). DECT (Digitally Enhance Cordless Telecommunications) also falls into this category. DECT is a standard for cordless telephony that has a number of features that make it attractive for providing economical access. These include: less expensive equipment, simpler network planning (because frequency planning is not necessary), and readily expanded capacity (by adding new base stations and adjusting cell sites).

[169] Adaptive Multirate Codec (AMR) is a speech codec (coder-decoder) that gives better speech quality outdoors and indoors, and added network coverage and capacity. It allows individual base station cell sizes to be increased by about 30%, reducing the number of base stations needed to cover a given area. AMR dynamically adapts to changing radio conditions, using the most effective mode of operation for each circumstance.

[170] Single Antenna Interference Cancellation (SAIC) is an improvement for mobile station receivers that reduces the bit-error-rate, and therefore the power requirement from the base stations. SAIC reduces the overall interference and results in improved quality and capacity, and improved down-link performance in interference prone areas.

Figure Anx 5.1: GSM and CDMA Migration Paths to 3G

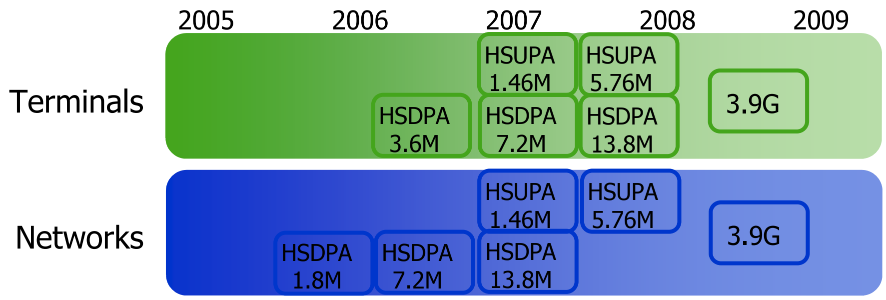


CDMA (IS-95A) evolved through several steps to its data only 3G version, CDMA 1x EV-DO, and eventually to what was to be its data and voice version, CDMA 1x EV-DV[171]. The intermediate steps (2.5G) are IS-95B, which offers speeds up to 64 Kbps, and CDMA 2000 1x, which offers speeds up to 144 Kbps in both the down-links (toward the user) and up-links. CDMA 1x Rev. A increases this speed to 307 Kbps. CDMA 1x EV-DO offers downstream and upstream speeds of 2.4 Mbps and 384 Kbps, respectively. CDMA 1x EV-DO Rev A, in which circuit switched voice is replaced by VoIP, offers up to 3.091 Gbps downstream and 1.86 Gbps upstream.

The GSM 3G standard, W-CDMA (Wideband Code Division Multiple Access), offers speeds up to 2 Mbps. The evolution to W-CDMA goes through GPRS (General Packet Radio Service), which has a channel rate of 115 Kbps, and EDGE (Enhanced Data rates for GSM), which has rates up to 384 Kbps. Both offer Internet Protocol (IP) based packed switched services. Beyond W-CDMA, the High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access Uplink (HSUPA) protocols, which are currently being developed, are expected to permit maximum data transmission speeds of 14 Mbps and 5.8 Mbps, respectively, if the terminal is close to the base station. HSDPA and HSUPA are sometimes referred to as 3.5G or 3.75G. The initial network version of HSDPA is expected to be deployed in 2006 (Figure Anx5.2).

[171] 1x indicates that there is only one radio frequency (RF) carrier. EV stands for "evolutionary"; DO, for "data only" or "data optimized"; and DV, for "data and voice".

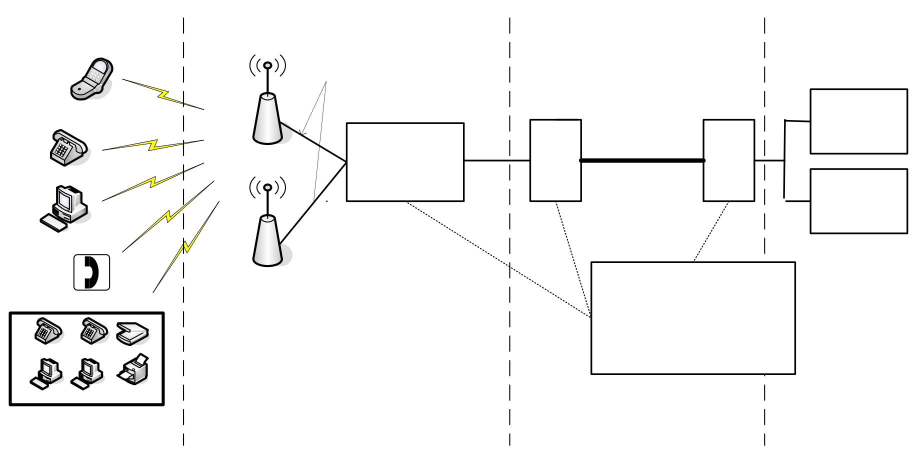
Figure Anx 5.2: Evolution of High Speed Down-link and Up-link Packet Access Protocols for Network and Terminal Devices



In the mean time Nokia has introduced the Internet High Speed Packet Access (I-HSPA) protocol which should allow a down-link speed of 14.4 Mbps and an up-link speed of 5.8 Mbps.

Manufacturers of GSM equipment have been improving the design of traditional GSM (2G and 2.5G) base station and mobile terminal equipment. Through a combination of newer base station designs, which do not require shelters or long cables between the antenna and transceivers, and newer signal processing algorithms, it has been possible to increase cell sizes by 30%, reduce interference and transmission power requirements, increase throughput capacity, and improve speech quality. In terms of capacity, one WCDMA BTS is equivalent to up to five GSM cabinets. The new design is less than half the size of the traditional BTS, and can be installed in a distributed way. As a result, the range for base stations for 2.5G EDGE applications has been increased up to 70 km, providing a coverage area of 9,555 km^2, and offering service to up to 1,480 subscribers within one cell. The cost of a base station is about US$45,000, which is 2% less than the traditional design.

Figure Anx 5.3: Cellular mobile access with fiber optic transport



The difference between GSM and CDMA in the evolution from 2G to 3G, is that the former requires the addition of new infrastructure, whereas the later maximizes the use of existing equipment and frequencies and simplifies upgrades to base stations in the field.

Figure Anx5.3 illustrates an option for providing mobile or fixed wireless access with a fiber optic backbone link.

There has been growing interest in using the 450 MHz band, and, in particular, CDMA 450 technology for rural, suburban and sparsely populated areas for both mobile and fixed applications. The main advantage of the 450 MHz band is that it permits relatively large cell sizes, which makes deployment less expensive because fewer base stations are required to cover a given area (Table Anx5.1).

