BOLIVIA

# Landlocked Developing Countries (LLDCs) in The Americas Region

# CONNECTIVITY CHALLENGES AND OPPORTUNITIES

# B O L I V I A

## Report


Telecommunication Development Sector

# Connectivity challenges and opportunities - Bolivia

## Landlocked developing countries (LLDCs) in the Americas region

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ISBN

978-92-61-25701-9 (Paper version)

978-92-61-25711-8 (Electronic version)

978-92-61-25721-7 (EPUB version)

978-92-61-25731-6 (Mobi version)

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## Abbreviations and acronyms

| | |
|---|---|
| ADSIB | Agency for Development of the Information Society in Bolivia |
| ADSL | asymmetric digital subscriber line |
| AfDB | African Development Bank |
| APoA | Almaty Plan of Action |
| ASYCUDA | Automated System for Customs Data |
| BDT | ITU Telecommunication Development Bureau |
| CAF | Andean Development Corporation – Development Bank of Latin America |
| CDN | content distribution network |
| CERT | computer emergency response team |
| COPLUTIC | Plurinational Committee on Information and Communication Technologies |
| COSTETIC | Sectoral Council for Telecommunications and Information and Communication Technologies |
| EAC | East African Community |
| EAC-BIN | East African Broadband ICT Infrastructure Network |
| EASSy | Eastern Africa Submarine Cable System |
| ETA | autonomous territorial entity |
| FO | fibre optic |
| FTTH | fibre-to-the-home |
| GDP | gross domestic product |
| GNI | gross national income |
| HFC | hybrid fibre-coaxial |
| ICT | information and communication technology |
| IDI | ICT Development Index |
| INE | National Statistical Institute |
| IPB | ICT Price Basket |
| ITU | International Telecommunication Union |
| IXP | Internet exchange point |
| LDC | least developed country |
| LLDC | landlocked developing country |
| LSE | ITU-BDT Least Developed Countries, Small Island Developing States and Emergency Telecommunications Division |
| LTE | long-term evolution |
| MSME | micro, small and medium enterprise |
| PIT | traffic exchange point |
| PPP | public-private partnership |

| | |
|---|---|
| PRONTIS | National Telecommunication Programme for Social Inclusion |
| SDGs | UN Sustainable Development Goals |
| SIDS | small island developing states |
| SME | small and medium enterprise |
| TEAMS | East African Marine System |
| TFA | Trade Facilitation Agreement |
| UEPP | PRONTIS Project Implementation Unit |
| UMTS | universal mobile telecommunication system |
| UN | United Nations |
| UNCEFACT | UN Centre for Trade Facilitation and Electronic Business |
| UNCTAD | United Nations Conference on Trade and Development |
| UNDP | United Nations Development Programme |
| UN-OHRLLS | United Nations Office of the High Representative for the Least Developed Countries |
| VoIP | voice over Internet Protocol |
| VPoA | Vienna Programme of Action |

# 1 Introduction

The Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014 to 2024 (VPoA) aims to help the LLDCs overcome their challenges towards an inclusive and sustainable development. Landlocked developing countries (LLDCs) are usually poorer than their neighbours, with limited capacities and dependence on a very limited number of commodities for their export earnings. The main challenges facing these countries include lack of territorial access to the sea, remoteness and isolation from world markets, improving their connectivity to global markets, dependence on neighbouring and coastal countries for communication connectivity, low level of interest in investing in information and communication technologies (ICTs), high infrastructure development costs, long and expensive transport routes, high vulnerability to external shocks, and lack of effective implementation of ICT plans and policies on the ground. Poor ICTs and inadequate telecommunication infrastructure have further contributed to their relative poverty. All of these factors substantially inflate transportation costs and lower their effective participation in international trade. In turn, these inflated transportation costs push up the cost of both importation and exportation, thus constraining market competiveness and profitability (World Bank, 2010).

The difficult environment in which the LLDCs have to operate, characterized by poor infrastructure, limited access to world markets, inferior logistics systems and no outlet to the sea, means that they face much higher costs of transport and trade transactions compared with coastal countries (United Nations General Assembly, 2014) (UN-OHRLLS, 2013a). According to the analysis made in the review of the Almaty Programme of Action (ITU and UN-OHRLLS, 2013a) and the World Bank's Doing Business 2013 report (World Bank and International Finance Corporation, 2012), the average cost of exporting a container for LLDCs is higher than for transit countries and has risen from USD 2 200 in 2006 to USD 3 000 in 2013, while transit developing countries are only paying half of that figure. These high costs exert a huge trade-reducing effect that has a direct negative impact on economic growth and puts LLDCs at a disadvantage in terms of harnessing their full potential to support their sustainable development efforts. Improved ICTs are important for connecting LLDCs more effectively to international markets, facilitating trade transactions, boosting the competitiveness of enterprises and speeding up customs and border procedures.

Information and knowledge is critical for innovation and for social and economic development, with the result that ICTs are playing a key role in fostering the development of all sectors of the economy and enhancing countries' competitiveness.

Since ICTs are, without doubt, today's most rapidly evolving industry, supporting the emergence of new and innovative services, it is vital that the necessary infrastructure be deployed to enable the LLDCs to achieve the pace of change needed to grow and gain competitive advantage. The right broadband infrastructure has to be put in place to cater for the needs of current and future services.

A satisfactory increase in the use of ICTs in industry can boost GDP growth. According to the analysis made by ITU, more affordable broadband access to the Internet for both households and the private sector could increase GDP by 1.5 per cent per year. Indeed, a direct correlation has been identified between GDP growth and increase in Internet penetration: when Internet penetration rises by 10 per cent in developing economies, it correlates with an incremental GDP increase of between one and two percentage points. (ITU and UN-OHRLLS, 2013b).

The versatility of ICTs and increased ICT usage can serve to reduce the time and costs involved in the execution and implementation of border procedures, and to reduce the costs of transactional trade. The use of services such as electronic payment, the Single Window concept and the Automated System for Customs Data (ASYCUDA) (UNCTAD, 1981) have triggered an improvement in the efficiency and competitiveness of customs procedures and services, impacting directly on export performance and, therefore, on economic growth.

E-commerce, through ICTs, offers an unprecedented opportunity to expand the trade capacity of LLDCs; but it must be supported by an effective trade and transport system and an efficient ICT

infrastructure to improve their capacity to participate in international trade. Although the average volume of administrative procedures, number of documents and amount of time required for LLDCs to export and import has decreased between 2006 and 2015, these indicators are still much higher for LLDCs than for transit countries. According to the World Bank's Doing Business 2013 report (World Bank and International Finance Corporation, 2012), the average number of documents that LLDCs require for exports has fallen from nine in 2006 to eight in 2012, and from 11 to ten for imports. The average time taken by LLDCs to complete export formalities has decreased from 48 to 42 days, and from 57 to 48 days for imports. Nevertheless, when compared to transit developing countries, where the average number of days required to export and import is 23 and 27, respectively, the LLDCs need to do more to reduce delays in exporting and importing.

The main problem hampering development of the use of ICTs is the digital divide between the LLDCs, on the one hand, and the developed world, the developing countries and transit countries, on the other. The speed at which LLDCs are developing may be not sufficient to overcome the digital divide; and digital divides also exist within the LLDCs themselves, between urban and rural areas, between social classes, between men and women, etc.

The importance of ICT for accelerating the competitiveness of LLDCs has been widely recognized in all LLDC conferences, and the following recommendations have been made (UN-OHRLLS, 2013a):

- Expand telecommunication facilities.
- Promote participation of the private sector in the planning and management of telecommunication facilities.
- Create cargo-monitoring systems to significantly reduce delays.
- The international community should support LLDCs and transit countries in establishing IT systems and making improvements in facilitation and transparency.
- LLDCs should share knowledge and experiences on trade facilitation.
- LLDCs are encouraged to take advantage of trade facilitation tools developed under the UN Centre for Trade Facilitation and Electronic Business (UNCEFACT) (United Nations, 1996), such as the Single Window Implementation Toolkit, in the process of implementing the Trade Facilitation Agreement (TFA).
- In the development of hard infrastructure and ICT infrastructure, promote the implementation of infrastructure-sharing between transport, energy and ICT; improve the LLDCs' access to international optical fibre networks; and improve the ability of LLDCs to use satellite by lowering costs through space segment consolidation efforts.
- LLDCs should develop a national broadband plan or strategy or include broadband in their universal access and service definitions.
- LLDCs should develop domestic ICT laws that must conform to others and to the Global ICT policy.
- LLDCs should develop regulatory frameworks that can facilitate and support improved ICT connectivity.
- The international community should facilitate access to technologies and transfer of know-how on ICTs.
- Promote e-business, e-government, e-banking, e-trading and cybersecurity.
- Forge partnerships between governments, inter-governmental organizations and the private sector in developing and implementing ICT plans.
- Collect ICT statistics and indicators and report regularly.

- Explore innovative funding such as regional infrastructure funds, infrastructure public-private partnerships (PPP), debt markets and creation of a universal service fund for ICT investors.

Several ITU conferences have adopted resolutions aimed at improving the LLDCs' access to international optical fibre networks and their connectivity:

- The ITU Plenipotentiary Conference adopted Resolution 30 (Rev. Busan, 2014) (ITU, 2014a), on special measures for the least developed countries (LDCs), small island developing states (SIDS), LLDCs and countries with economies in transition.
- The World Telecommunication Development Conference adopted Resolution 16 (Rev. Hyderabad, 2010) (ITU, 2014b), on special actions and measures for the LDCs, SIDS, LLDCs and countries with economies in transition.
- The World Conference on International Telecommunications adopted Resolution 1 (Dubai, 2012) (ITU, 2012a), on special measures for LLDCs and SIDS for access to international optical fibre networks.

## 1.1 Objective of this report

The objective of this report is to make a series of recommendations and propose a project for Bolivia to improve the use of ICTs, seeking synergies between Bolivia and Paraguay, the two LLDCs in South America, with a view to instituting active collaboration and proposing common or shared projects to facilitate effective implementation in their territories.

To this end, the report will analyse Bolivia's status and evolution in terms of the main ICT indicators, benchmarking with the developed countries, the developing countries, the rest of the LLDCs and the other countries of South America. Both legal and regulatory aspects will be considered, as well as connectivity, services and prices. It will be important to differentiate between different regions or departments of each country, and also between access, national backbone and international connectivity.

This is followed by a review of the use of ICTs in the main economic, public and social sectors of each country, identifying initiatives that can lead to improved efficiency of each sector and more effective proposals for new and innovative services for the population and businesses.

The report will then go on to analyse the challenges that Bolivia faces and explore opportunities and joint actions to significantly improve the development of ICTs, increase the country's specific weight in the region and accelerate the current growth trend.

Last but not least, a number of recommendations will be formulated for improving the use of ICTs.

# 2 Bolivia's current situation

Recognizing the importance of ICTs for leveraging the efficiency and competitiveness of all other sectors of the economy, it is important to measure the status and evolution of all aspects of ICTs in the American LLDCs. This report will analyse policy and regulatory aspects, connectivity for fixed and mobile telephony and, more importantly, broadband connectivity and Internet use from both fixed and mobile networks, benchmarking first with the developed countries and then with the developing countries, the rest of the LLDCs and the South American countries.

The Vienna Programme of Action for landlocked developing countries for the decade 2014-2024 (VPoA), adopted at the second United Nations Conference on landlocked developing countries, aims to help the world's 32 LLDCs overcome the challenges they face in moving towards sustainable, inclusive and rapid economic growth and development. It identifies six priority areas, one of which highlights the importance of infrastructure development and maintenance, notably ICT infrastructure (United

Nations General Assembly, 2014). As described in the VPoA, ICTs can contribute to more sustainable and inclusive growth by increasing productivity, lowering costs, facilitating market expansions beyond borders, facilitating access to services, including access to broadband infrastructures, and contributing to increased participation in governance, accountability and transparency. However, the LLDCs find it difficult to keep up with the necessary infrastructure deployment and policy frameworks, as their broadband costs are, as a share of gross national income (GNI), much higher than in coastal countries. Two further factors that impact directly on ICT costs and coverage in LLDCs are the size of their markets, which are smaller than those in other countries, and the lack of a suitable regulatory environment. It is also very important to analyse how ICT development and economic indexes are evolving in the American LLDCs so as to better understand the critical factors for achieving higher ICT penetration.

It should be pointed out, too, that the 2030 Agenda for Sustainable Development and all the Sustainable Development Goals (SDGs) are relevant to the LLDCs. The SDG means of implementation support relevant strategies and programmes of action; and the follow-up and review of the 2030 Agenda requires enhanced capacity-building support for the LLDCs, including the strengthening of national data systems and evaluation programmes.

