New Approach to Rural Connectivity: The Case of Peru

Introduction

In recent years, the development of telecommunications networks and services have led not only to more connected and serviced communities, but also to the addition of new services and applications that have a direct effect on the welfare of users and communities as a whole. However, there are still segments of the world population that have not experienced the benefits of connectivity and access. Approximately 3.8 billion people (half of the world's population) does not have access to the Internet. In developing countries, the lack of digital awareness and the high costs of service acquisition and infrastructure deployment have left a significant percentage of rural populations without the benefits of connectivity.

Peru is a prime example. 80% of Peruvian localities (mainly rural) lack Internet coverage. 74% of households (mainly in rural areas) do not have Internet access. And 53% of the population aged 6 or older, are not Internet users. (source: FITEL 2016)

In many of countries that do not fully enjoy the benefits of Internet connectivity, the efforts of governments and regulators to expand connectivity have been incomplete. As governments and communities continue to face deployment and connectivity challenges, new approaches to solve these problems should be developed. As outlined in the paper that follows, expanding rural connectivity is achievable in Peru if regulators adopt new tools, regulatory flexibility, and facilitate the use of new, efficient, and low-cost technologies.

Benefits of Connectivity

Multiple studies illustrate the link between Internet access and economic and social benefits. According to Qiang et al (2004), there are three venues through which ICT can influence economic growth:

1) Efficiencies in sectors producing ICT
2) Increase in capital intensity in the economy
3) Growth driven through ICT usage

A significant incentive for improving connectivity in rural communities is the economic growth and development that results from improved access to information, education, and health applications, among others.

In studies for the United States of America, authors found positive associations between broadband penetration and different economic outcome variables such as employment, wages,

and housing prices across U.S. States. Czernich et al (2011) found, for OECD countries, that after a country has introduced broadband, GDP per capita is 2.7 to 3.9 percent higher on average than before its introduction.

Many governments understand the importance of these effects in economic and social growth and development. In the case of the Americas, multiple countries have adopted broadband plans that establish minimum download speeds and coverage targets for service at national levels. The following table summarizes those cases:

Connectivity Targets: Broadband Plans
Americas

	Broadband coverage target		
	Download speed (Mbps)	Coverage	Year
Argentina	No target	No target	
Brazil	1 Mbps	70%	2014
Canada	5 Mbps	98% of pop.	2019
Chile	10 Mbps	90% of HH	2020
Colombia	No target	No target	
Costa Rica	20 Mbps	80% of pop.	2021
Ecuador	Undecided	100% of population	2017
Mexico	Undecided	70% of HH	2018
Paraguay	Undecided	80% of pop. (mobile broadband)	2020
Peru	2 Mbps	59.7% of HH	2016
United States	4 Mbps	100%	2020

Source: Cullen International

Rural Communities and Internet Access

Half of the world's population lives in rural areas. Delivering rural Internet access has been of particular concern for governmental strategies and policies because the marginal benefits of connectivity are generally higher for these populations due to their generally low incomes and development conditions. However, due to the high investment costs derived from challenging terrain topographies, long distances from urban centers and low population densities, rural connectivity programs have faced economic, political and social challenges.

Most developing countries that have implemented legislative and regulatory reforms in their telecommunications sector have been successful in increasing service penetration and connectivity. Growth in mobile networks have been key in granting users access to Internet connectivity and services in rural areas, especially given the very high level of investment required to deploy fixed broadband access infrastructure. However, comprehensive rural

access coverage for mobile services continues to be difficult for most countries to achieve.

In response, many developing countries have implemented rural connectivity programs or other similar strategies, including Latin America.

In Mexico, E-Mexico was the first program to offer rural connectivity through Tele-centers in remote communities, through satellite links. The program was supplemented by México Conectado, which focuses on offering public access from public buildings located in rural and remote communities. Mexico Conectado currently has more than 100,000 public spaces that offer Internet access.

Chile implemented the provision of telephone access to rural and unserved areas through a reverse auction to private companies. The lowest bidder received a subsidy in return for building out service. The amount of subsidy was dependent on the costs and revenues, potential usage and cost of service provision (Kenny 2002).

This program attracted US$40 million in private investment with a public subsidy of just over US$2 million. As a result, 1,000 public telephones were installed in rural towns, at around 10 percent of the cost of direct public provision. (Cechini et al 2003)

Part of the success of the Chilean model can be attributed to the involvement of local authorities and the community. For example, “municipal governments and civic organizations participated in the formulation of proposals for rural telecom services in Chile, which were then put out for bid by government through the reverse auctions process mentioned” (Barandse 2004).