Table Anx 5.1: Theoretical cell sizes that can be achieved using CDMA 2000 1x in the different frequency bands[172]

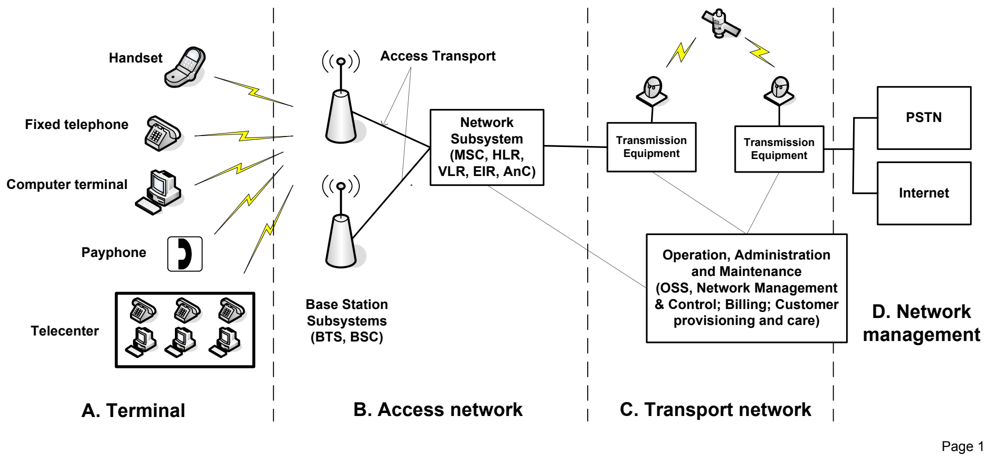
Frequency band (MHz)	Cell Radius (Km)	Cell Area (Km^2)	Normalized Cell Count
450	48.9	7,521	1
850	29.4	2,712	2.8
1900	13.3	553	13.6
2100	10	312	24.1

CDMA 450, in its current 2.5G version (CDMA2000 1x), can support about 70 voice users per base station, with one carrier in each sector of a 3-sectored cell. It can provide a peak data rate of up to 307.2 kbps on the down-link and 153.6 kbps on the up-link, per user. The peak data rate for the 3G version (CDMA2000 1xEV-DO), is predicted to be up to 3 Mbps on the down-link and up to 1.8 Mbps on the up-link.

Figure Anx5.4 illustrates a radio based (mobile and fixed) solution with a satellite backbone. The wireless local access network might be one that uses a 450 MHz standard such as CDMA 450, with the backbone being an IP based satellite network using SCPC DAMA (Single Channel per Carrier, Demand Assigned Multiple Access) and Bandwidth-on-Demand technology, which can offer data rates of up to 2 Mbps.

172 Response by Lucent Technologies to Questionnaire 2, usage of Lower Frequency Bands in the AP Region, 2nd Meeting of the APT Wireless Forum, Shenzen, PR China, September 5-8, 2005.

Figure Anx 5.4: Cellular mobile access with satellite transport



Cordless Systems were initially designed to be used indoors; however, these systems have been enhanced for outdoor applications. One of the most representative cordless telephone systems is DECT (Digital Enhanced Cordless Telecommunications), the standard developed by the European Telecommunications standards Institute (ETSI) in the late 1980s. DECT is able to deliver service in moderate subscriber density situations at lower cost than cellular mobile. It is a wireless local loop (WLL) system that in its enhanced versions such as CorDECT, can support simultaneous voice and data, the latter with up to 72 kbps throughput.

Line-of-sight multi-channel, multi-point and local multipoint distribution systems (MMDS and LMDS, respectively) and spread spectrum systems, can support speeds of up to 38 Mbps on the down-link, and 10 Mbps on the up-link. MMDS (or MCS) operates in the 2.4 GHz band. LMDS, which operates in a much higher frequency band (26 GHz), is much more susceptible to attenuation because rain limits the scope for use.

Digital Way, a small operator in Lima, has deployed a MMDS system that has one strategically placed base station on top of a small peak (Cerro Morro Solar de Chorrillos), and a footprint that covers all of Lima and Callao - an area of 6,400 km^2. The cost of the system is about US$1,000/client, based on 1000 clients.

Geostationary and low earth orbit satellite systems support speeds of up to 2 Mbps in the down-link and 384 Kbps in the up-link. IP based satellite networks using SCPC DAMA (Single Channel per Carrier, Demand Assigned Multiple Access) and Bandwidth-on-Demand technology, allow for efficient use of satellite bandwidth, and data rates of up to 2 Mbps. The central hub of the system located on the operator's premises, serves as the management and control center for a star or mesh network, and as the link for the satellite based network into the PSTN and the Internet. On the user side, a compact remote unit, which is connected to a VSAT terminal, integrates the satellite modem and IP router, and can be connected directly to a computer, a VoIP telephone or other IP based device, through an Ethernet 10Base-T interface.

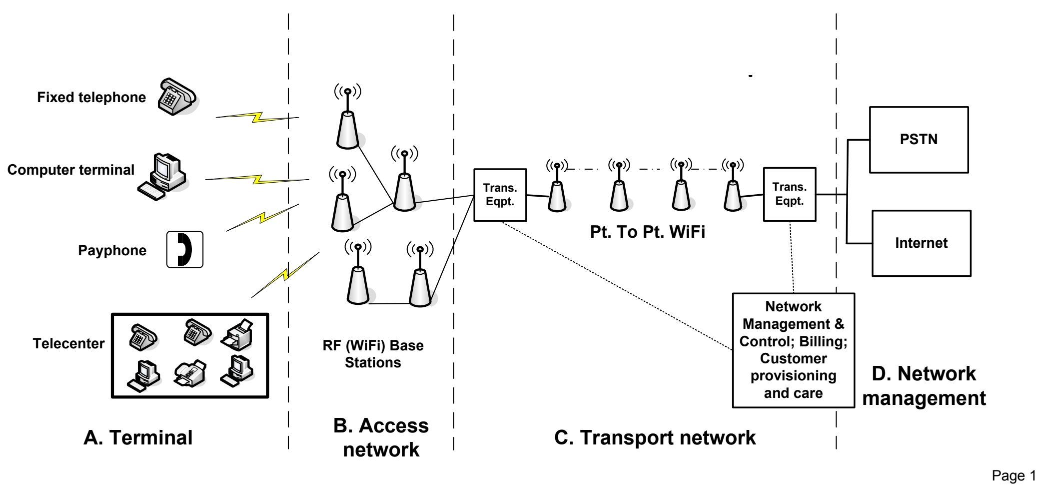
The same satellite operators also offer high speed local services directly to end users. For example, Hispasat, the Spanish satellite operator, offers a bi-directional Internet access service with down-link speeds of 2,048 Mbps and up-link speeds of 256 Kbps to up to 50 terminals. Each terminal is connected to one or several PC's via local wired or wireless (e.g. WiFi) links, at about US$43,000/month or US$861/terminal[173]. The one time purchase price for a terminal is about US$2,500. While relatively expensive, these satellite based solutions present certain advantages in the rural areas where there are no other wireline or wireless alternatives.

New wireless short and longer range technologies operate in licensed and unlicensed frequency bands, and use orthogonal frequency division multiplexing (OFDM). WiFi and WiMAX, the best known of these technologies, are, respectively, short-range (approx. 100 meter radius) and longer-range (approx 6–10 km) access systems.

WiFi (Wireless Fidelity) is a wireless local area network (WLAN) technology based on the IEEE's 802.11 wireless interface standard. IEEE 802.11a operates in the 5 GHz band - between 5.725 and 5.850 GHz. It can support data transmission speeds of up to 54 Mbps. IEEE 802.11b operates in the 2.4 GHz band – between 2.4 and 2.4835 GHz. It can support data transmission speeds of up to 11 Mbps in a range of up to about 300 m, in a hotspot wireless local area network (WLAN) 360^0 radiation configuration. When deployed in a point–to point mode, IEEE 802.11b can used for transmission links of up to 20 km. However, the power of the transmitter needs to be increased, and it must be used in conjunction with high gain antennas. These frequency bands are unlicensed in many Regulatel countries.

Figure Anx 5.5 illustrates a network that combines a WiFi local access mesh network, with a point-to-point WiFi transport link.

Figure Anx 5.5: Access with a WiFi mesh and WiFi transport



[173] An alternative service offered by *Hispasat* is a 2048 Kbps/512 Kbps down/up-link for up to 100 terminals at US$53,700/month or US$537/terminal.