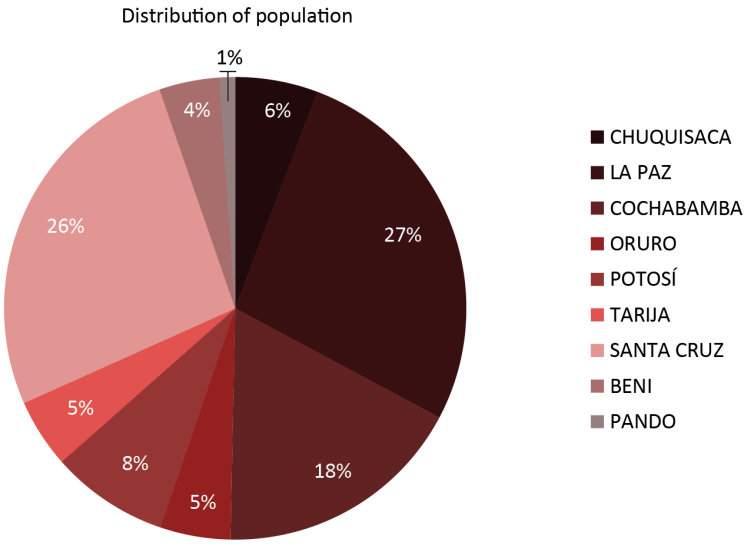
## 2.1 Demographics and main economic indicators

Bolivia is a relatively large country, with a land area of 1 098 580 km$^2$. The latest official data published by the National Statistical Institute (INE) (Instituto Nacional de Estadística, 2012), give a population figure of 10 059 856[1], of whom 50.10 per cent are women. The population density is thus very low, at just under 10 inhabitants per km$^2$.

### 2.1.1 Distribution of population by department

Bolivia is divided into nine different departments. The pie chart in Figure 1 below shows the population distribution by department:

Figure 1. Bolivia: Distribution of population (Instituto Nacional de Estadística, 2012)

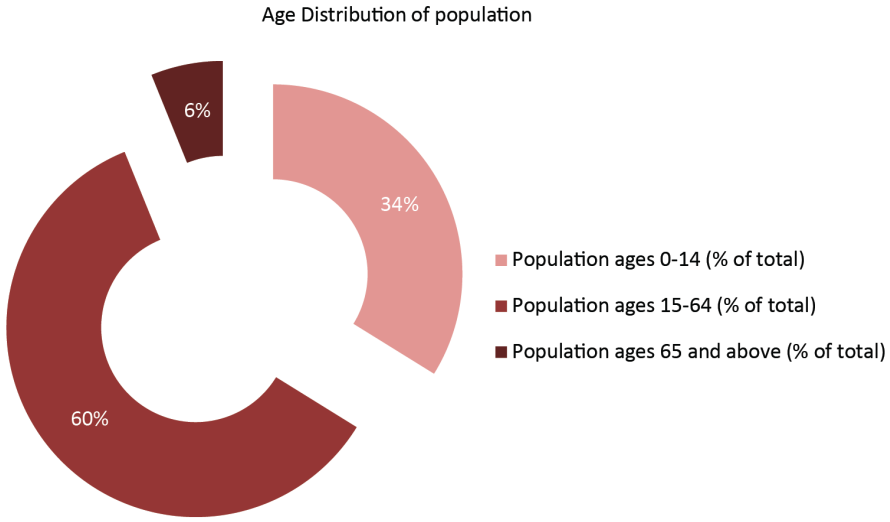



[1] According to the United Nations Development Programme (UNDP), the total population at end 2016 was 11 201 531 (UNDP, 2016)

### 2.1.2 Age distribution of the population

In Bolivia, as shown in Figure 2, around one-third of the population is young (14 or younger), almost two-thirds are between the ages of 15 and 65, and only 6 per cent are above 65.

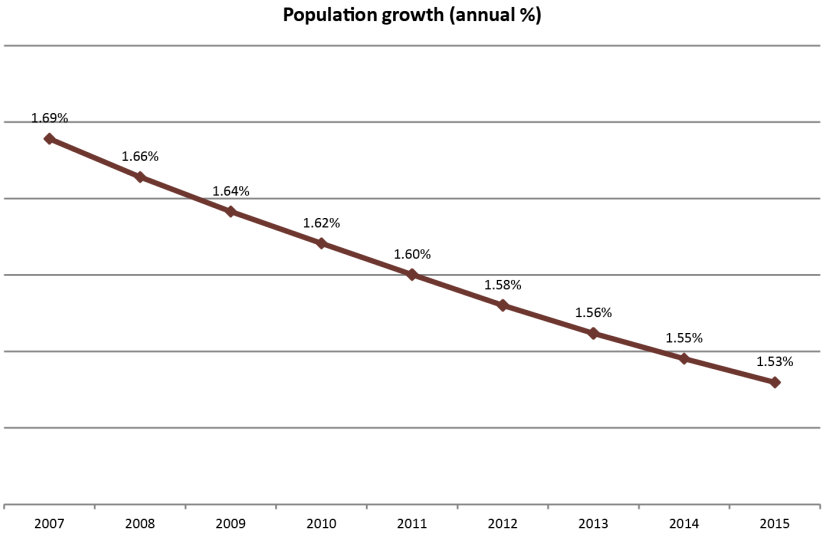
Figure 2. Bolivia: Age distribution of population (World Bank, 2017)




### 2.1.3 Population growth

Bolivia shows a decreasing linear trend in population growth, according to the graph in Figure 3, from 1.69 per cent in 2007 to 1.53 per cent in 2015 (World Bank, 2017):

Figure 3. Bolivia: Population growth 2007-2015



### 2.1.4 Main economic indicators

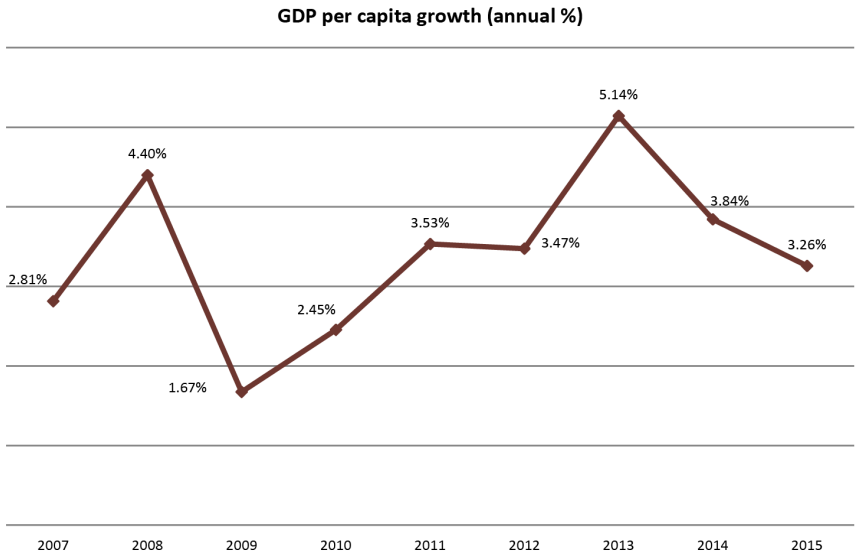
Table 1 summarizes the main economic indicators for Bolivia (World Bank, 2017):

Table 1. Bolivia: Main economic indicators

| | | |
|---|---|---|
| GDP (constant 2010 USD) | 2015 | 25.661 billion |
| GDP per capita (constant 2010 USD) | 2015 | 2 392 |
| GDP per capita (current USD) | 2015 | 3 076 |
| Gini index (World Bank estimate) | 2014 | 48.4 |
| GNI (constant 2010 USD) | 2015 | 24.852 billion |
| GNI per capita (constant 2010 USD) | 2015 | 2 317 |
| GNI per capita, Atlas method (current USD) | 2015 | 3 000 |
| Exports of goods and services (% of GDP) | 2015 | 30.87 |
| Imports of goods and services (% of GDP) | 2015 | 36.93 |
| Gross national expenditure (% of GDP) | 2015 | 106.60 |
| Gross savings (% of GDP) | 2015 | 13.63 |

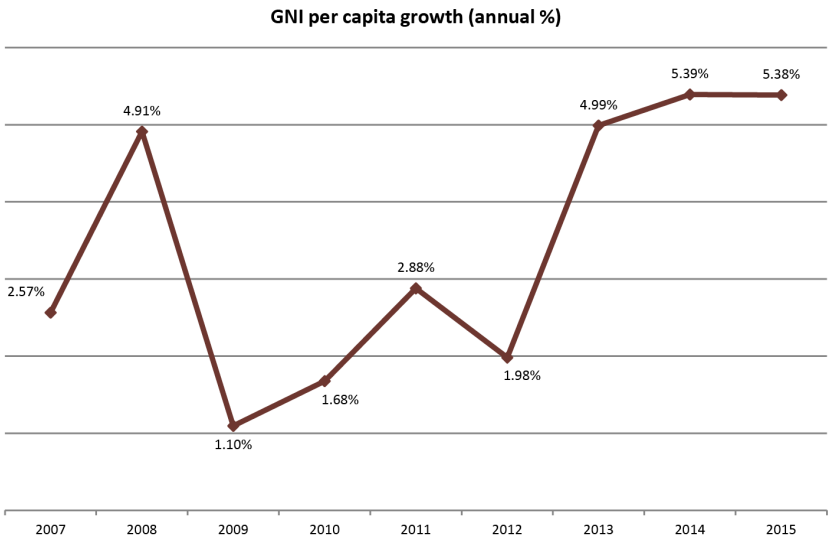
As depicted in Figure 4, GDP growth in Bolivia was uneven between 2007 and 2015: the highest growth of 5.14 per cent was recorded in 2013, while the worst year was 2009 with a growth of 1.67 per cent.

Figure 4. Bolivia: GDP per capita growth (World Bank, 2017)




As shown in Figure 5, Bolivia's lowest GNI per capita growth rate of 1.10 per cent occurred in 2009, since when the trend has been positive, peaking at 5.39 per cent in 2014.

Figure 5. Bolivia: GNI per capita growth (World Bank, 2017)

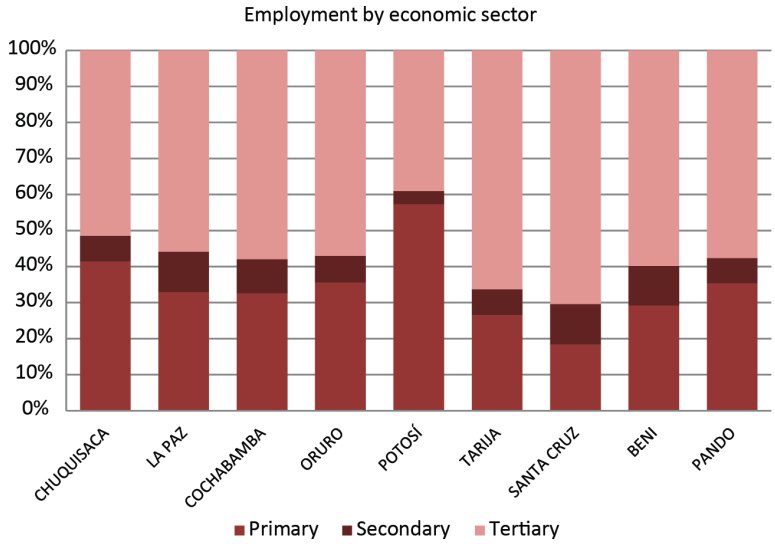



### 2.1.5 Employment by economic sector

The chart in Figure 6 reveals the distribution of employment among the different sectors, by department.

In all the departments of Bolivia, the tertiary sector is the one that generates the most employment (over 50 per cent), except in Potosí, where the primary sector is the most important.

Figure 6. Bolivia: Employment by economic sector (Instituto Nacional de Estadística, 2012)




## 2.2 Regulation and policy

Policy everywhere has evolved in recent years, with the approval of new telecom laws, and the adaptation of regulation to better address the needs of the ICT market in order to ensure higher penetration of telecom services and lower prices. The telecom market is evolving very rapidly, with new technologies and services. Improvement is necessary to ensure that the American LLDCs keep pace with this trend.

Policies should encourage the deployment of broadband infrastructures, services and Internet access, which have become essential to ensuring the competitiveness of any country.

Bolivia recognizes the importance of ICTs, which play a vital role for the country's economic development and as a fundamental right of all its inhabitants.

The main laws affecting the ICT sector in Bolivia are outlined below.

### 2.2.1 Bolivian Constitution

In the Political Constitution of the Plurinational State of Bolivia (Gobierno de Bolivia, 2009a), telecommunications are defined as a basic service and, as stipulated in its Article 20, everyone has the right to universal and equitable access to basic telecommunication services, among others, it being the responsibility of the State, at all levels of government, to ensure the provision of basic services through public, mixed, cooperative or community entities. For the specific case of telecommunications, "The service may be provided through contracts with private companies. The provision of services must meet the criteria of universality, responsibility, accessibility, continuity, quality, efficiency, effectiveness, fair tariffs and necessary coverage; with social participation and control" (Gobierno de Bolivia, 2009a).

We consider it extremely important that universality of telecommunication services is recognized in the Bolivian Constitution.

### 2.2.2 Patriotic Agenda for the Bicentennial 2025 and scientific and technological sovereignty

In the Patriotic Agenda for the Bicentennial 2025 (Gobierno de Bolivia, 2013a) a set of principles and objectives are established as pillars governing the development of Bolivian society. The ICT sector is highlighted as having a key role to play in:

- socialization and universalization of basic services with sovereignty;
- technological sovereignty; and
- sovereignty and transparency in public management.

In regard to the specific pillar of scientific and technological sovereignty with a Bolivian identity, the Agenda seeks to foster national and locally-based innovation, knowledge and technological tools in the various strategic, production and service areas in the country.

This ambition is underpinned by related goals or objectives aimed at the development of technology in strategic areas and sectors of society, such as agriculture, mining, energy, medicinal products and food, as well as the development of talent and local professional skills in the scientific and technological fields.