Historically, Peru´s main approach to rural connectivity has been through the license obligations imposed on the incumbent operator. The operator has been required to install and operate public telephone booths in rural areas. Peru is now implementing a new model with three main characteristics: a) shared infrastructure (such as the Peruvian backbone network), b) the use of wireless technologies and c) the application of subsidies to improve feasibility of household access.

In order to promote the development of mobile broadband, in 2018 the Peruvian Ministry of Transport and Communications published a modification to the payment regime for the use of the radio spectrum in which it allows mobile operators to substitute a percentage of their payment in exchange for a commitment to expand service in rural areas that lack mobile coverage or to migrate services from 2G to 4G.

It is clear that multiple countries have pursued similar initiatives to increase connectivity, including imposing license obligations and developing specific universal service obligations or agencies. However, certain conditions have to be met in order for these initiatives to achieve their goal of increasing access and connectivity in rural areas. Below we discuss those

conditions and proposed remediation.

The need for a new approach

The different models explained above had varying levels of success. At least two common characteristics can be extracted from the most successful cases that could be replicated in further models: a) access to infrastructure (Cecchini et al 2003), financed through subsidies or by other means; and b) involvement at the local community level.

However, most of the models faced implementation challenges that reduced their effectiveness in attaining their penetration and access goals. These challenges included:

- Lack of supporting infrastructure: Most rural communities and regions lack basic connectivity infrastructure that could be shared or used for these kinds of initiatives. There are few or no suitable fiber networks, backbones or towers available in these communities that could be adapted and used for rural applications. In addition, the price and lack of available of spectrum also negatively impacted costs.

- Mismatch between the cost to provide service and ability to pay: These regions were marked by limited economies of scale, low population density and challenging environmental conditions that increased operating costs and drove higher service prices. According to the ITU (2015), the share of average income that a family in a developing country should allocate for basic mobile service is between 11 to 25 percent. Even with subsidies or direct government investment, to be sustainable for the provider, access to a telephone line or Internet connection will almost always require users to pay for at least part of the service, which may make those services unaffordable to the community being served.

- Unattractive business models: These projects are generally promoted by governments, and are justified by societal benefits which may not have an underlying economic rationale. Given the significant investment costs and often unattractive return on investment, telecom operators lack the appropriate incentives to participate, other than as a consequence of their license obligations.

- Lack of local participation: In Latin America, rural communities are generally isolated and physically distant from the main cities and decision centers. Local governments often lack the necessary human and financial resources to have significant involvement in connectivity projects. As a consequence, these projects are defined centrally without the relevant input of local communities and may not properly take the needs of those communities into account.

- Lack of digital awareness: Estimates (ITU 2015) indicate that 50 to 70% of the people that do not use Internet in developing countries are not even aware of its existence.

Unless this lack of awareness and corresponding low digital literacy are addressed, adoption will be limited even if services are available.

In order to maximize the possibility of increasing access and connectivity in rural areas, a new model that could tackle these problems should be devised.

Desirable characteristics of a new model

A new rural connectivity approach should be designed to have the following characteristics:

1) Affordable. Affordability is central for a successful rural connectivity model. People need to have sufficient income to maintain and pay for their telecom services and Internet access. Lower process may be achieved with the assistance of government subsidies or other type of transfers.

2) Cost effective. Deploying infrastructure in rural communities and regions is particularly costly due to geographic conditions, distance from urban centers and low population density. Technological innovation and development is key to cost reduction and finding the appropriate economies of scale for operators. Cost effectiveness and efficiency should be prioritized in the usage of infrastructure, spectrum and in the process of offering services to final users. In this area, innovation and technological cooperation between operators, vendors, intermediaries, regulators and other interested parties is essential and should be promoted. Operators should be financially incentivized to develop and apply new technological developments for more efficient connectivity.

3) Community-oriented. The involvement of communities, local NGOs and local governments is fundamental to the success of a rural connectivity initiative. Additionally, central governments must cooperate with local governments in order to solve permits and rights of ways issues. In the case of Peru, for instance, there is a Broadband Development Law that mandates this coordination between the different levels of government.

4) Regulatory flexibility. A new approach to rural connectivity will require regulatory flexibility in order to apply the best tools to solve the rural connectivity and access problem. This flexibility should include the possibility of modifying or substituting current license and regulatory obligations; the availability of resources such as spectrum, right of ways, etc. and coordination between different levels of government and local communities.