WiMAX is a wireless metropolitan network (MAN) technology that provides broadband wireless (BWA) for fixed and mobile applications. WiMAX is based on the IEEE 802.16 wireless interface standard. The original version of 802.16 adopted in 2001, was a point-to-multipoint line-of-sight technology operating in the frequency range 10-66 GHz. WiFi standard IEEE 802.11b supports transmission speeds of up to 11 Mbps. The more recent version, IEEE 802.16a, is designed for fixed applications. It operates in the frequency range 2-11 GHz, and does not require that there be a line-of-sight between the base station and the user (NLOS). IEEE 802.16d offers a range of up to 50 km with typical cell radii of 6 to 10 km, and will offer variable channel sizes from 1.25 to 20 MHz. IEEE 802.16e, which is currently being developed, will allow for limited mobility (20 to 100 kph), and will operate in licensed bands in the 2–6 GHz range. It is now foreseen for deployment in 2007/08.

The 2003 World Radio Conference (WRC) agreed to allocate 455 MHz of spectrum in the bands 5.15 to 5.35 GHz and 5.47 to 5.725 GHz for wireless access systems.

A new version of broadband wireless access systems that is being developed is Flash OFDM. It will use 1.25 MHz sized channels like CDMA, and will permit download data rates of between 700 and 800 Kbps in radii of 3–5 km, with full mobility.

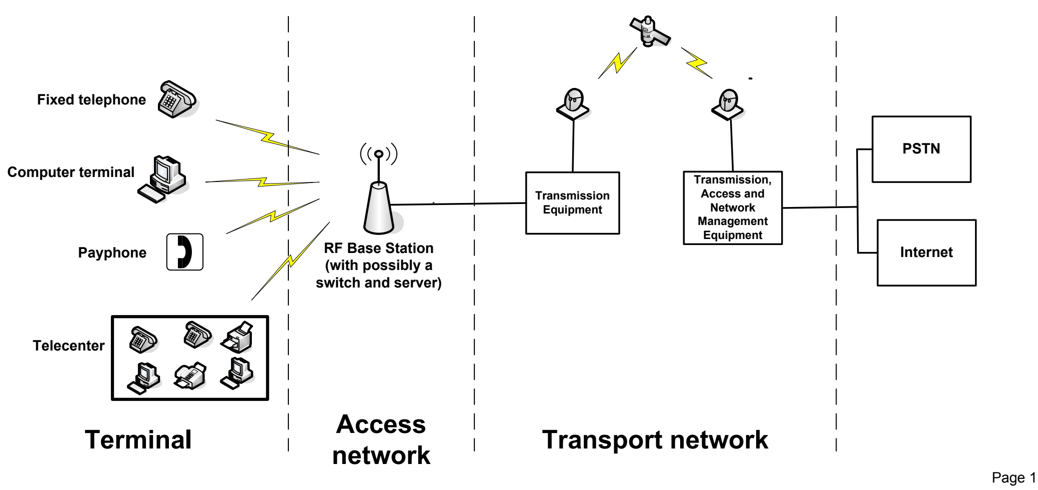
The following are other technologies in this category, which are currently under development, and will have the effect of increasing the amount of spectrum available for various fixed and mobile applications, including broadband local access. Ultra Wide Band (UWB) is based on spread spectrum. It is designed to operate over a very large band with very low power just below the noise floor, so as not to interfere with other signals that may also be using the same frequency band but with signal strengths well above the noise floor. UWB uses the spectrum very efficiently and offers good transmission qualities, because it eliminates multipath signal distortion and can easily penetrate walls[174]. Smart antennas can determine where signals are coming from, and are also good at suppressing interference and multipath signal distortion. For example, devices are being developed that can distinguish two signals depending on the angle of arrival, allowing satellite and terrestrial systems to operate at the same time in the same frequency band. Agile or cognitive radios can identify frequencies that are not being used at a particular moment, and use these frequencies to transmit signals for as long as they remain unused. When agile radios sense that another radio is trying to use a particular frequency, they hop to another unused frequency. Software defined radios (SDR) are multimode, multi-band devices that operate using different technologies and different frequency bands. An example of this is a mobile radio that operates equally in a GSM or a CDMA environment, irrespective of the frequency at which each may operate. GSM/WiFi is another type of SDR device that is currently being developed and deployed[175].

[174] In 2002, the FCC authorized UWB above 3.5 GHz. In early 2005, the Canadian Government was conducting a consultation on developing an appropriate regulatory framework in Canada for UWB. See "Industry Canada, Consultation Paper on introduction of Wireless Systems Using Ultra-wideband Technology", SMSE-002-05, February 2005. See also Reynolds, Taylor, "Background Paper: Advanced Wireless Technologies and Spectrum Management", Workshop on Radio Spectrum Management for a Converging World, International Telecommunication Union, Geneva, February 16 - 18, 2004.

[175] Motorola (MP) and Nokia (Communicator 9500) are dual mode GSM/WiFi handsets. SonyEricsson is developing multimode devices which incorporate WiFi.

Figure VII.1 (attached) shows a BWA access configuration with a satellite backhaul link. A single base station transmitting in the 2.5–2.7 GHz (licensed) MMDS frequency band[176], can cover an area with a radius of up to 30 km in a flat rural setting where it can be practical to provide non line-of-site coverage with an outdoor customer premises equipment (CPE), depending on the signal strength. The system, which does not require line-of-sight between the transmitter and receiver, uses adaptive modulation (AMOD) techniques to switch among 4, 16 and 64 orthogonal frequency division multiplexing (OFDM) modes, depending on the quality and strength of the signal received by the CPE. If the latter are high, the system will go to the higher modes, thereby optimizing the overall capacity of the base station. This switching among modes does not affect user performance. The use of higher complexity modulation techniques[177] permits higher data rates. The indoor CPE, which consists of the antenna, transceiver, and modem, can be designed as a single, integrated unit with an indoor antenna that subscribers can install themselves. Subscribers simply plug the CPE into a power source and a terminal, which may be a residential VoIP telephone, a computer, or a public payphone (Figure Anx 5.6, attached). It is connected via a simple Ethernet cable directly to a computer. The backhaul capacity required depends on the number of customers, and whether the traffic type is continuous as in business uses, or bursty as in residential uses. For a village with 50 customers, a 128 Kbps link may be enough. For more intense use, up to a 2 Mbps (E1) link may be needed.

Figure Anx 5.6 Broadband Wireless Access (BWA) with satellite transport



[176] Other such pre-WiMAX and WiMAX systems operate in the 3.5 and 5.8 GHz bands.

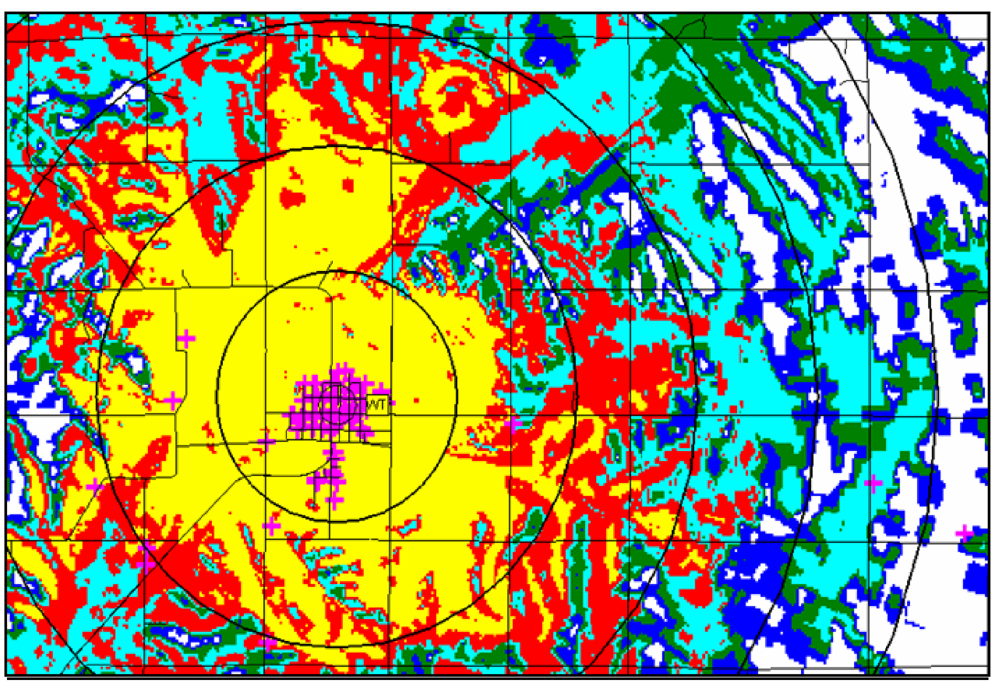
[177] Such as quadrature phase shift keying (QPSK), or 16-quadrature amplitude modulation.