### 2.2.3 General Telecommunications Law

General Law No. 164 of 8 April 2011 on Telecommunications and Information and Communication Technologies (Gobierno de Bolivia, 2011a) establishes the general telecommunication/ICT regime, laying down the distribution of powers among public institutions for the sector; provisions regarding authorizations and contracts for the provision of telecommunication/ICT services; and provisions for the financing of social telecommunication projects. It declares promoting the use of ICTs and aspects related to e-government and free software, among other topics, to be matters of national priority.

Where institutional aspects are concerned, it stipulates first of all that the Ministry of Public Works, Services and Housing[2] shall be responsible for establishing public policies, plans and programmes

[2] *Ministerio de Obras Públicas, Servicios y Vivienda*, https://oopp.gob.bo

that guarantee the use of telecommunication/ICT services and the use of the radio-frequency spectrum for improving the quality of life of citizens. For its part, the Telecommunication and Transport Regulatory and Control Authority (ATT)[3], which comes under the aforementioned ministry, is in charge of authorizing, regulating and supervising fixed- and mobile-telephony services, all telecommunication networks and ICT services in the country.

In addition, the Law creates the National Telecommunication Programme for Social Inclusion (PRONTIS) (Viceministerio de Telecomunicaciones, 2011), which also comes under the Ministry of Public Works, Services and Housing, for the financing of telecommunication and ICT programmes and projects that support the expansion of telecommunication networks and the development of content and applications for achieving universal access in rural and urban areas. In this connection, the Law prescribes that the ministry shall sign contracts for the execution of projects in the sector with telecommunication enterprises in which the State holds a majority share. In the event that the projects cannot be executed by such enterprises, the ministry may put them out to tender to operators established in the country. The Law also states that the ministry shall coordinate linkages between the National ICT Plan (Gobierno de Bolivia, 2011b) and the health, education, culture, communication and other sector plans, promoting the development of applications and connectivity nationwide.

Moreover, the Plurinational Committee on Information and Communication Technologies (COPLUTIC)[4] was created to propose policies and development plans for the ICT sector and to coordinate projects and lines of action among all the actors involved. COPLUTIC is composed of the Ministry of Public Works, Services and Housing, as chair, the Ministry of Communications[5], the Ministry of Education[6], the Ministry of Development Planning[7] and the Agency for Development of the Information Society in Bolivia (ADSIB)[8].

Finally, the Law creates the Sectoral Council for Telecommunications and Information and Communication Technologies (COSTETIC)[9], as an advisory body for proposals and consultation between the central level of the State and the autonomous governments, for the coordination of sectoral issues.

### 2.2.4 Supreme decrees pertaining to the General Telecommunications Law

Supreme Decree No. 1391 of 2012 (Gobierno de Bolivia, 2012) establishes a series of rules to address the need for regulations on issues in the provision of services to users, such as contracts related to access and use of infrastructure, service areas, tariffs, interconnection charges, contributions to PRONTIS, elaboration and updating of fundamental technical plans and technical standards.

To expand the broadband internet infrastructure, the Decree also states that the Ministry of Public Works, Services and Housing, through the Vice-Ministry for Telecommunications[10], shall prepare the National Broadband Plan (Viceministerio de Telecomunicaciones, 2017a), which is to provide, *inter alia*, for international connections and regional integration, as well as connections to and from capital cities and intermediate cities.

Supreme Decree No. 1793 of 2013 (Gobierno de Bolivia, 2013b) contains provisions aimed at promoting ICT development in the country, laying down the rules governing digital certification, in the context of the development of digital content and applications. It states the need to elaborate and implement Bolivia's e-government plan in order to modernize public management and make it transparent,

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3 *Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte,* http://www.att.gob.bo
4 *Comité Plurinacional de Tecnologías de Información y Comunicación*, https://coplutic.gob.bo
5 *Ministerio de Comunicaciones,* http://www.comunicacion.gob.bo
6 *Ministerio de Educación*, http://www.minedu.gob.bo
7 *Ministerio de Planificación de Desarrollo*, http://www.planificacion.gob.bo
8 *Agencia de Desarrollo para la Sociedad de la Información en Bolivia*, http://adsib.gob.bo
9 *Consejo Sectorial de Telecomunicaciones y Tecnologías de Información y Comunicación*, https://vmtel.oopp.gob.bo/index.php/informacion_institucional/COSTETIC,1000.html
10 *Viceministerio de Telecomunicaciones*, http://vmtel.oopp.gob.bo/

providing quality services and care to users, and to generate technological mechanisms for social participation and control through the use of ICTs. In addition, it also addresses the plan for the implementation of free software and the use of open standards in public entities, under the responsibility of the Ministry of Development Planning, in coordination with the Ministry of Public Works, Services and Housing, through the Vice-Ministry of Telecommunications and the ADSIB.

### 2.2.5 National Broadband Plan

Recognizing the importance of the development and availability of broadband services for increasing Bolivia's GDP, the National Broadband Plan (Viceministerio de Telecomunicaciones, 2017a) was formulated in February 2017, for a period of four years.

The broadband plan has an important impact on the efforts of several sectors, both public and private, to ensure their proper development.

It proposes targets for increasing the use of broadband until 2020, guidelines for the development and expansion of transport networks at the national level, lines of action, and incentives in the regulations for the development of the broadband Internet access service through future infrastructure, service and digital adoption projects.

The following goals are defined:

- 50% of households connected to the broadband Internet access service
- 90% of educational establishments with Internet access service coverage
- 100% of target localities connected through the Bolivian trunk network
- 100% of health facilities in target areas and municipal capitals with access to broadband Internet.

Programmes and projects for the development of broadband will be governed by the principles of accessibility, network neutrality, and up-to-date infrastructure and technological innovation.

The Ministry of Public Works, Services and Housing, through the Vice-Ministry of Telecommunications, is responsible for coordination, evaluation and monitoring of the plan.

### 2.2.6 National Telecommunication Programme for Social Inclusion

The Strategic Plan for Telecommunications and ICTs for Social Inclusion drawn up by the PRONTIS Project Implementation Unit (UEPP) in December 2015 (UEPP, 2015) synthesizes the vision for the development of telecommunications for social inclusion, underpinned by current legislation and the national vision in the 2025 Patriotic Agenda. It constitutes a long-term strategic guide (2015 to 2025), which will be reflected in the formulation and implementation of telecommunication projects for social inclusion.

The plan identifies three strategic objectives:

- Increase telecommunication/ICT penetration in localities with more than 50 inhabitants:
    - Development of projects prioritizing mobile access
    - Deployment of technologies with low operating costs
    - Deployment of broadband in rural areas.

(Localities with less than 50 inhabitants, which account for 40.88 per cent of total localities in Bolivia and 2.3 per cent of the total population, are outside the scope of this plan.)

- Achieve a balance in the development of networks and access at department level, accelerating penetration in the localities of the less privileged departments:

- Prioritizing access to ICTs in the departments of Beni, Chuquisaca, Pando and Potosí
- Developing telecommunication/ICT projects with low energy consumption.

- Develop multisector synergies for sustainability, mainly with health and education:
  - Articulating the sustainability of projects
  - Telecommunications/ICTs for social inclusion portal.

### 2.2.7 Interconnection Regulation

The Interconnection Regulation, adopted by Ministerial Decision No. 062 of March 2013 (Viceministerio de Telecomunicaciones, 2013) regulates interconnection and access and shared use of infrastructure.

Public network operators shall establish the nodes, points and routes for interconnection, meeting the criteria of efficiency, proportionality and transparency, avoiding any type of discrimination and restriction that affects the exercise of competition.

It also details the procedures for requesting access and infrastructure-sharing.

It includes roaming support service in rural areas, as well as implementation of the Internet exchange point (IXP).

### 2.2.8 Supreme Decree No. 2013

Supreme Decree No. 2013 of 28 May 2014 (Gobierno de Bolivia, 2014) aims to regulate the provision of computer equipment to State and "approved"[11] educational units within the Regular Education Subsystem for students at the Productive Community Secondary level, as well as the information technology infrastructure called the "technological floor" (*piso tecnólogico*).

## 2.3 Connectivity benchmarking

The importance of the existence of telecommunication networks to facilitate access to ICTs for most of the population is widely acknowledged. All governments have made efforts to create the right investment environment and attract private investment and, additionally, where it is not profitable for private investors, use public investment or public-private partnerships, in order to renew existing infrastructures and deploy new ones, which has helped in the positive evolution of connectivity indicators, especially in mobile networks, both for telephony and broadband.

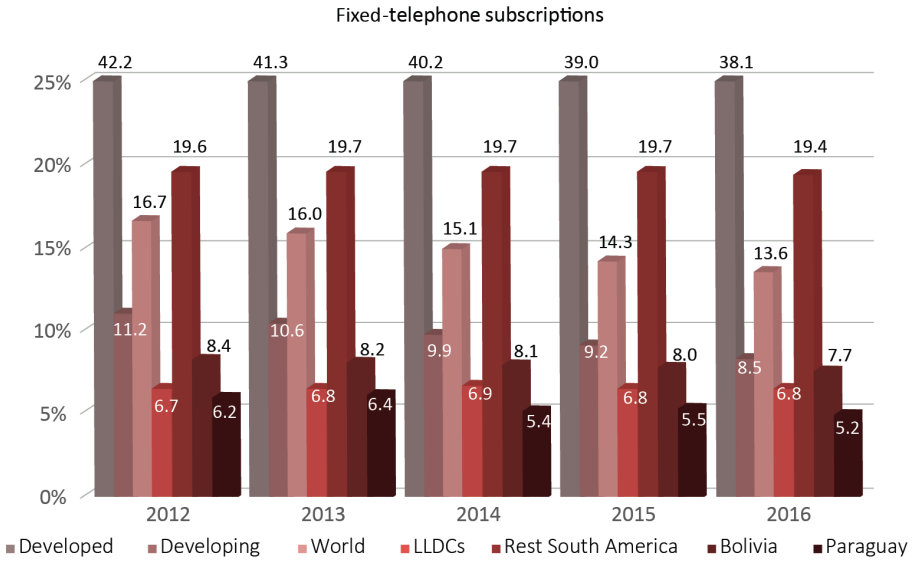
This report first analyses the status and evolution of the classic connectivity indicators in Bolivia and Paraguay, in areas such as fixed telephony, mobile telephony, and broadband in both the fixed and the mobile network, as well as the availability of computers and Internet access in homes, Internet access and use by individuals, and- especially interesting for LLDCs- the availability of international bandwidth.

It will compare these indicators with the trend in recent years in developed and developing countries, in the world average for all countries and, even more interestingly, in the LLDCs and especially the other countries of South America, which will give us a better idea of the gaps with Bolivia and Paraguay, the only two landlocked South American countries.

[11] *Unidades educativos de convenio*: In Bolivia, these are non-profit educational establishments (e.g. schools) approved by the State but run by other groups (e.g. religious or non-governmental organizations)

### 2.3.1 Fixed-telephone subscriptions

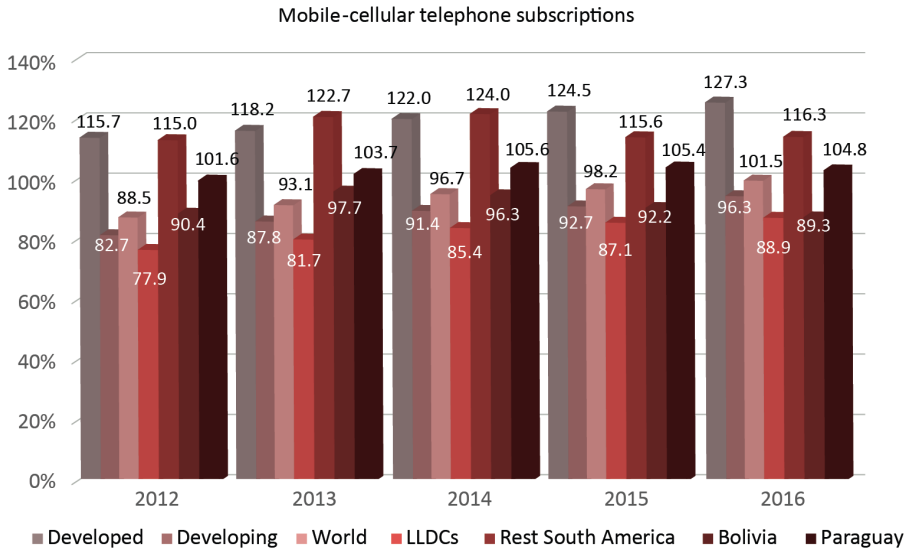
Figure 7. Benchmarking fixed-telephone subscriptions (ITU, 2016a) (ITU, 2017a)




**Fixed-telephone subscriptions**: There is a very large difference between the developed countries and the other countries, especially the LLDCs, including Bolivia and Paraguay. Fixed-telephone penetration in Bolivia (7.7 per cent in 2016) is somewhat higher than in Paraguay (5.2 per cent in 2016), without much evolution in recent years, and both are quite a way below the average for the rest of the countries of the region (19.4 per cent in 2016), which has remained stable in recent years.