5) Service neutral: Service definitions should be general enough to evolve as technology and customer needs evolve rather than specifying a specific usage case or service . For example, rural public telephony was at one time very relevant but is now being subsumed by mobility and the migration from voice to data services. Service obligations should be adaptable/flexible to address new and emerging needs such as Internet access and access to digital applications.

The Case of Peru

Peru has experienced rapid growth in access to telecom services, as has been the case with other countries in the region. However, a large number of Peruvians still lack access to proper Internet/broadband services or the supporting reliable infrastructure needed to enable service expansion. This is due in part because mobile telephony has been the driver of this growth.

The Peruvian market is composed of 4 mobile carriers: Telefonica del Peru (40%), Claro (33%), Entel (16%) and Bitel (12%). Currently, with a mobile penetration of 124.9%, there are more than 38 million mobile lines in the country[1]. 80% of Peruvian localities (mainly rural) lack Internet coverage. 74% of household (mainly in rural areas) do not have Internet access. And 53% of the population aged 6 or older, are not Internet users. (source: FITEL 2016)

The current approach to rural connectivity is double pronged. First, represents a broader policy that includes Universal Service Fund financing to private operators, including interconnection rate incentives facilitating infrastructure sharing and addressing rights of way needs. And second, it represents regimes for rural connectivity obligations.

Peru´s commitment to rural access connectivity is embedded in its Telecom Law, specifically regulation and institutional design. The Peruvian Telecom Law Article 12 states that telecom service providers should apportion a percentage of their annual sales to the Telecom Investment Fund. The same Article creates the Fund and establishes that it will exclusively finance telecom service provision in rural areas and areas of social interest.

According to the relevant regulation, a Rural Area in Peru is defined as having the following four characteristics:

1. Not classified as part of an urban area by the National Statistics Institute
2. A population of less than 3,000 people
3. Lacking in proper basic services
4. Localities with telecom service penetration of less than 2%, regardless of the previous three conditions.

FITEL legal framework and role in Connectivity Approach

Fondo de Inversion en Telecommunicaciones, or FITEL, manages the Universal Service Fund in Peru. The objective of the Fund is to provide universal access, that is, access to a set of basic telecom services, including the transmission of voice and data in Peruvian territory.

[1] Data for September 2017, from Osiptel (https://www.osiptel.gob.pe/documentos/2-indicadores-del-servicio-movil)

FITEL has the following objectives:

- Design and implement programs and projects for telecom service provision in rural and social interest areas; including infrastructure deployment and other actions needed to guarantee access to these services.
- Promote the participation of the private sector in the offering of telecom services in rural and social interest areas
- Finance projects and programs aimed to provide telecom services in rural and social interest areas

FITEL[2] auctions projects for the participation of private entities in infrastructure and service deployment in rural and social interest areas. In 2016, FITEL initiated 21 regional projects for rural connectivity including both broadband access and backhaul network deployment worth 1,800 M USD in financing, seeking to benefit 6,000 localities. As of February 2018, auctions for 15 projects have been finalized and 6 are still pending. It should be noted that even though the focus of most of this paper is on broadband access, low-cost backhaul and access to transit for Internet transmission are also essential elements for addressing rural connectivity.

Asymmetric Interconnection Rates and Other Measures

The Peruvian government also stipulates the use of asymmetric interconnection rates as another measure to support Rural Connectivity.
The rural rate - which is around half of the cap rate established by the regulator for each carrier - is paid by rural operators for calls originating in rural areas and terminated in urban areas. Whereas the urban rate is paid by urban operators for calls terminating in rural areas.

There are other laws and regulations that promote infrastructure sharing between carriers and coordination in rights of ways and other permits with local authorities to facilitate rural connectivity. Rural service continuity is another important obligation, although compliance has been complicated by the proliferation of mobile services.

License Obligations

Additionally, the Peruvian government has incorporated rural coverage and access obligations into the license terms associated with its recent spectrum auctions.

[2] Legal FW FITEL: http://www.fitel.gob.pe/pg/base-legal.php

For example, in the 2013 contract between Telefonica and the Peruvian government to renovate the spectrum licenses, the following obligations, related to Rural Connectivity, were included[3]:

- Mobile Coverage in 2327 localities with more than 400 pops.
- 559 Social Internet accesses in 259 localities
- Social rate pricing for prepaid mobile telephony for social program beneficiaries
- Free access to Social Internet (Satellite) in 661 highest impoverished districts and 396 TAMBOS (Rural development and distribution centers)

Technological Requirements

Although Peruvian regulation tends to be technology neutral, not all spectrum auctions and FITEL projects have followed this principle; some required certain type of technologies to be used and/or specific services to be offered through a particular spectrum band.