Figure Anx 5.7 Pre WiMAX: indoor Customer Premises Equipment (CPE) containing an antenna, transceiver and modem

Source: NextNet

Figure Anx 5.8 shows the received signal strength within an 8 km radius of a pre-WiMAX base station consisting of an antenna located on top of a water tower, in the hilly, rural community of Kingsley, Iowa (population 1,245). This varies between >21 dB within most of the area within a 3.2 km. radius (yellow) of the base station, and 15-21 dB (red), 10-15 dB (light blue), 5-10 dB (green) and 0-5 dB (dark blue) in the areas beyond.

Figure Anx 5.8 Outdoor received signal strength, 1st floor level (Radius of concentric circles is 1.6, 3.2, 4.8 km, etc.)



Source: NextNet

ANNEX 6

TRADITIONAL FINANCING INSTRUMENTS FOR ICT PROJECTS

Among the more traditional financing instruments available for both large and small projects are the following:

Foreign donors and lenders

There is a broad network of international, public, non-profit and private donors and financial institutions that plays an active role in supporting the finance and development of ICT networks and services throughout the developing world. The Task Force on Financial Mechanisms (TFFM) of the World Summit on the Information Society prepared a comprehensive report on the status and activities of Official Development Assistance (ODA) and International Finance Institutions (IFIs) in the sphere of ICT financing.[178] This report shows that, while some forms of direct donor financing have declined as market forces have taken precedence, these institutions continue to play a vital role in promoting market-driven development, sector reforms, and targeted direct assistance. The latter is increasingly taking the form of Output Based Aid (OBA), in which donor institutions link financial support to quantifiable and measurable results of infrastructure and service expansion plans. This can be set in place, for example, through universal access fund mechanisms.

Loan guarantees

Some foreign donor agencies and government programs emphasize reducing investor risk rather than direct financial assistance. Loan guarantees represent an important element of this strategy, by helping start-up companies, or those without strong credit histories, to obtain commercial financing, subject to partial or total underwriting of those loans by the aid agency. This strategy can be especially helpful in supporting micro-finance institutions lending to SMMEs.

Vendor-financing

Vendor-financing has evolved over recent years to become a potentially attractive source of financing for many start-up ICT companies. Equipment suppliers historically have offered limited financing options (e.g., short instalment plans) to their purchasers. However, recent changes in the telecommunications and Internet industries have broadened the types of financing options offered by vendors. Competition has created incentives for suppliers to reach out to smaller and less established customers, in order to establish brand loyalty as the industry grows. This is especially true regarding new markets in developing countries. Companies such as Cisco, Lucent, Nortel, ZTE, and Huaway have provided attractive financing terms, even "free" equipment, to lock up new network operators for longer term upgrades and expansion deals. There is a risk that the terms of these financing arrangements may hinder competition or inflate

[178] http://www.itu.int/wsis/tffm/.

costs down the road. The downturn in the global technology sector in the past few years has led some suppliers to cut back on lucrative financing offers in emerging markets.[179]

The Valtron Rural Telecommunications Pilot Project is partially financed this way (Chapter VII).

Public private partnerships (PPP)

A variety of practices and business-government arrangements fall under the term "Public Private Partnership" (PPP). Generally, the concept implies a coordinated effort between private companies and public agencies to pursue a given investment or business deal that neither party would be as likely to implement on its own. Under some PPPs, private companies act as outsource agents for government functions, or otherwise obtain contracts to deploy specific facilities and services mandated and funded by government. In the case of ICTs, the more common model that is emerging involves government subsidy or co-financing of socially beneficial infrastructure projects, leading ultimately to private ownership and operation on a commercial basis. Examples include large-scale national and regional fiber optic backbone networks and Internet Exchange Points, which can be of value to the ICT industry as a whole, but may not be sufficiently attractive for any one operator to implement on its own.

Other types of PPP arrangements include the following:

- Project Finance[180], also known as limited or non-recourse finance, generally involves the establishment of a special purpose finance vehicle to develop, finance, construct and operate a specific project. The lenders in project financing look to the cash flow generated by the project as the source of funds for repayment of their loans and to the assets of the project as collateral for the loans, rather than to recourse from the shareholders of the company.

  Unlike, for example, a project financing in the power sector, telecommunications projects do not tend to be based around a single asset, generating a single predictable revenue stream over a definite period. The dynamic nature of the telecom industry - a function of customer demand, technological advances and regulatory changes - requires that a telecommunications project be supple enough to react quickly to market forces. In some cases that will require having enough flexibility to add new businesses or services. In some circumstances, there is conflict between traditional project finance requirements, which use a static business and quantifiable risks as a model, and the need of a company to operate and manage its business in the ever-changing telecom and Internet markets.

- Build Operate Transfer (BOT) schemes are similar to project finance schemes. The difference is that with BOTs, after the capital costs of the project have been paid off, the ownership of the project can revert to the original owner, whether it is government or a private company. These arrangements have been used extensively in some countries. In Thailand, for example, BOT schemes were used to build three million new customer

[179] Ouida Taafe, "Low ARPUs, high hopes." http://www.itudaily.com/new/home.asp?articleid=4090911 September 2004.

[180] Glenn S. Gerstell and Alisa Fiddes, "Techniques for Financing Telecoms and Internet Infrastructure Buildout in Asia." http://web.ptc.org/library/proceedings/ptc2001/sessions/test_area/monday/m16/m164/.

access lines for the state telecommunications operators during the 1990s, prior to the opening of the markets to competitive, private entry.

- Export bank or credit agency financing involves the sale of goods or services from an ICT project's country of origin to a foreign market. This type of financing may be eligible for coverage by public export credit agencies (ECAs). When the export content is insufficient, or the political risks are significant, multilateral credit agency (MCA) coverage may be available. The willingness of ECAs and MCAs to participate in projects provides significant encouragement to, and is often a prerequisite for attracting private lenders and investors to be interested in participating in emerging market projects[181] The Chinese Sino Bank has been very aggressive in promoting the export of Chinese ICT equipment and services through these types of arrangements. The Ruralfone project described in Chapter VII uses this type of financing.

[181] Ibid.