### 2.3.2 Mobile-telephone subscriptions

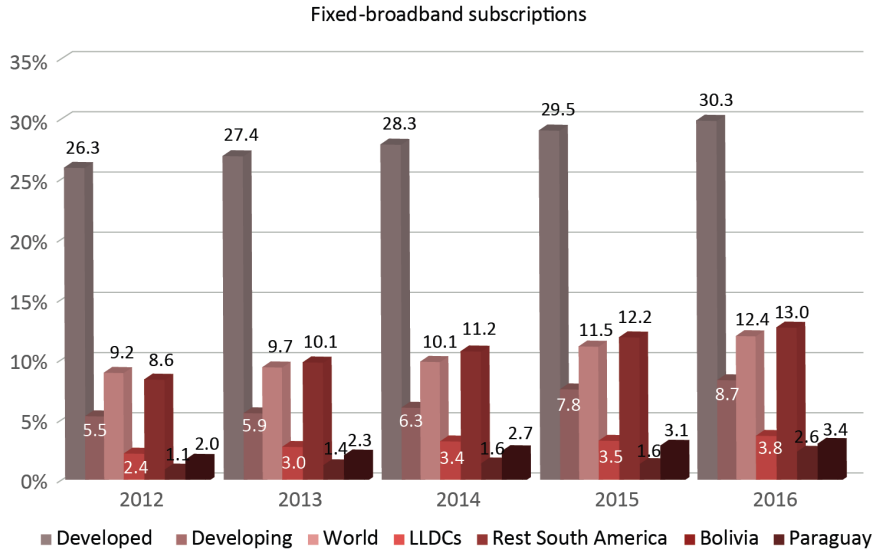
Figure 8. Benchmarking mobile-cellular-telephone subscriptions (ITU, 2016a) (ITU, 2017a)




**Mobile-telephone subscriptions**: The availability of mobile networks has increased considerably in recent years, leading to relatively high penetration levels. The penetration rates in the mobile networks in Bolivia (89.3 per cent in 2016) and Paraguay (104.8 per cent in 2016) are not very different from the averages for the developed countries (127.3 per cent in 2016) and other South American countries (116.3 per cent in 2016), and slightly higher than the LLDC's average (88.9 per cent in 2016).

### 2.3.3 Fixed-broadband subscriptions

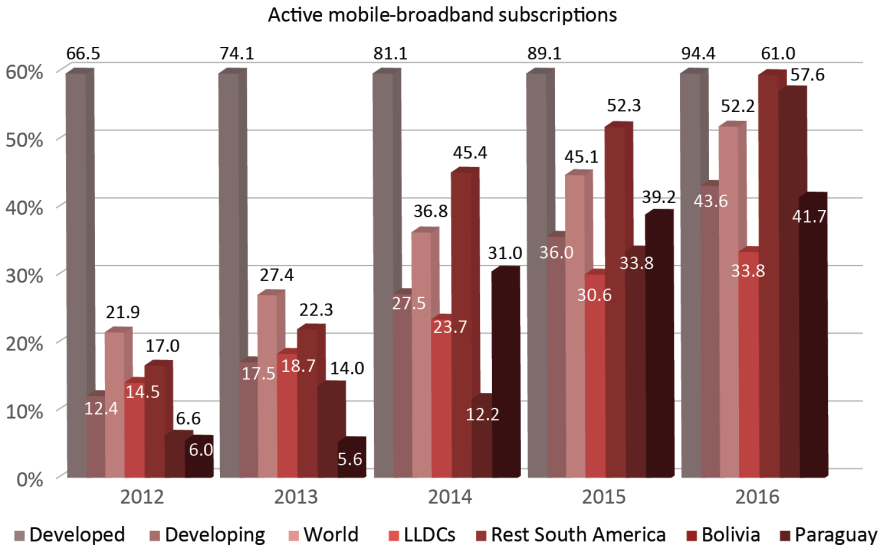
Figure 9. Benchmarking fixed-broadband subscriptions (ITU, 2016a) (ITU, 2017a)




**Fixed-broadband subscriptions**: Consistent with the trend in the deployment of fixed networks, subscription rates to fixed-broadband services are very low in Bolivia (2.6 per cent in 2016) and Paraguay (3.1 per cent in 2016). The developed countries lead the way, with an average penetration rate above 30 per cent in 2016. Moreover, the difference with the rest of South American countries (13.0 per cent in 2016) is very significant.

### 2.3.4 Active mobile-broadband subscriptions

Figure 10. Benchmarking active mobile-broadband subscriptions (ITU, 2016a)

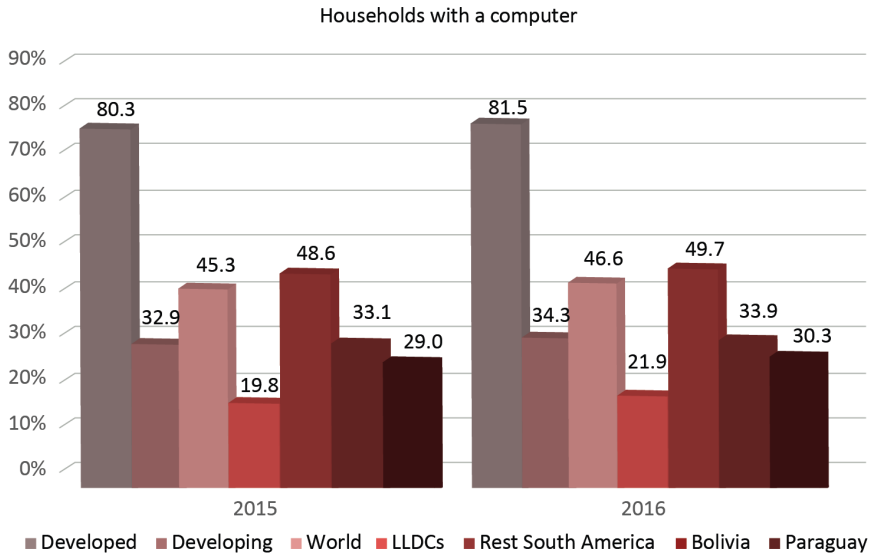



**Mobile-broadband subscriptions**: The last three years have witnessed a sizeable increase in the penetration of mobile-broadband services, both in the developing countries as a whole (43.6 per cent in 2016) and in the LLDCs (33.8 per cent in 2016), including Bolivia (57.6 per cent in 2016) and Paraguay (41.7 per cent in 2016), thus reducing the gap in relation to the developed countries (94.4

per cent in 2016). Mobile-broadband penetration in the two American LLDCs is slightly lower than in the rest of the South American countries (61.0 per cent in 2016), but is growing faster.

### 2.3.5 Households with a computer

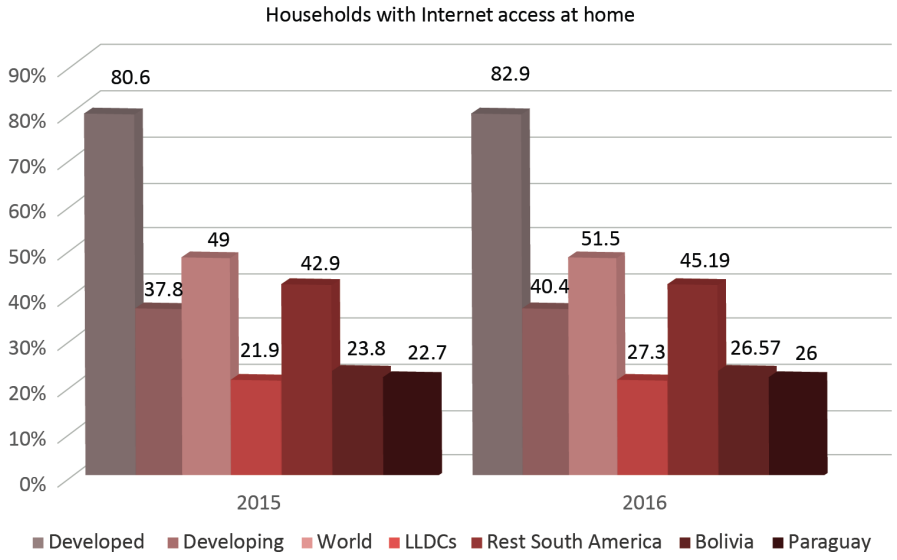
Figure 11. Benchmarking households with a computer (ITU, 2016a)




**Households with a computer**: The availability and use of computers in homes gives us a clear idea of how the use of new technologies in the residential environment is evolving, and of progress in digital training in the countries concerned. The penetration rates in Bolivia (33.9 per cent in 2016) and Paraguay (30.3 per cent in 2016) are similar, and not too far off the other South American countries (49.7 per cent in 2016).

### 2.3.6 Households with Internet access

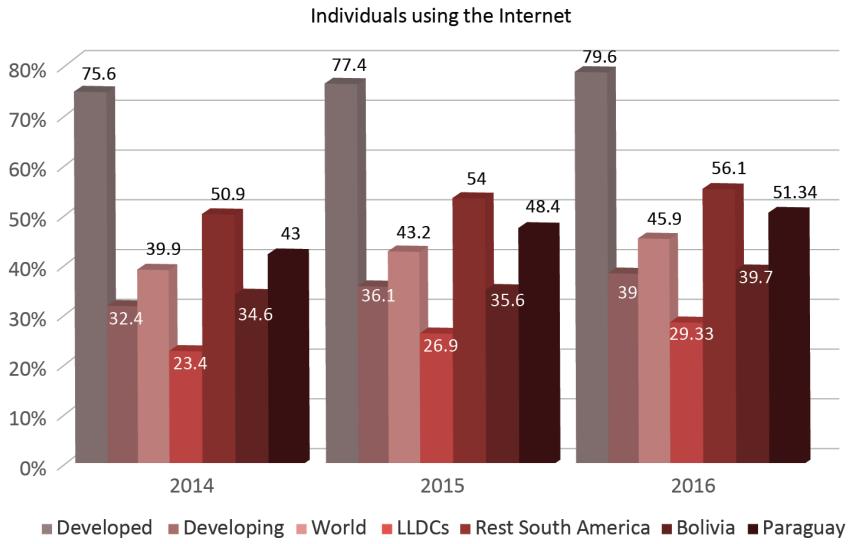
Figure 12. Benchmarking households with Internet access (ITU, 2016a)



**Households with Internet access**: Ideally, the figures for Internet access from home should not be very different from those for the penetration of computers in households. The desired evolution would be for the two indicators to converge to very similar levels in the coming years. The difference in Bolivia is 7.3 per cent in 2016, while in Paraguay it is 4.3 per cent in 2016, much the same as in the South American countries (4.5 per cent in 2016).

### 2.3.7 Individuals using the Internet

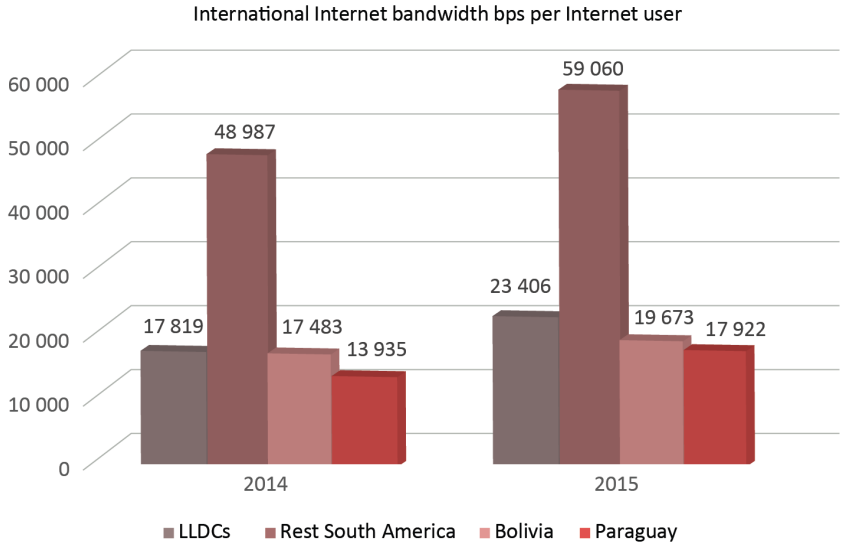
Figure 13. Benchmarking Individuals using the Internet (ITU, 2016a) (ITU, 2017a)




**Internet use**: Internet access by the population stands at a very positive level in the two South American LLDCs (Bolivia 39.7 per cent and Paraguay 51.3 per cent in 2016), and the gap with respect to surrounding countries (South America: 56.1 per cent in 2016) is closing, especially in the case of Paraguay.

### 2.3.8 International Internet bandwidth per Internet User

Figure 14. Benchmarking Internet bandwidth (bits/s) per Internet user (ITU, 2016a)



**International Internet bandwidth per Internet user**: International Internet bandwidth per Internet user is an essential parameter to properly appreciate the difficulties faced by LLDCs in expanding the use of new technologies, since most Internet content comes from outside their countries and, as they do not have direct access to international submarine cables, the cost of Internet access is higher. It is not only the cost of peering, but also the cost of transport to reach the submarine cables and the IXPs, that has to be considered. The current situation in Bolivia and Paraguay is challenging: in 2015, international bandwidth was between 20 per cent and 30 per cent lower than the LLDC's average, and well below that of the other South American countries.

## 2.4 ICT development and ICT prices and affordability

### 2.4.1 ICT Development Index

The study of connectivity indicators gives an accurate picture of the availability of different networks and ICT services in the country, but to better understand their capacity to access and use these services there is a need to take into account other indicators that are related to each country's GNI per capita, like the ICT development Index (IDI) and the ICT Price Basket (IPB).