Some rural connectivity obligations have also been technology specific. For example, consider the Social Internet, which is a service that dictated use of satellite links. While there is no specific justification for prescribing use of a particular technology, it is clear that the authorities were looking for satellite based services, because they concluded that would help maximize rural connectivity and access under the conditions of large rural territories, varied terrain and low population density.

Remote Mobile Infrastructure Operator concept

The Peruvian Congress created the Rural Mobile Infrastructure Operator ("RMIO") designation in 2013, when it adopted measures to strengthen competition in the public mobile services market. RMIOs deploy network facilities and operate in rural areas and preferred social interest locations where no mobile operator has previously deployed. Mobile network operators ("MNOs") extend their networks into these areas by contracting for use of the RMIO's physical network facilities. RMIOs must obtain (i) a concession for the provision of carrier services, and (ii) an RMIO registry from the Ministry of Transport and Communications ("MTC"), in order to operate. Today, four RMIOs are registered to operate.

- RMIOs do not have their own allocations of spectrum, numbering resources, nor end users; service to the MNO's end users is provided using the partner MNO's allocated spectrum.
- The rules governing the relationship between an MNO and an RMIO are set forth by both regulation and the agreement between the two parties.

[3] http://www.mtc.gob.pe/comunicaciones/concesiones/renovacion_telefonica.html

- RMIOs are also subject to equipment type approval, regulatory fee payment, regulatory reporting, and competition law regulations.

A goal of RMIOs is to enable wholesale services in underserved rural areas. This could include both greenfield and areas currently served only by 2G voice services. Rural Mobile Infrastructure Operator companies operate passive and active infrastructure and offer services on a wholesale basis to enable MNOs to provide retail wireless services using their own spectrum, brand and BSS/OSS. A key to the attaining a feasible and reliable deployment and business model rests on new technological developments that will reduce costs and increase efficiency.

However, while the RMIO framework provides a foundation for addressing rural connectivity, there has not yet been significant adoption. Below we propose how to build upon the RMIO framework to make it truly impactful.

The New Approach

The New Approach to expanding rural connectivity is premised upon giving MNOs more flexibility for meeting their rural coverage and service obligations through the use of RMIO infrastructure and ensuring that RMIOs can avail themselves of the cost saving benefits from newer technologies.

All three stakeholders stand to gain – rural users get up-to-date mobile and data services, RMIOs see increased customer commitment, and MNOs can apply savings to further enhance rural access. We believe these changes can help attract the necessary investment to drive widespread implementation.

In this sense, a New Approach, through the operation of a RMIO attains the required characteristics of an efficient and effective Rural Connectivity program:

- Affordability. Broadband connections and convergent services will give users access to multiple services with affordable commercial schemes. It is well established in Peru and elsewhere, because of the ability to adjust usage to match disposable income, prepaid services allow low-income users to access mobile Internet services from wherever mobile networks are available.
- Cost effective. New technological developments reduce infrastructure deployment costs and increase the efficiency of spectrum and connectivity usage. These savings can translate to more predictable business cases for a RMIO and more attractive end-user pricing.
- Community Oriented. Even though rural communities are not necessarily directly involved in the development and deployment of RMIOs, because the RMIO's services are replacing inefficient and obsolete service schemes and by design being developed specifically in response to demand for new and more affordable services in rural communities, they are effectively taking into account the needs of the rural communities.

- Regulatory flexibility. The economic challenges required to reduce the digital divide may dictate increased flexibility for other obligations that add costs, such as for MNOs, to whom the RMIOs provide service for. Examples are relief on spectrum fees, QoS requirements and associated penalty structures. Furthermore, incentive schemes such as allowing MNOs to substitute fees in exchange for commitments to expand geographic coverage or service levels should be considered.