Annex 7

ANNEX 7

REGULATORY DISPOSITIONS OF INTEREST

Treatment of Internet-based local telephony (e.g. VoIP)

Unbundling of local loop. Cost Methodology

License-free spectrum

Dial-up Internet access through (e.g. flat rate)

Use of 450 MHz band in rural applications, and availability

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Argentina	Under the current framework, VoIP is considered a transmission technology, not a telecommunications service. Therefore, there are currently no restricting regulations or specific treatment regarding VoIP.	Art. 13 of the National Regulation on Interconnection (RNI) establishes that, "Providers with dominant power and significant power must facilitate the access to the subscriber loop[182]. However, the matter has not yet been regulated, and therefore the unbundling of the local loop has not been implemented. Applying providers have the right to determine the prices for essential installations in function of long-term increasing costs.	Spectrum regulations establish the procedure for contest or auction of an authorization to a frequency band. This does not include all bands, for example, those with less than 30 MHz. The installation or use of license-free frequency bands doesn't require an authorization. It is defined through ad-hoc resolutions for some applications, such as wireless telephones and low-potency telemetry transmitters.	Internet access tariffs are not regulated, as the service is a value-added one and this market is considered a competitive one. Consequently, the ISP can freely establish prices and can offer access to the Internet under a flat rate plan or even for free, since the use of the telephone is charged by the basic telephone service licensee. Incumbents have offered a choice between two semi-flat rate plans since 2000. Telecom offers a choice of either 25 or 50 hours of Internet use per month. Telefónica ooffers a choice of either 30 or 60 hours. However, Internet navigation itself is charged using the 0610 tariff.	The frequency bands of 452,500 to 456,750 MHz and 462,500 to 466,750 MHz are approved for use in basic fixed services through digital fixed wireless access technology and cellular reuse of frequency, to provide local telephony services and data and Internet services. This standard potentially benefits 2 million households in rural and suburban areas that so far have had no network coverage.

[182] If this is technically reasonable in terms of timeframe, conditions and prices freely agreed upon between the interested parties or, in case of disagreement, determined by the Enforcing Authority.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Brazil	No regulation specific to VoIP, as legislation is technologically-neutral. VoIP over Internet, PC-to-PC style, is license-free. Corporate VoIP requires a license. VoIP phone-to-phone requires a telecommunications operator license.	There is an obligation to unbundle network elements. There are price caps for unbundling of the line sharing type. Under preparation is a new regulation for tariffs based on LRIC costs. This is to be in force by 2008.	License–free use of spectrum is characterized by stations exempted from installation and operation licenses. There is no protection against interferences. The equipment must be homologated.	No special regulation for dial-up Internet access. However, the regulation over telephony services establishes periods of a flat rate. Some operators have launched plans with flat rates for access that are available in limited areas.	Currently, the 450 MHz band is extensively used and there is no spectrum available for rural applications. Other frequencies (411-415 Mhz and 412-425 Mhz) have been designated for use in fixed services in rural areas, and mobile services in urban areas.
Chile	Currently being studied.	Unbundling is regulated through tariffs, in two ways: completely unbundled, or shared. A new regulation is under preparation. Tariffs follow LRIC.	No authorization is needed, but specific parameters must be respected in function of the frequency. These include maximum level of radiated potency and potency density.	No regulation for this service provided under competition. Only the charges by dominant operators for use of their network are regulated - and also the charges for network use that are paid for by the Internet Service Provider rather than by the user.	The frequencies available in this band for rural applications were included in FDTelecom's last tender, as an incentive to operators to provide service in remote areas.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Colombia	Only services are regulated, not the networks. Therefore, there is no regulation specific to VoIP.	There is an obligation for dominant operators to offer the network elements or services in an unbundled form, following a specific procedure decided on by CRT. There is no disposition regarding cost methodology.	Pending	As per CRT's resolution, there is a flat rate and a reduced rate for access to the Internet via fixed telephony network (local telephony).	Pending

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Cuba	Currently, all public services are provided exclusively by ETECSA. Telephony-over-Internet is not permitted. IP (voice and data) for private networks with closed user groups is under consideration.	Currently, all public services are provided exclusively by ETECSA. Therefore, there is no interconnection with other operators, and no reason to unbundle the local loop.	In general, all frequencies used for radio-communications services are subject to an individual license, with the exception of: a) frequencies authorized for lifesaving emergencies; b) frequencies authorized for use by CB aficionados. Two resolutions are currently under study that would allocate frequencies without requiring individual licenses. They would be subject to a generic license at the level of the manufacturers, importers and marketers. These are: 1) frequencies authorized for use of short range radio-communications systems; and 2) frequencies authorized for industrial, scientific and medical applications.	Internet Service Providers offer various service packages, through dial-up access, or number of hours of navigation. There are two flat rate modalities: from 18 h to 8 h, and 24/24.	In the National Plan of Frequency Allocations, the sub-band 450-470 MHz is allocated to fixed and mobile services.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
El Salvador	There is no regulation specific to VoIP, or quality standards for telephony. Therefore, to provide telephony service (with or without IP technology), a regulated concession must be obtained.	There is no regulation about unbundling the local loop. However, due to the recent signing of the CAFTA, studies have been undertaken to define cost-based tariffs.	The Telecommunications Law and Regulation includes some parts of the radio-electric spectrum for which no licenses are required, as well as the instructions for their management and operation.	Internet access through commutated network is offered as an increase to telephone tariff, in different forms - a specific number of minutes for a fixed amount; for free in the case of some providers.	There is no specific regulation for the 450 MHz band, for which the corresponding technical feasibility and availability study are used (according to the requested coverage and bandwidth).
Guatemala	To provide telephony services using VoIP, a network operator license is required. For international long distance, an International Port Operator is required.	Unbundling the local loop is not considered an essential resource, and therefore the operator who is asked to unbundle can accept or reject the request. If it accepts, the conditions can be negotiated or imposed by the resource grantor.	A procedure has been undertaken to clear the frequency bands for provision of broadband Internet access, and to declare them to be license-free for the foreseeable future.	Telecommunications services prices are not regulated, and do not need government's approbation. Dial-up Internet access is subjected to a per-minute tariff.	The 450 MHz band is not classified for use in rural applications.
Honduras	This service is not regulated.	No regulation specific to this matter.	Only a generis license is required for its use and operation	Each ISP can define tariffs as it pleases. The telephone call is charged as one more call.	No special measures. This band is allocated to terrestrial fixed and mobile services.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Mexico	IP telephony is not considered a value-added service, and therefore a concession is required to provide the service. It enjoys technological neutrality.	Unbundling of the local loop has not been implemented.	No permit required, but operation requirements must be met. No taxes for use, but it is prohibited to complain for interferences, and to cause interferences to authorized users in these frequencies. As per Cofetel's resolution (not yet in force), the 900 MHz, 2.4 GHz, 5 150-5 250 MHz and 5 250-5 350 MHz frequency bands are classified as license-free spectrum, and the frequency band 5 725 – 5 850 MHz is classified for both license-free and authorized uses.	Internet provision is considered a value-added service (regardless of bandwidth or technology used), that must be registered with Cofetel.	The 450 Mhz band is used in rural areas, through a 10 MHz sub-band for WLL that requires an authorization through the previous tender. In urban areas, the 450-470 band is used for fixed and mobile communications, and WLL is not authorized. The 450 MHz band will be included in the second tender of the Fondo de Cobertura Social, to be used exclusively in the communities defined in this tender.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Nicaragua	Regulation focuses on services, under the principle of technological neutrality. Local telephony is classified as a service of public interest, regardless of technology. Providing IP telephony requires meeting quality requirements and obtaining the corresponding license.	In the Interconnection Offer of Reference, the local loop is defined as an installation essential to interconnection or access between telecommunications operators. Dominant operators are required to offer the essential installations in an unbundled form, and under terms, conditions, and tariffs that are reasonable, non-discriminatory and transparent. Specifically, it is stipulated that the local loop be accessible in a complete or a shared manner.	The use of the radio-electric spectrum does not require authorization or permits for industrial, scientific and medical equipment, or the operations of involuntary radiators such as computers, or voluntary radiators of low-potency (less than 50 mW). Equipment working in these frequencies is prohibited from causing interferences, and accepting interference caused by any possible undesired use.	Internet service is classified as being of general interest, and subject to a license granted by TELCOR. TELCOR doesn't have a policy specific to dial-up Internet, but any policy regarding the Internet in general is technologically neutral.	In the 440-450 MHz band, private radio-telephony systems and common carrier private mobile systems are operating, with and without a link to the public telephone network. The 450-470 MHz band is used extensively in cities and regions throughout the country. The national support for private radio-communications by government agencies, public and private firms, through fixed. mobile and portable base stations, is installed in the 450-470 MHz band and the 148-147 MHz band.
Paraguay	IP telephony is not specifically classified as a telecommunications service, but is considered a basic service. Therefore it can only be provided by the Basic Service Concession Holder, regardless of technology.	No regulation specific to this matter.	The use of the radio-electric spectrum requires an authorization or a license.	There are no special tariffs for Internet access.	There are no special promotion measures.