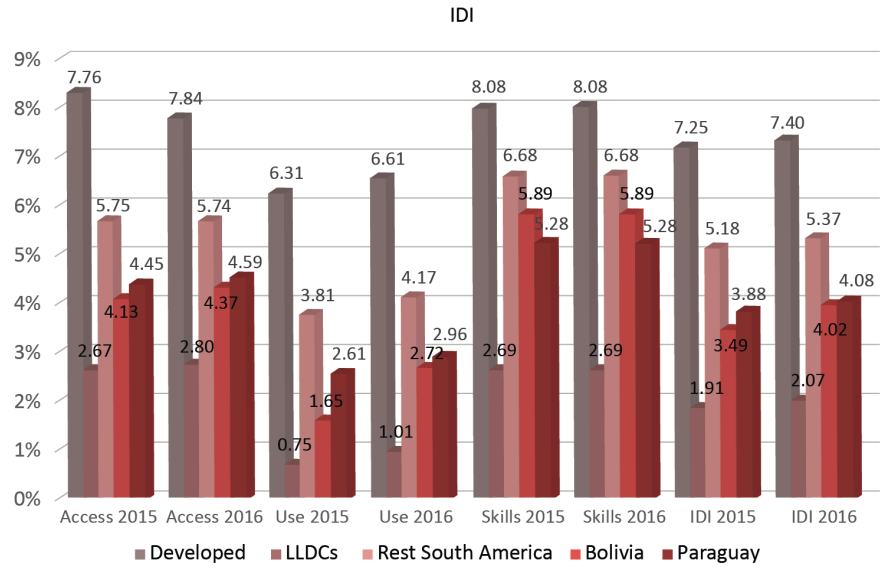
The ICT Development Index (ITU, 2016a) is a composite index combining several indicators into one benchmark measure that serves to monitor and compare developments in ICT across countries. The main objectives of the IDI are to measure:

- The level and evolution over time of ICT developments in countries and relative to other countries.
- Progress in ICT development in both developed and developing countries: the index should be global and reflect changes taking place in countries at different levels of ICT development.
- The digital divide, i.e. differences between countries with different levels of ICT development.
- The development potential of ICTs or the extent to which countries can make use of ICTs to enhance growth and development, based on available capabilities and skills.

The IDI aims to capture the evolution of the information society as it goes through its different stages of development, taking into consideration technology convergence and the emergence of new technologies. Based on this conceptual framework, the IDI is divided into the following three sub-indices:

- Access sub-index: This sub-index captures ICT readiness, and includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, percentage of households with a computer, and percentage of households with Internet access).
- Use sub-index: This sub-index captures ICT intensity, and includes three ICT intensity and usage indicators (percentage of Internet users, fixed-broadband subscriptions, and active mobile-broadband subscriptions).
- Skills sub-index: This sub-index captures ICT capability or skills as indispensable input indicators. It includes three proxy indicators (adult literacy, gross secondary enrolment and gross tertiary enrolment), and is therefore given less weight in the computation of the IDI than the other two sub-indices.

Figure 15. Benchmarking IDI (ITU, 2016a)

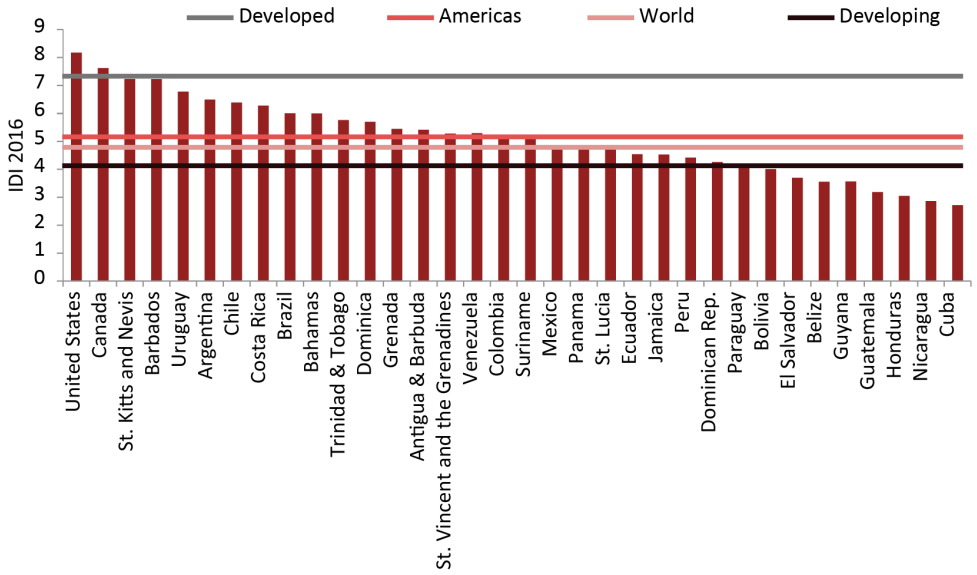



The IDI in 2016, compared to 2015, shows similar trends in all cases, the skills sub-index being the highest, followed by the access and the use sub-indexes. Looking in detail at the LLDCs, the highest values are found in the European LLDCs; Asia-Pacific and Latin American LLDC values are similar; and African LLDCs lag behind, Africa being the region with lowest values in all sub-indexes.

In both Bolivia and Paraguay, the IDI has increased between 2015 and 2016 (+15.2 per cent in Bolivia and +5.2 per cent in Paraguay), owing to the increase in the use sub-index (+64.8 per cent in Bolivia and +13.4 per cent in Paraguay), since the access sub-index has grown little (+5.8 per cent in Bolivia and +3.1 per cent in Paraguay) and the skills sub-index has remained stable (no change in both countries). The difference in relation to the average of the rest of the South American countries has narrowed in the case 0f Bolivia and remains stable for Paraguay.

Also interesting is the information provided in the chart in Figure 16, which details the IDI values of all the countries of the Americas region and plots them against the average IDIs of the developed countries, the developing countries and the Americas region as a whole, as well as the world average.

Figure 16. Benchmarking the Americas region IDI (ITU, 2016a)



The IDI values for Paraguay and Bolivia are similar, and very close to the developing-country average.

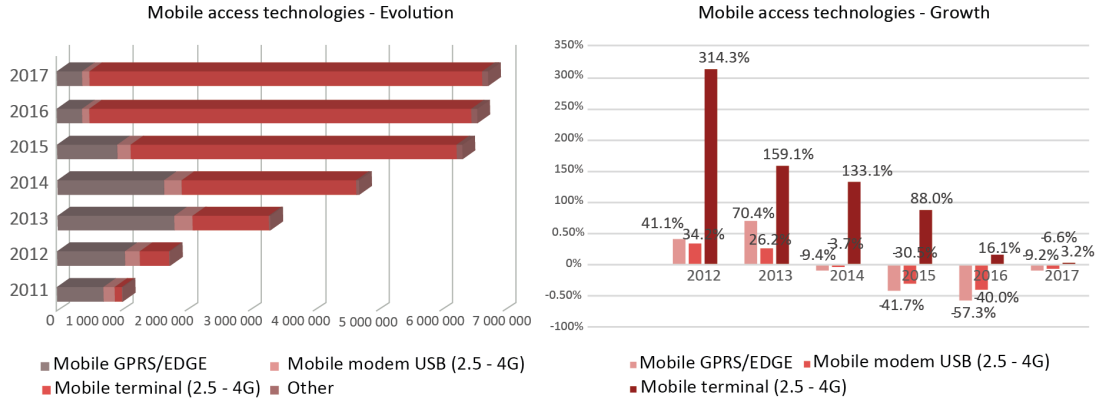
### 2.4.2 Prices

A key factor in determining the extent to which a country's population is able to use telecommunication services is the cost of the services in relation to people's purchasing power. The ITU publishes annually (ITU, 2016a) the cost of fixed- and mobile-broadband services as a percentage of countries' average GNI per capita.

This enables the price and affordability of ICT services in every country to be assessed and benchmarked against the corresponding figures in other countries. It is very difficult to compare similar prices owing to the variety of offers and bundles available in all countries.

While it is true that a significant decrease is observed in the cost of access to broadband networks, and it appears that this trend will continue for the next few years, major efforts are needed, since ICT Price Basket (IPB) values in most LLDCs are significantly higher than in developed countries.

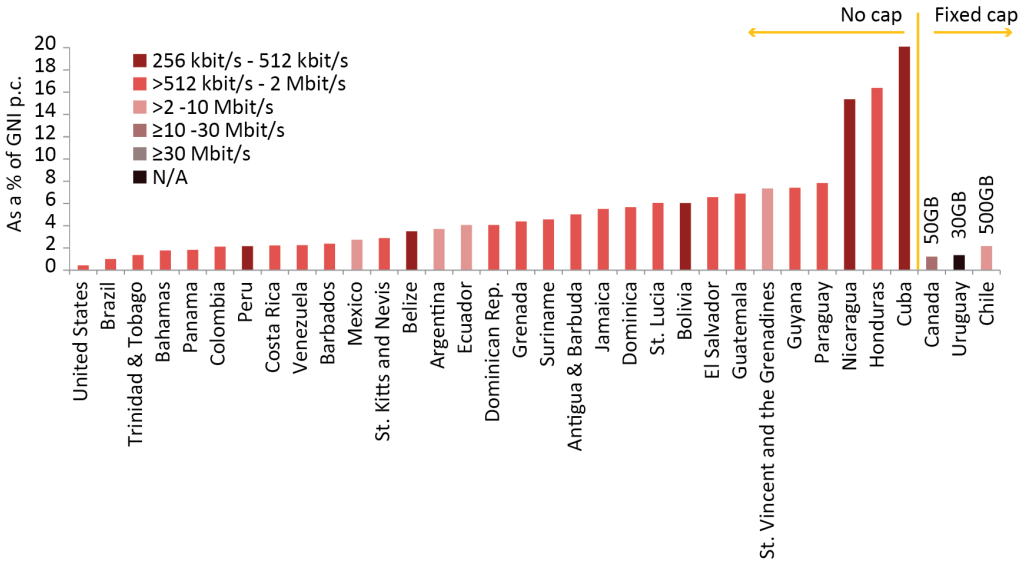
Figure 17. Benchmarking broadband prices (ITU, 2016a) (ITU, 2017a)




For fixed broadband, the 2016 price indicators for Bolivia and Paraguay suggest that prices remain relatively high, compared with the other South American countries. Whereas the trend between 2014 and 2016 has been positive in Bolivia, fixed-broadband affordability in Paraguay actually worsened in 2016 compared to 2014. For mobile broadband, on the other hand, the indicators have followed a positive trend in both countries, and lie very close to the average for the rest of the South American countries in 2016.

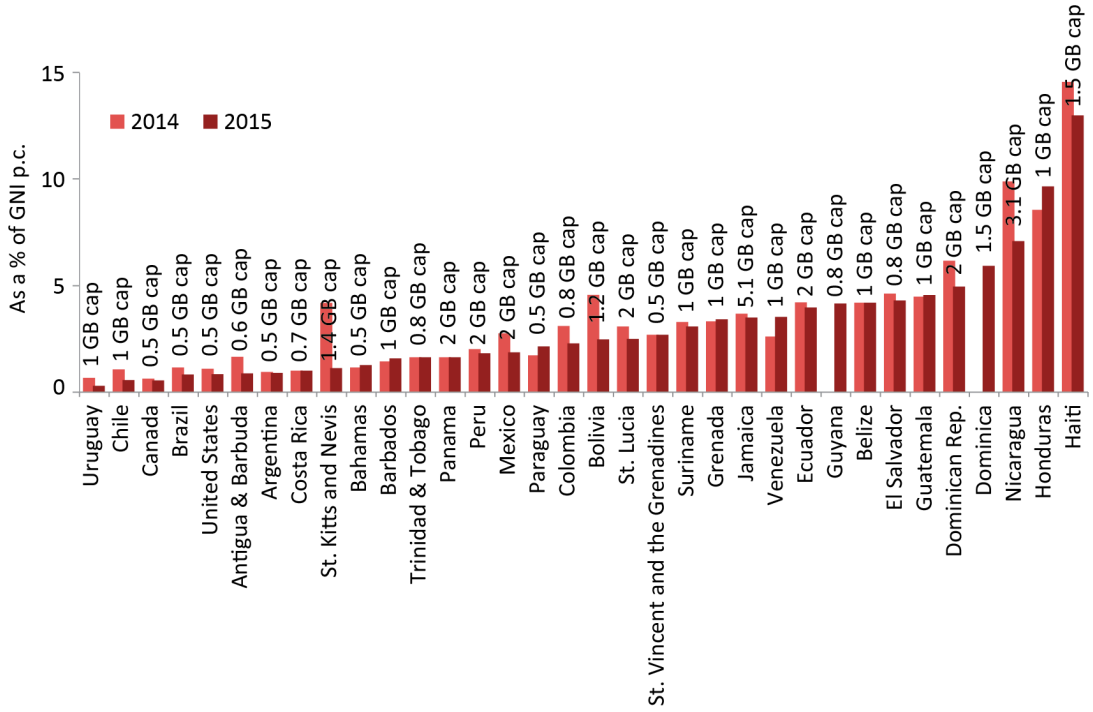
The chart in Figure 18 compares fixed-broadband prices in the countries of the Americas region, together with information about average connection speed. It can be seen that in Paraguay the average speed is higher than in Bolivia, but the cost when related to GNI per capita is also higher.