The relevant Laws and regulations related to the implementation of the New Approach are the following:

- **Telecom Law**: The telecom law is the general statutory framework for the Peruvian Telecom Sector, setting forth relevant definitions, general obligations, and licenses types.
- **Supreme Decree 013-93-TCC:** Supreme Decree 013-93-TCC implements regulations emanating from the Telecom Law, expanding on definitions, obligations, and requirements.
- **Law 30083:** The purpose of this statute is to strengthen competition in the mobile market and to introduce new tools to promote mobile rural telephony.
- **Supreme Decree 004-2015-MTC** ("S.D."): S.D. implements regulations emanating from the 30083 Law.
- **Resolution N° 059-2017-CD/OSIPTEL** ("Resolution"): The Resolution approves complementary regulation related to the Rural Infrastructure Mobile Operator's network facilities.

Although no changes or amendments are necessary for the implementation of the New Approach, as mentioned, increased flexibility by the government and regulator with respect to current obligations are recommended to make the Scheme more reliable and efficient.

In order to properly align incentives and better ensure the success of the new RMIO based approach, flexible provisions in the regulation for the following areas could be helpful:

a) Replace out of date or obsolete legacy obligations that no longer align with the ultimate goal of increasing rural access and connectivity. Policymakers and regulators should consider modifying current regulation to provide the flexibility to trade old coverage and access obligations, for new, market oriented obligations, that let the operator respond to specific market demands and needs, with more efficient technology.
b) Obligations that come with existing FITEL projects must be technology neutral and amended to address current requirements. Regulation should provide a technology-neutral approach to rural connectivity to allow operators to offer their services in a more efficient and cost-effective way.

Regulatory implications of a new Regime

The appropriate regulatory conditions for the New Approach appear to exist in Peru. However, in addition to the proposed policy and regulatory flexibility regarding current obligations, there are also regulatory implications for the coexistence between the current regime and New Approach that deserve mention.

a) Current Regime and the New Approach

The current legislative framework allows for infrastructure sharing, license/spectrum leasing, and other required processes to implement a new approach like the one described above. Local authorities' rights of way coordination is also already included in the current Broadband Law, as well as provisions for shared backhaul and towers. However, the construction of a new regime will also require a new regulatory focus.

The New Approach and the current Universal Service/Rural Connectivity approach do not conflict per se. However, flexibility will be required from authorities to review existing regulation/obligations and maintain those that generate cost-effective access and eliminate those that are obsolete, costly and – more importantly – no longer central to citizens' communication needs.

A regulatory scheme that generates incentives for operators to bring the most efficient and accessible technology and services, in order for users to have access to new and more useful applications they are demanding will be necessary to achieve rural connectivity and user satisfaction. Investment incentives, access goals and other options should be promoted over fees, sanctions or penalties.

b) Quality of Service

The Peruvian legislation establishes quality of service standards and requirements for telecom services. The only specific obligation on quality of service for RMIOs is for continuity. However, operators offering services to end users through RMIO infrastructure are subject to broader quality obligations. The RMIO and the retail operator must work together to ensure that the technical capabilities of the networks deployed by the RMIO allows the retail operator to meet its ongoing service quality obligations.

c) Technology Neutrality

In order to enable RMIOs to fully address the rural wholesale market, further technical coordination between the license obligations approach and the FITEL mandates may be merited. The necessary changes are regulatory and not legislative. For example, in some cases, terms for spectrum licenses and FITEL´s projects have specific technology requirements that may not be met by the RMIO even though the RMIO's services address the overall connectivity objective of the license or project, as may be the case. Regulatory relief should be possible given there is a technology neutral principle in the Rules for the Promotion of Rural Telecom Service Development, which allows use of different technologies for rural services.

Conclusions

With the proper regulatory adjustments, a tool devised to increase rural connectivity through a different arrangement – based on taking advantage of already available spectrum and infrastructure resources – can prove to be not only a successful model in providing cost effective rural broadband connectivity and access for Peru, but for other economies with similar socioeconomic and geographical conditions.

However, in order for the scheme to be effective, it requires the cooperation and involvement of regulators and policy makers to establish the appropriate incentives to motivate the market and its participants – both operators and users – to maximize their position.

Regulatory environments that promote rural connectivity should be flexible and open enough to enable even rural operators to innovate and to bring to market new services and technologies. Rural connectivity also needs to offer users the possibility of accessing new services and applications. Operators should not be burdened with requirements to deploy expensive, inefficient technologies when other alternatives are economically and technologically feasible.

Improved rural connectivity has always been a goal for regulators and policymakers. This goal has not yet been achieved in Peru, but taking a New Approach will help. Using the right tools, together with regulatory flexibility through a market-oriented technology neutral incentive scheme and new, efficient, low-cost technologies, can help achieve that goal.

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