Table Anx 7: Regulatory dispositions of interest

Country	Treatment of Internet-based local telephony (e.g. VoIP)	Unbundling of local loop. Cost Methodology	License-free spectrum	Dial-up Internet access through (e.g. flat rate)	Use of 450 MHz band in rural applications, and availability
Uruguay	There is no regulation specific to IP telephony.	No regulation specific to this matter.	The use of radio spectrum requires an authorization or a license, with the exception of low-potency homologated equipments (wireless telephones, remote controls). The 915 Mhz, 2,4Ghz, and 5,8Ghz frequency bands require an authorization.	Tariffs for Internet access services through switchboard are not regulated	This band is not allocated to cellular telephony.
Venezuela	IP telephony is governed by the same standards as switchboards. Quality–of-service standards are different.	There is a regulation with tariffs based on benchmarking. An LRIC-based costs methodology is under preparation.	Included in the Organic Law on Telecommunications, and defined in the standards for license-free equipments, which specify what part of the radio spectrum can be used.	Internet access tariffs are established freely, unless there exists a Universal Service obligation, or a dominant position, in which case CONATEL establishes maximum and minimum tariffs.	This band is allocated to terrestrial mobile radio-communication services, radio-messaging, help to meteorology services, etc.

Annex 7

ANNEX 8

COMPARISON OF MONTHLY CHARGES FOR BROADBAND INTERNET ACCESS IN REGULATEL MEMBER COUNTRIES

Table Anx 8.1 Comparison of Monthly Charges for Entry Level Broadband Internet Access in Regulatel Member Countries

Country	Service Provider	Service	Techn.	Speed (Kbps)		US $/ month	Inst. US$	Features
				Down	Up			
Switzerland	Swisscom	Bluewin ADSL 150	ADSL	150	50	7.40		+$2/hour of usage ; 5 e-mail addresses, anti-virus, spam filter, etc.
Colombia	Colombia Telecom	Plan Velocidad 256	ADSL	256	128	14.00		
Mexico	Cableaccess		Cable	80		14.00	50.30	One time US$57.80 charge for non-TV subscribers
Argentina	Ciudad (Grupo Clarin)	Flash	Cable	128		14.60		With cable TV subscription; 30 MB web hosting; anti-spam; anti-virus; 1 e-mail address
Mexico	Cableaccess		Cable	150		17.50	50.30	One time US$57.80 charge for non-TV subscribers
Argentina	Telefonica	Speedy 256K	ADSL	256		17.80	0	3 e-mail addresses; web hosting 30 MB
Finland	Elisa Comm.	Elisa ADSL	ADSL	256	256	21.00		
Colombia	ETB	Banda Ancha 150	ADSL	150		21.30		
Brazil	Brasil Telecom	Turbo Lite	ADSL	150	64	22.10	28.70	50 hr/month usage limit
Canada	Bell Canada	Basic Lite	ADSL	128		22.40		Discount for the first year; certain features such as anti-virus, spam filters, etc. are given free for the first 3 months; better rates can be negotiated
Canada	Rogers	Ultra lite	Cable	128	64	22.50		
Colombia	ETB	ADSL Servicio Residencial	ADSL	150		24.30	13.25	1 year contract

Table Anx 8.1 Comparison of Monthly Charges for Entry Level Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Colombia	TV Cable	Cable Servicio Residencial	Cable	300	100	24.80	0	1 year contract
Costa Rica	ICE		ADSL	128	64	24.90		
Sweden	Telia	Upp till o,25	ADSL	250	128	25.00		
Chile	Telefonica (CTC)	Speedy 128	ADSL	128	64	26.70		1 year contract
Chile	GTD Manquehue	Fastnet 128 Hogar	ADSL	128		28.00		
Colombia	Telecom	ADSL	ADSL	128	64	28.80	13.25	1 year contract
Chile	TELMEX	TELMEX ADSL Full	ADSL	128	64	28.80		
Republica Dominicana	Verizon Dominicana	Internet Flash	ADSL	384	128	29.80		
Barbados	C&W Barbados	ADSL 256	ADSL	256	64	31.60		
Peru	Telefonica del Peru	Speedy	ADSL	200	128	31.90		
Paraguay	Tigo	IW Cablelan	Cable	64		32.90	132.00	
Colombia	Telecom	ADSL	ADSL	256	128	33.12	13.25	1 year contract
Uruguay	Antel	256 Libre	ADSL	256	64	35.80		
Chile	TELMEX	TELMEX ADSL Full	ADSL	200	64	36.00		
Chile	Entel	200 Empresas	ADSL	200		38.10	0	
Chile	GTD Manquehue	Fastnet 200 Hogar	ADSL	200		38.20		
Bolivia	COTAS		ADSL	128		39.00		
Ecuador	AndinaNet	Fast Boy	ADSL	128	64	39.90	50.00	
Jamaica	C&W Jamaica	Lite	ADSL	128	64	40.00		
Jamaica	C&W Jamaica	Classic	ADSL	256	128	40.00		
Brazil	NET (Telmex)	Virtua	Cable	300	128	41.40		
Cayman Islands	Cable & Wireless Cayman	ADSL 256	ADSL	256	128	48.00		

Table Anx 8.1 Comparison of Monthly Charges for Entry Level Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Cayman Islands	TeleCayman	256/128 unbundled	BWA	256	128	48.00		
Ecuador	AndinaNet	Corporativo	ADSL	128	64	49.90	50.00	
Bolivia	AXS	Post Pago	ADSL	256		50.00		
Ecuador	Ecuanet		ADSL	128	64	50.00	60.00	
Cayman Islands	WestTel	Speed Saver	BWA	256	256	52.80		
St. Lucia	C&W	XNET 256	ADSL	256	128	54.70		
Grenada	C&W	XNET 256	ADSL	256	128	54.70		
Bolivia	COTAS		ADSL	256		55.00		
Jamaica	N5	Wireless	MMDS	256	128	55.00		
Republica Dominicana	Tricom	Turbo ADSL	ADSL	128	128	57.00		
Belize	Channel Broadcasting	128K	Cable	128	56	59.00		
Belize	BTL	DSL	ADSL	128	64	60.00		
Paraguay	Tigo	Banda Ancha Hogar	Pre-WiMAX	64		64.90		4 PCs, 128 Kbps download speed at night
Ecuador	AndinaNet	Fast Boy	ADSL	256	128	65.00	50.00	
Trinidad & Tobago	TSTT	Residential High Speed Access	ADSL	256	64	70.50		
Jamaica	Kasnet	Res. Silver	MMDS	256	128	75.00		
Ecuador	Ecuanet		ADSL	256	128	75.00	75.00	
Ecuador	AndinaNet	Corporativo	ADSL	256	64	79.90	50.00	
Republica Dominicana	Tricom	Turbo ADSL	ADSL	256	256	82.50		
Antigua & Barbuda	C&W	Select	BWA	256	64	91.40		
Paraguay	Tigo	Banda Ancha PYMES	Pre-WiMAX	128		108.90		For cybercafés with up to 10 PCs