Figure 18. Fixed-broadband prices as a percentage of GNI p.c., speeds and caps, Americas, 2015 (ITU, 2016a)




For mobile-broadband prices (Figure 19), Bolivia's and Paraguay's positions in relation to the rest of the countries of the Americas region improve substantially in comparison with fixed broadband. It is worth mentioning the very significant improvement made by Bolivia between 2014 and 2015, reducing its gap with Paraguay.

Figure 19. Prepaid handset-based mobile-broadband prices (500 MB per month) as a percentage of GNI p.c. and data volume (cap) included, in the Americas, 2015 and 2014 (ITU, 2016a)



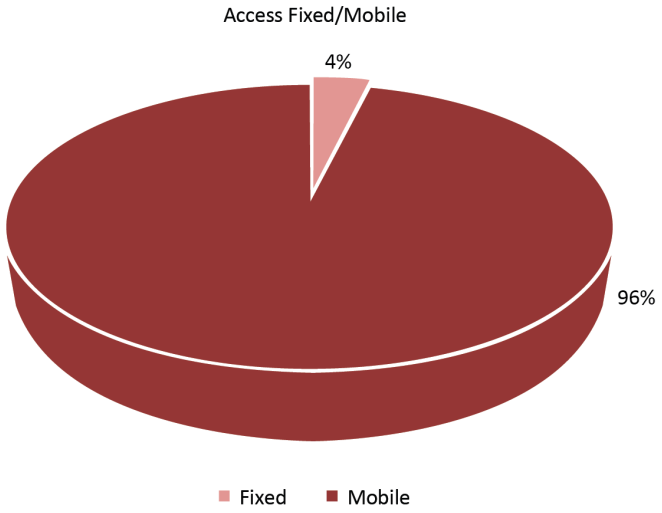
## 2.5 Bolivia - relevant indicators

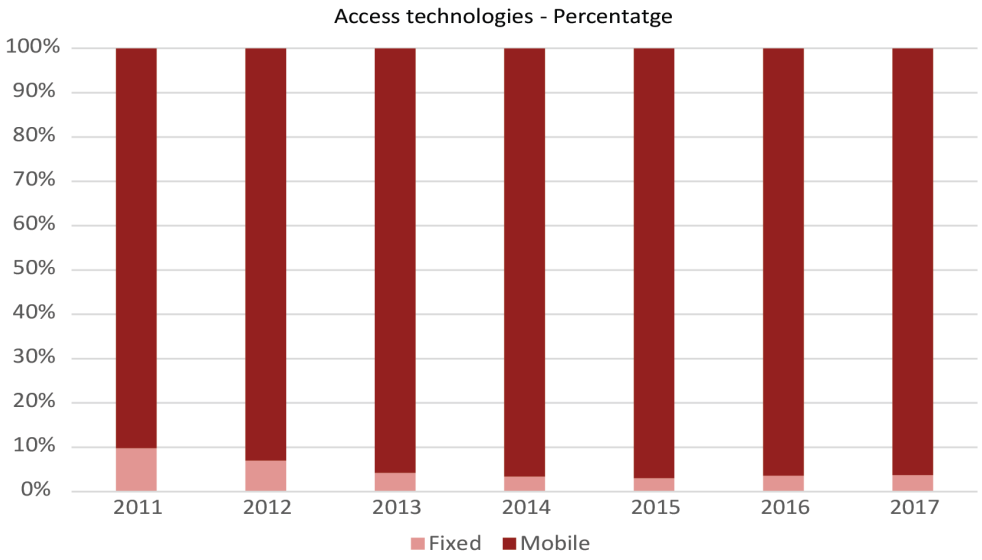
Having compared the status and evolution of the main ICT indicators, let us take a more detailed look at the situation in Bolivia, focusing on broadband and Internet access and use.

### 2.5.1 Access technologies

In recent years, there has been a considerable improvement in access to telecommunication services in Bolivia. Although access has increased in both fixed and mobile, the higher growth in mobile phones has meant that the proportion of fixed has been decreasing. At present, we see that 96 per cent of penetration in Bolivia is mobile.

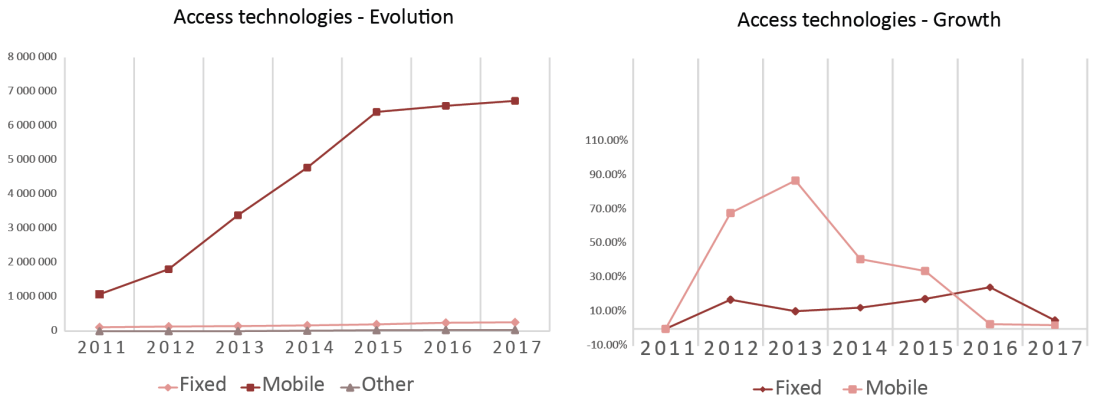
Figure 20. Bolivia: Access technologies – Fixed/mobile (Viceministerio de Telecomunicaciones, 2017b)




As Figure 21 shows, the boom in the growth of mobile occurred during the period 2011 to 2015. Today, penetration is high, at about 100 per cent, and not too far from the average penetration in the rest of the South American countries.

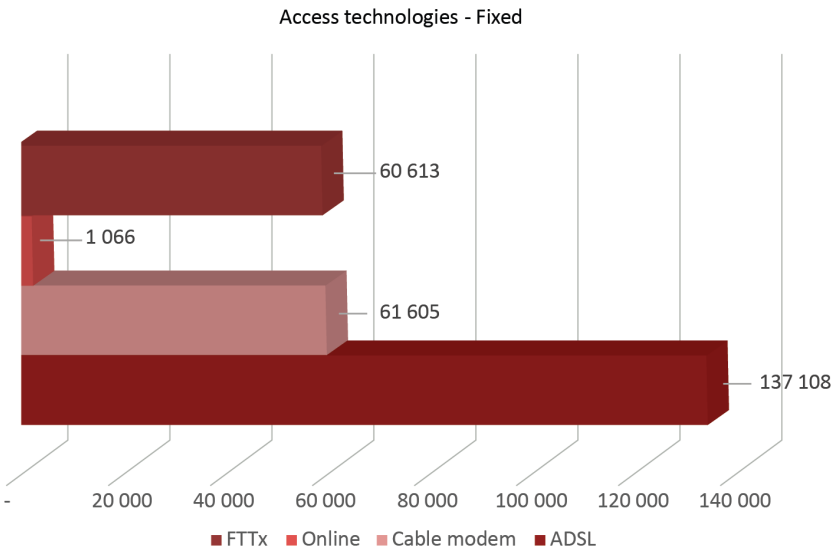
Figure 21. Bolivia: Access technologies (fixed/mobile) – Evolution and growth (Viceministerio de Telecomunicaciones, 2017b)




### 2.5.1.1 Fixed access technologies

The dominant broadband technology in the fixed network continues to be ADSL, accounting for just over 50 per cent of the total, although there has been a significant growth in FTTH, which is at practically the same level as cable modems.

Figure 22. Bolivia: Access technologies - Fixed (Viceministerio de Telecomunicaciones, 2017b)

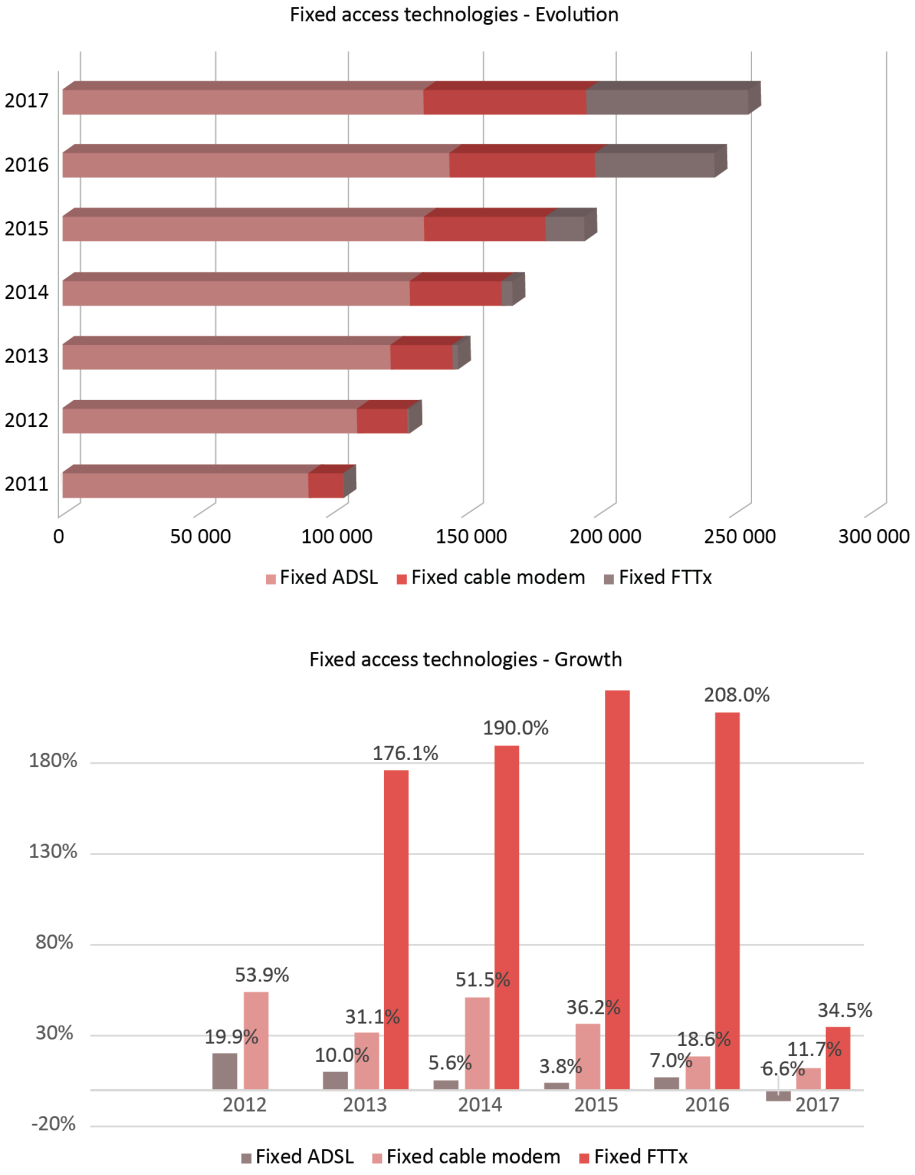



The technology showing sustained high growth is FTTH, which is expected to continue at the same rate during 2017. Cable technology displays a more moderate growth, while the number of ADSL connections is decreasing.

Entel[12] plans to considerably increase the availability of FTTH connections, offering higher bandwidth to its customers and, at the same time, boosting the backhaul of its 4G network.