Table Anx 8.1 Comparison of Monthly Charges for Entry Level Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Trinidad & Tobago	TSTT	Business 1	ADSL	128	64	184.0 0		
Paraguay	Tigo	Banda Ancha Empresariales	Pre-WiMAX	256		209.0 0		

Table Anx 8.2 Comparison of Monthly Charges for Mid Range Broadband Internet Access in Regulatel Member Countries

Country	Service Provider	Service	Techn.	Speed (Kbps)		US $/month	Inst. US$	Features
				Down	Up			
Bahamas	Coralwave	GEO	Cable	1,000	256	10.70		Limited to 10 hrs/month
USA	Verizon		ADSL	768	128	15.00		1 year contract
Bahamas	Coralwave	Jazz	Cable	1,000	256	21.70		No time limited
Germany	Deutsche Telecom	T-DSL 1000	ISDN (?)	1,024	128	21.80		
Argentina	Telecom	Arnet 640 Megas	ADSL	640	128	22.70	0	Discount for first year; anti-virus, anti-spam, web hosting, 3 e-mail addresses
Argentina	Ciudad (Grupo Clarin)	Flash ADSL	ADSL	640		24.30		Includes anti-spam, anti-virus, technical support, web space, etc.
Canada	Videotron	Basic Internet	Cable	600	128	24.30		1 year contract; limited to 1 GB in each direction
Argentina	Telefonica	Speedy 512K	ADSL	512		25.90	0	3 e-mail addresses; web hosting 30 MB
Finland	Elisa Comm.	Elisa Adsl	ADSL	1,000	512	29.00		
Argentina	Telefonica	Speedy 1 M	ADSL	1,024		29.10	0	10 e-mail addresses; web hosting 30 MB
France	FT	Internet 512	ADSL	512	128	30.00		
Canada	Bell Canada	Basic	ADSL	1,000		31.30		Discount for the first year; certain features such as anti-virus, spam filters, etc. are given free for the first 3 months; better rates can be negotiated

Table Anx 8.2 Comparison of Monthly Charges for Mid Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Canada	Rogers	Highspeed lite	Cable	1,000	128	31.50		
Argentina	Ciudad (Grupo Clarin)	Flash Cablemodem	Cable	1,024		34.20	0	With cable subscription; 1 e-mail address; 30 MB web hosting; anti-spam, anti-virus included
El Salvador	CTE Telecom	Turbonet	ADSL	512		35.00		Does not include sales tax
Mexico	Cableaccess		Cable	600		35.10	50.30	One time US$57.80 charge for non-TV subscribers
Brazil	Brasil Telecom	Turbo 400	ADSL	400	200	35.30	28.70	
Colombia	TV Cable	Servicio Residencial	Cable	500	150	36.17	0	1 year contract
Colombia	Colombia Telecom	Plan Velocidad 1,024	ADSL	1,024	512	37.20		Includes anti-spam and a number of additional services
Chile	GTD Manquehue	Fastnet 600 Hogar	ADSL	600		38.20		
Venezuela	CANTV	ABA	ADSL	512	128	38.70		Taxes not included
Jamaica	C&W Jamaica	Delux	ADSL	1,024	256	40.00		
Colombia	ETB	Banda Ancha 600	ADSL	600		41.40		
Brazil	Telefonica	Speedy	ADSL	500	128	43.40		
Peru	Telefonica del Peru	Speedy	ADSL	600	256	45.80		
Chile	Telefonica (CTC)	Speedy 600	ADSL	600	128	46.20		1 year contract
Chile	TELMEX	TELMEX ADSL Full	ADSL	600	128	47.00		
Chile	Entel	600 Empresas		600		47.20	0	

Table Anx 8.2 Comparison of Monthly Charges for Mid Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Venezuela	CANTV	ABA	ADSL	1,024	512	47.40		Taxes not included
Republica Dominicana	Verizon Dominicana	Internet Flash	ADSL	768	512	49.80		
Chile	Entel	WILL Empresas	WLL	512	128	50.10		
Mexico	Telmex			1,200		52.60	50.30	One time US$57.80 charge for non-TV subscribers
Colombia	ETB	Servicio Corporativo	ADSL	600		53.00	22.08	1 year contract
Chile	TELMEX	TELMEX ADSL Full	ADSL	1,024	256	56.10		
Chile	Telefonica (CTC)	Speedy 1 Mbs	ADSL	1.024	256	56.90		1 year contract
Colombia	ETB	Banda Ancha 1000	ADSL	1,000		58.00		
Chile	Entel	1024 Empresas		1,024		58.10	0	
Chile	GTD Manquehue	Fastnet 1300Hogar	ADSL	1,300		58.30		
Mexico	Alestra (AT&T)		ADSL	1,024		60.30		
Cayman Islands	WestTel	Bronze	BWA	512	256	64.80		
Colombia	ETB	Servicio Residencial	ADSL	1,000		66.20	13.25	1 year contract
Cayman Islands	TeleCayman	512/256 unbundled	BWA	512	256	69.60		
Cayman Islands	Cable & Wireless Cayman	ADSL 512	ADSL	512	256	70.80		
Costa Rica	ICE		ADSL	512	128	72.30		
St. Lucia	C&W	XNET 512	ADSL	512	128	73.00		

Table Anx 8.2 Comparison of Monthly Charges for Mid Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Grenada	C&W	XNET 512	ADSL	512	128	73.00		
Ecuador	Ecuanet		ADSL	512	128	75.00	120.00	
Cayman Islands	WestTel	Silver	BWA	1,024	512	76.80		
Uruguay	Antel	768 Empresariale s	ADSL	768	192	78.18		
Ecuador	AndinaNet	Fastboy	ADSL	512	128	79.99	50.00	
Colombia	Colombia Telecom		ADSL	640	384	83.90	35.33	1 year contract
Barbados	C&W Barbados	ADSL 768	ADSL	768	128	86.30		
Colombia	ETB	Servicio Corporativo	ADSL	1,000		88.30	33.12	1 year contract
Bolivia	AXS	Post Pago	ADSL	512		95,00		
Costa Rica	ICE		ADSL	1,024	256	98.30		
Ecuador	AndinaNet	Corporativo	ADSL	512	256	99.90	50.00	
Mexico	Alestra (AT&T)		ADSL	1,300		100.70		
Peru	Telefonica del Peru	Speedy	ADSL	1200	256	103.80		
Colombia	Colombia Telecom		ADSL	832	416	106.00	35.33	1 year contract
Colombia	TV Cable	Servicio Corporativo	Cable	1,200	500	110.40	0	1 year contract
Bolivia	AXS	Post Pago	ADSL	768		120.00		
Republica Dominicana	Tricom	Turbo ADSL	ADSL	512	512	132.00		
Mexico	Telmex	Protegy	ADSL	512		136.10		Anti-virus included
Grenada	C&W	XNET 768	ADSL	768	256	139.10		
Colombia	Colombia Telecom		ADSL	1,024	512	154.56	35.33	1 year contract
Mexico	Telmex			1,000		161.30		Anti-virus included

Table Anx 8.2 Comparison of Monthly Charges for Mid Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Antigua & Barbuda	C&W	Premium	BWA	512	128	183.10		
Uruguay	Antel	1,024 Empresariales	ADSL	1,024	256	192.50		
Bolivia	COTAS		ADSL	1,024		195.00		
Mexico	Telmex			1,300		201.70		Anti-virus included
St. Lucia	C&W	XNET 1544	ADSL	1,544	512	219.80		
Ecuador	AndinaNet	Corporativo	ADSL	1,024	512	230.00	50.00	
Belize	BTL	DSL	ADSL	1,024	256	265.00		
Grenada	C&W	XNET 768 (Business)	ADSL	768	256	307.90		
Paraguay	Tigo	Banda Ancha Empresariales	Pre-WiMAX	512		330.00		
Ecuador	AndinaNet	Corporativo	ADSL	1,536	384	350.00	50.00	
Antigua & Barbuda	C&W	Delux	BWA	1,024	256	366.60		
Trinidad & Tobago	TSTT	Business 4	ADSL	512	128	467.72		
Paraguay	Tigo	Banda Ancha Empresariales	Pre-WiMAX	1,024		506.00		

Table Anx 8.3 Comparison of Monthly Charges for Upper Range Broadband Internet Access in Regulatel Member Countries

Country	Service Provider	Service	Techn.	Speed (Kbps)		US $/ month	Inst. US$	Features
				Do wn	Up			
Germany	Deutsche Telecom	T-DSL 2000	ISDN (?)	2,04 8	192	25.60		
Netherlands	KPN	Direct ADSL GO	ADSL	1,50 0	256	27.70	94.50	Free wireless modem
USA	Verizon		ADSL	3,00 0	768	30.00		1 year contract
USA	Comcast		Cable	6,00 0	768	30.00		
Germany	Deutsche Telecom	T-DSL 6000	ISDN (?)	6,01 6	576	32.00		
UK	British Telecom	BT Broadband Option 1	ADSL	8,00 0		33.50		2 GB monthly maximum; 1 year contract, anti-phishing, anti-virus, spam filter, etc.
Argentina	Telefonica	Speedy 2 MB	ADSL	2,04 8	256	34.40	0	10 e-mail addresses; web hosting 30 MB
Spain	Jazztel	Hasta 20 M	ADSL	20,4 80	1,02 4	35.00		
Argentina	Telecom	Arnet 2.5 Megas	ADSL	2,5 MB	256	35.60	0	Discount for first 4 months; Anti-virus, anti-spam, web hosting, 3 e-mail addresses
Argentina	Ciudad (Grupo Clarin)	Flash ADSL	ADSL	2,50 0		37.60		Includes anti-spam, anti-virus, technical support, web space, etc.
Bahamas	Coralwave	Lite	Cable	2,00 0	512	37.70		
Netherlands	KPN	Direct ADSL Lite	ADSL	3,00 0	512	37.80	94.50	Free wireless modem
Canada	Bell Canada	Sympatico	ADSL	3,00 0	800	38.00		
Germany	Deutsche Telecom	T-DSL 16000	ISDN (?)	16,0 00	1,02 4	38.40		
Switzerland	Swisscom	Bluewin ADSL 2000	ADSL	200 0	100	40.20		5 e-mail addresses, anti-virus, spam filter, etc.
Canada	Rogers	Highspeed express	Cable	5,00 0	384	42.30		

Table Anx 8.3 Comparison of Monthly Charges for Upper Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
UK	British Telecom	BT Broadband Option 2	ADSL	8,000		42.80		6 GB monthly maximum; 1 year contract, anti-phishing, anti-virus, spam filter, etc.
Canada	Bell Canada	High speed Ultra	ADSL	5,000		44.80		Discount for the first year; certain features such as anti-virus, spam filters, etc. are given free for the first 3 months; better rates can be negotiated
Canada	Rogers	Highspeed extreme	Cable	6,000	800	45.00		
Argentina	Telecom	Arnet 5 Megas	ADSL	5 MB	256	48.00	0	Discount for first 4 months; Anti-virus, anti-spam, web hosting, 3 e-mail addresses
Jamaica	C&W Jamaica	Business Delux	ADSL	2,048	512	50.00		
Argentina	Ciudad (Grupo Clarin)	Flash ADSL	ADSL	5,000		50.40		Includes anti-spam, anti-virus, technical support, web space, etc.
Bahamas	Coralwave	Groove	Cable	3,000	768	55.70		
UK	British Telecom	BT Broadband Option 4	ADSL	8,000		55.80		40 GB monthly maximum; 1 year contract, anti-phishing, anti-virus, spam filter, etc.
Switzerland	Swisscom	Bluewin ADSL 3500	ADSL	3500	300	56.60		5 e-mail addresses, anti-virus, spam filter, etc.
Canada	Videotron	Extreme high speed	Cable	10,000	900	58.50		1 year contract
Netherlands	KPN	Direct ADSL Basic	ADSL	6,000	768	63.00	94.50	Free wireless modem
Chile	Telefonica (CTC)	Speedy 2 Mbs	ADSL	2,048	256	69.30		1 year contract
Republica Dominicana	Verizon Dominicana	Internet Flash	ADSL	1,536	128	70.30		

Table Anx 8.3 Comparison of Monthly Charges for Upper Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
Chile	TELMEX	TELMEX ADSL Full	ADSL	2,04 8	256	70.60		
Chile	Entel	2048 Empresas		2,04 8		70.80	0	
Chile	GTD Manquehue	Fastnet 2000 Hogar	ADSL	2,00 0		71.00		
Canada	Videotron	Extreme plus	Cable	16,0 00	1,00 0	72.10		1 year contract
Netherlands	KPN	Direct ADSL Extra	ADSL	12,0 00	1,10 24	94.50	94.50	Free wireless modem
Mexico	Cableaccess		Cable	1,50 0		99.10		
Argentina	Telefonica	Speedy 5 MB	ADSL	5 MB	256	103.80	0	3 e-mail addresses; web hosting 30 MB
Barbados	C&W Barbados	ADSL 256	ADSL	1,54 4	256	108.10		
Cayman Islands	WestTel	Gold	BWA	1,54 4	512	112.80		
Cayman Islands	TeleCayman	1.5/512 unbundled	BWA	1,54 4	512	117.60		
Cayman Islands	Cable & Wireless Cayman	ADSL 1544	ADSL	1,54 4	512	118.80		
Colombia	ETB	Banda Ancha 2000	ADSL	2,00 0		124.50		
Colombia	TV Cable	Servicio Corporativo	Cable	2,00 0	600	154.60	0	
Colombia	Colombia Telecom		ADSL	2,02 4	512	154.60	35.33	1 year contract
Venezuela	CANTV	ABA	ADSL	1,53 6	512	163.30		Taxes not included
Dominica	C&W	XNET 1544	ADSL	1,54 4	512	183.10		
Costa Rica	ICE		ADSL	2,04 8	256	204.50		
St. Lucia	C&W	XNET 1544	ADSL	1,54 4	512	219.80		
St. Vincent & The Grenadines	C&W	XNET 1544	ADSL	1,54 4	512	238.20		
Republica Dominicana	Tricom	Turbo ADSL	ADSL	1,53 6	768	244.4		

Table Anx 8.3 Comparison of Monthly Charges for Upper Range Broadband Internet Access in Regulatel Member Countries

				Speed (Kbps)				
St. Kitts & Nevis	C&W	XNET 1544	ADSL	1,544	512	256.00		
Grenada	C&W	XNET 1544	ADSL	1,544	512	256.50		
Antigua & Barbuda	C&W	XNET 1544	ADSL	1,544	256	292.50		
Antigua & Barbuda	C&W	XNET 1544 (Business)	ADSL	1,544	256	421.70		
Grenada	C&W	XNET 1544 (Business)	ADSL	1,544	256	440.00		
Ecuador	AndinaNet	Corporativo	ADSL	2,048	512	450.00	50.00	
Mexico	Alestra		ADSL	2,000		458.80		
Mexico	Telmex	Protegy ADSL	ADSL	2,000		564.90		
Trinidad & Tobago	TSTT	Business 6	ADSL	1,544	256	663.35		

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