12 Entel, *http://www.entel.bo*

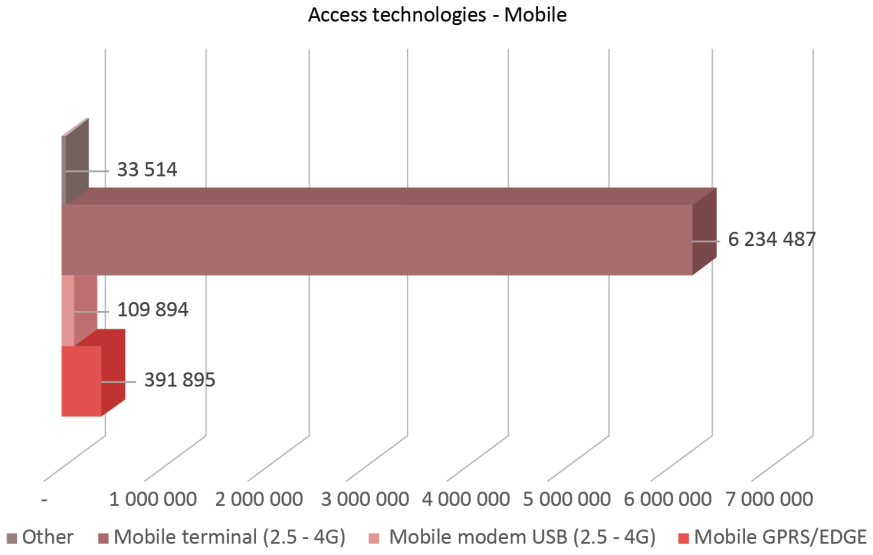
Figure 23. Bolivia: Access technologies: Fixed – Evolution and growth (Viceministerio de Telecomunicaciones, 2017b)




## Mobile access technologies

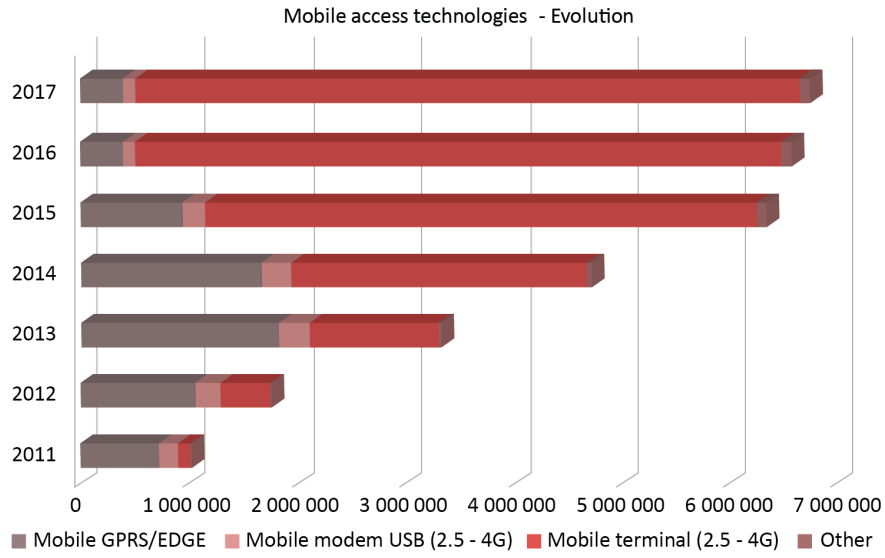
The clearly dominant mobile access technology is 2.5 to 4G terminals, although growth slowed in 2016, a trend that seems set to continue in 2017.

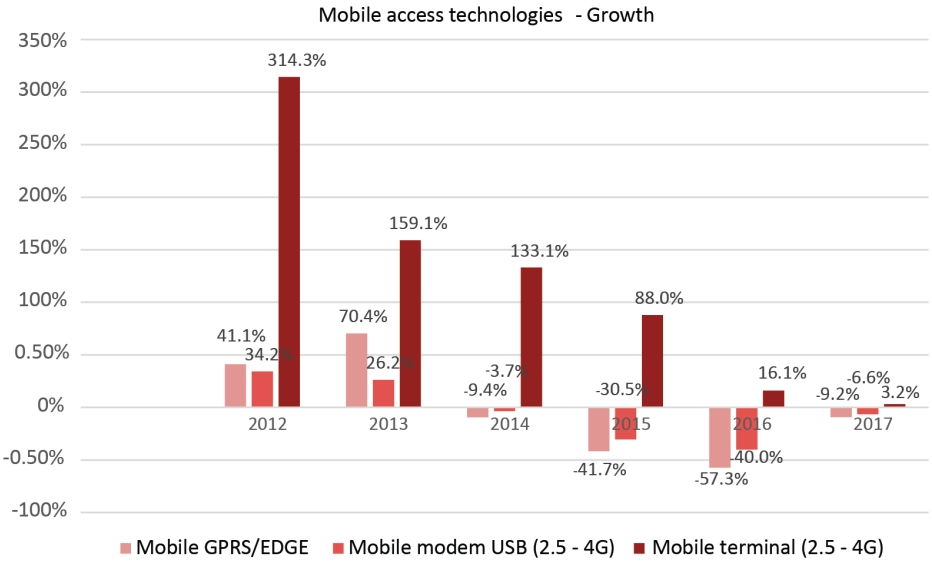
Figure 24. Bolivia: Access technologies - Mobile (Viceministerio de Telecomunicaciones, 2017b)




The charts in Figure 25 reveal replacement of the older GSM/GPRS terminals by 2.5- 4G terminals, a fact that undoubtedly signals an increase in the use of Internet access by mobile.

Figure 25. Bolivia: Access technologies: Mobile – Evolution and growth (Viceministerio de Telecomunicaciones, 2017b)






## 2.5.2 Mobile Internet access

Prepaid contracts being the most common for mobile, it is not surprising that the majority of Internet access in the mobile network is by prepaid customers, although the average access speed for postpaid customers is higher than for prepaid.

Figure 26. Bolivia: Mobile Internet access (Viceministerio de Telecomunicaciones, 2017b)

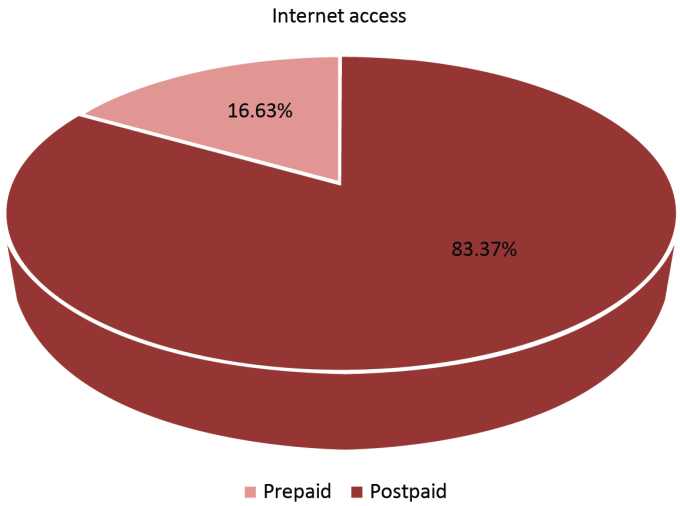
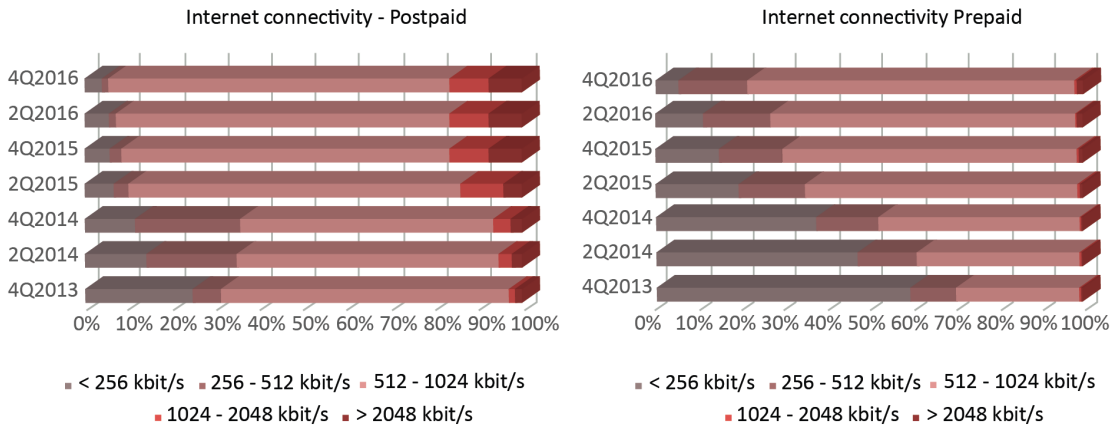


Figure 27. Bolivia: Mobile Internet connectivity - prepaid/postpaid (Viceministerio de Telecomunicaciones, 2017b)



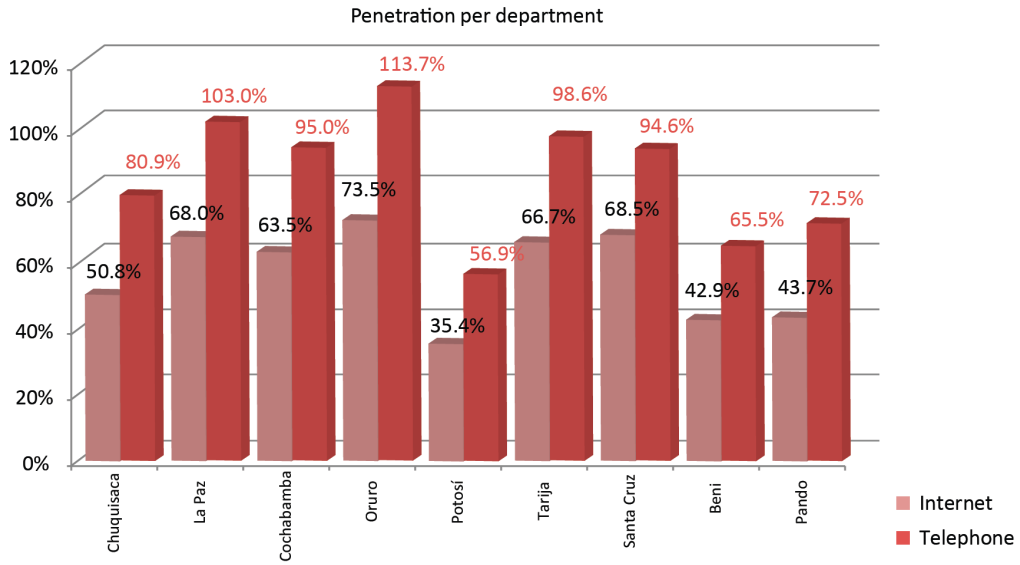

In the charts in Figure 27, we observe that the prevalent Internet access speed, for both prepaid and postpaid users, is between 512 and 1 024 kbit/s. However, different trends are discernable: for prepaid customers there was a significant increase in the average access speed between 2013 and 2016, but hardly any connections at higher speeds; whereas for postpaid, in the same period, the average speed used most frequently did not vary much, but there was a sustained increase in access at higher speeds.

### 2.5.3 Connections by department

It is very important to analyse connectivity in each department, in order to understand the national digital divide and to design specific actions for each department with a view to correcting the imbalances in the near future and facilitating the use of ICTs nationwide.

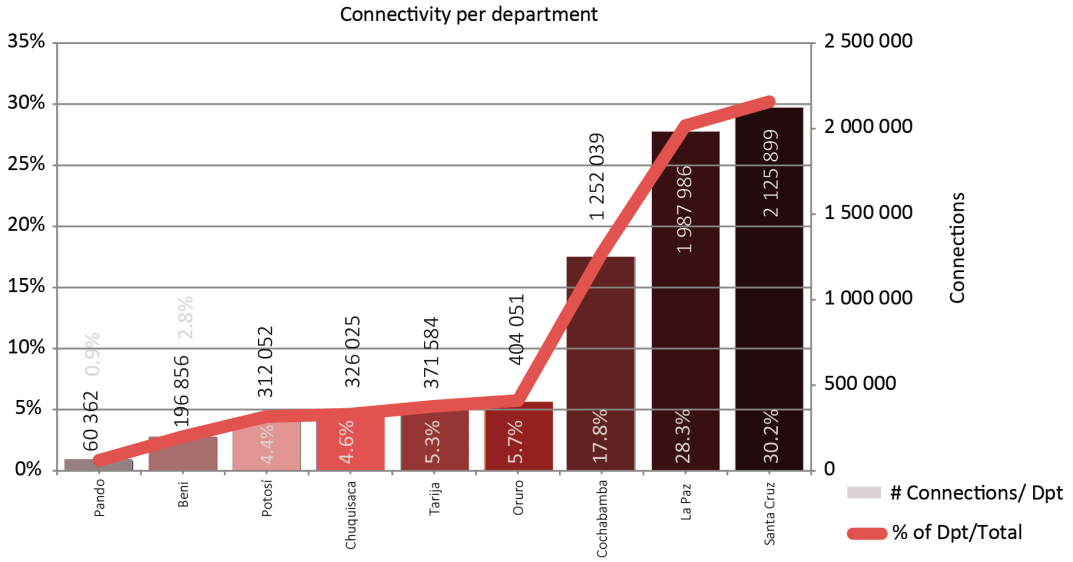
Figure 28 shows the telephone and Internet connectivity in the nine departments of Bolivia. Oruro leads the way in both telephony and Internet, with penetration rates of 113.7 per cent and 73.5 per cent, respectively, approximately twice that of Potosí, which is the one with the lowest penetrations.

Figure 28. Bolivia: Internet and telephone penetration by department (Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte, 2017)



The most populous departments where most of the country's economy is concentrated are Santa Cruz, La Paz and Cochabamba, which boast more connections and a greater concentration of operators and telecommunication networks. Taken together, these three departments account for 76.3 per cent of the country's total connections.

Figure 29. Bolivia: Connectivity by department (Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte, 2017)



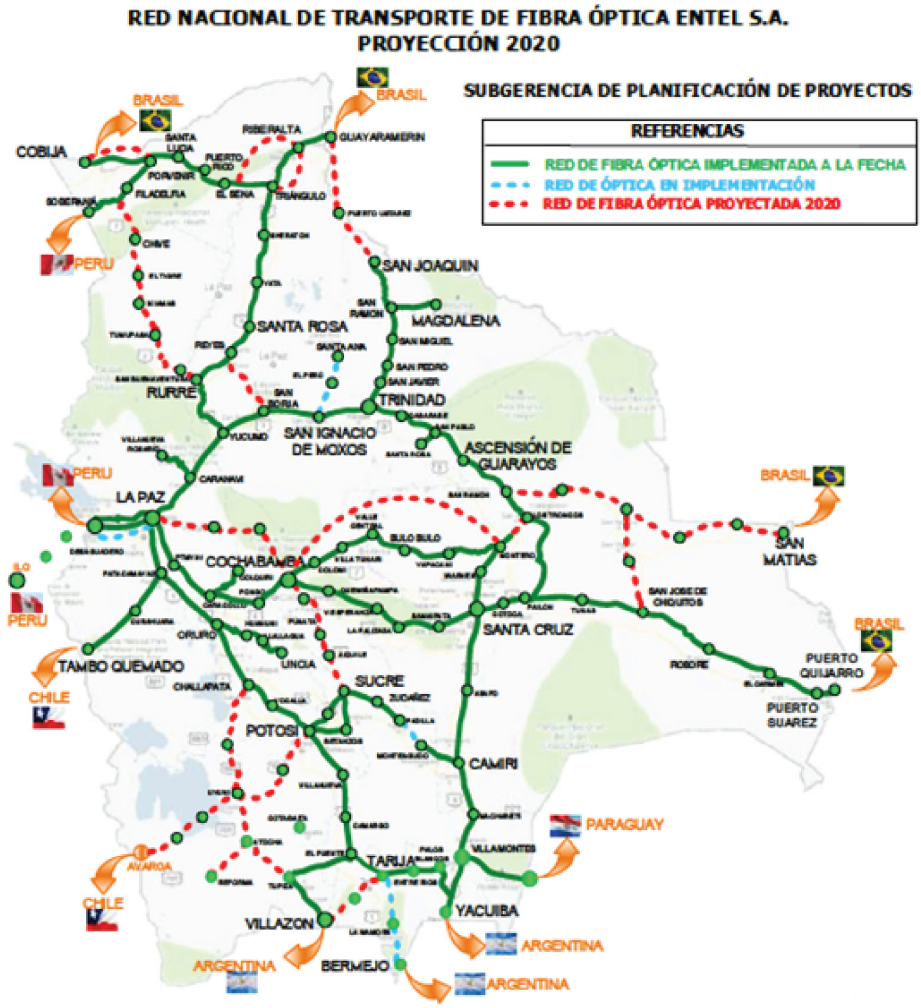

## 2.5.4 National backbone

A major effort has been made in the deployment of the backbone network, carried out by Entel, with an important presence in all departments and aggressive plans to improve connectivity in rural areas by 2020, with the help of PRONTIS.

In addition, other operators such as Tigo, Nuevatel and AXS are concentrated in the departments of La Paz, Cochabamba and Santa Cruz.

Figure 30 shows the topology of the Entel network, with high capillarity and international connections with borders of all surrounding countries:

Figure 30. Bolivia: Entel national fibre-optic network (Viceministerio de Telecomunicaciones, 2017b)




Another very important aspect is the capacity of the installed network as against current use, which provides an indication of the potential for rapid growth. Table 2 summarizes the percentage of bandwidth used in first half of 2016:

Table 2. Bolivia: Installed and used bandwidth (Viceministerio de Telecomunicaciones, 2017b)

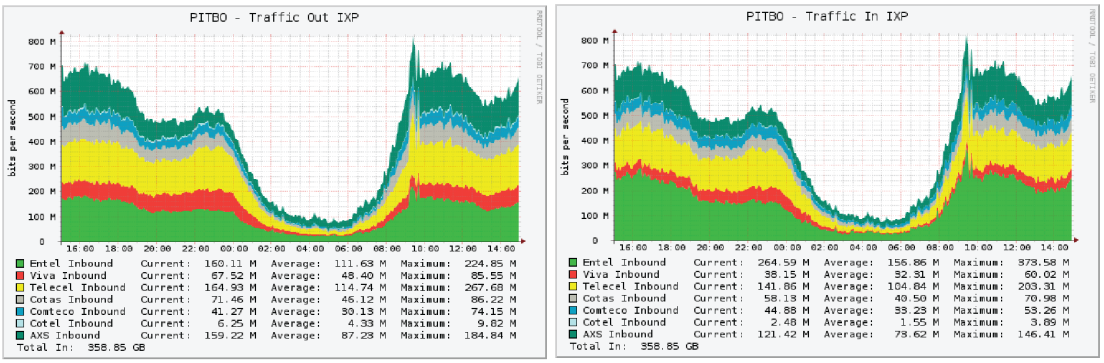
| | Jan-16 | Feb-16 | Mar-16 | Apr-16 | May-16 | Jun-16 |
|---|---|---|---|---|---|---|
| Bandwidth used (Gbit/s) | 20 005.90 | 22 230.90 | 19 069.10 | 18 565.20 | 19 280.90 | 20 934.10 |
| Bandwidth total (Gbit/s) | 34 418.00 | 34 418.00 | 34 418.00 | 34 418.00 | 44 018.00 | 63 218.00 |
| **Percentage** | **58.13%** | **64.59%** | **55.40%** | **53.94%** | **43.80%** | **33.11%** |

The table shows that there is considerable room for growth, especially considering the physical capacity (optical fibre) available within the network.

### 2.5.5 Internet exchange point

In the Bolivian IXP, there are six providers that exchange IP traffic. Figure 31 depicts outbound and inbound traffic carried through the IXP, based on information as at 3 March, 2017, and refers to the traffic of each operator connected to the Traffic Exchange Point (PIT).

Figure 31. Bolivia: Internet exchange traffic out/in (Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte, 2017)




Since the start of operation of the Bolivian PIT, download traffic has grown to over 800 Mbit/s; upstream traffic has likewise been increasing, up to 800 Mbit/s. Thus, traffic in the PIT increased by more than 100 per cent, with more than 720 GB in both directions. It is observed that some ISPs have larger networks distributing national content, while others focus more on consumption than generation of content. This traffic is originated and terminated in the country without the use of international links, which would produce a saving of USD 50 000 per month. Mobile operators account for 56.7 per cent of the PIT's traffic, and fixed operators the remainder.

Currently, Bolivia's mobile market environment is focused on the growth of mobile Internet and changing behaviour towards access and digital interaction. It may be estimated that, by end 2016, some 39.7 per cent of the Bolivian population will be using the Internet. A significant barrier to mobile Internet access for the unconnected is the lack of relevance of the Internet, especially the dearth of local content. The irony of this situation is that, in general, it is the same content that drives the growth in use of the Internet among the current mobile users. It is thus an ongoing task for Bolivian society to increase the volume of local content, which currently only represents less than 1 per cent of total Internet traffic.

### 2.5.6 International connectivity

Internet service operators in Bolivia connect with all neighbouring countries, including Paraguay, bearing in mind that Entel has recently already interconnected its fibre-optic infrastructure to Punto Sucre, on the border with Paraguay, with Copaco Paraguay[13].

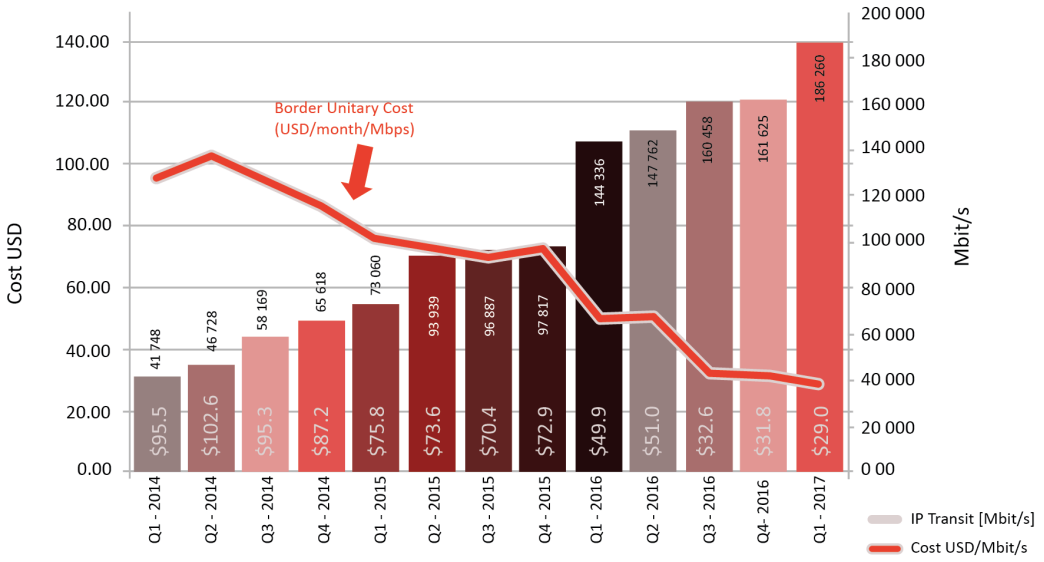
In addition to Entel, there are other operators with international connectivity, such as:

- **AXS Bolivia**[14] has agreements for international traffic with operators in Argentina, Chile and Peru.
- **Telefónica Celular de Bolivia S.A**[15] has international connectivity agreements with operators in Argentina, Brazil, Chile and Peru.

13 COPACO, http://www.copaco.com.py
14 AXS Bolivia, http://www.axsbolivia.com/
15 Telefónica Celular de Bolivia S.A, http://www.tigo.com.bo

- **Nuevatel PCS de Bolivia**[16]has international interconnections with operators in Argentina and Peru.

Figure 32. Bolivia: International IP traffic (Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte, 2017)




In Figure 32, it can be seen that the cost of border traffic is following a decreasing trend, down to USD 29 per Mbit/s in the first quarter of 2017, which is about one-third of the cost in 2014 (around USD 100/month/Mbit/s). The volume of international traffic has increased significantly, from 41 748 Mbit/s in early 2014 to 186 260 Mbit/s in the first quarter of 2017. Considering that most Internet traffic is international, measures should be sought that will help bring down this cost further.

Prices for international capacity vary widely by region owing to differences in available supply, levels of competition and cost of the underlying infrastructure. On large-volume submarine cable routes, wholesale capacity is usually priced in 10 Gbit/s wavelengths, and prices can vary considerably depending on the route. For example, on some of the most competitive inter-regional or intercontinental routes such as Hong Kong, China to Tokyo, Japan, a 10 Gbit/s wavelength costs an average of about USD 15 000 a month in 2013; while 10 Gbit/s from New York, United States to London, United Kingdom cost USD 7 000 a month. Prices on the same route also vary significantly. For example, the cost of a 10 Gbit/s circuit between Los Angeles and Tokyo varies between USD 16 000 a month and USD 33 000 a month, depending on the submarine cable operator. The cost of international capacity is often up to ten times higher on less competitive, longer distance and lower volume routes, especially those linking smaller economies. Although there have not been any new cables on the Latin America to United States route recently, cable upgrades have driven prices down substantially, so that Miami, United States to Sao Paulo, Brazil now costs about USD 100 000 a month for 10 Gbit/s.

### 2.5.7 Telecentres

Bolivia recognizes the importance of telecentres for the promotion and use of ICTs in the most isolated regions and for deprived localities and people, and has an aggressive plan to install and promote them.

Table 3 summarizes the number of telecentres of different types in each department.

[16] Nuevatel PCS de Bolivia, http://www.viva.com.bo/

Table 3. Bolivia: Telecentres (Viceministerio de Telecomunicaciones, 2017b)

| | Community telecentres 1 | Community telecentres 2 | Military telecentres | Satellite telecentres Phase 1 | Satellite telecentres Phase 2 | TOTAL |
|---|---|---|---|---|---|---|
| Beni | 17 | 11 | 8 | 66 | 35 | **137** |
| Chuquisaca | 73 | 4 | 16 | 116 | 102 | **311** |
| Cochabamba | 129 | 2 | 28 | 107 | 239 | **505** |
| La Paz | 104 | 9 | 63 | 246 | 531 | **953** |
| Oruro | 57 | 7 | 20 | 34 | 49 | **167** |
| Pando | 8 | 4 | 8 | 17 | 26 | **63** |
| Potosí | 48 | 5 | 26 | 232 | 252 | **563** |
| Santa Cruz | 131 | 21 | 26 | 133 | 200 | **511** |
| Tarija | 33 | 10 | 5 | 53 | 69 | **170** |
| Mobile | | | 20 | | | **20** |
| **TOTAL** | **600** | **73** | **220** | **1 004** | **1 503** | **3 400** |

# 3 Use of ICTs in Bolivia

The Bolivian authorities attach great importance to the availability of broadband infrastructures that will help improve and develop all the country's other important sectors nationwide. This is demonstrated by the legislation in force, which identifies universal broadband services as a right to be enjoyed by all the country's inhabitants, stimulates the creation of specialized agencies to develop defined plans, and provides for the necessary economic contributions to make such plans a reality.

This section of the report will detail the role of key players in the ICT sector and the special projects that have been formulated and their expected impact, as well as the current initiatives undertaken through international cooperation and partnerships, along with the remaining challenges Bolivia faces.

## 3.1 Main ICT players

In regard to institutional aspects, the **Ministry of Public Works, Services and Housing**, through the **Vice-Ministry of Telecommunications,** is the entity in charge of establishing public policies, plans and programmes that guarantee the use of telecommunications/ICTs, the corresponding use of the radio-frequency spectrum, for improving the quality of life of citizens. The ministry, through the PRONTIS Project Implementation Unit (UEPP), is responsible for execution of the National Telecommunication Programme for Social Inclusion (PRONTIS) (Viceministerio de Telecomunicaciones, 2011), which includes the financing of telecommunication/ICT programmes and projects.

Under the oversight of the Ministry of Public Works, Services and Housing, the **Telecommunication and Transport Regulatory and Control Authority (ATT)** is the body responsible for authorizing, regulating and supervising fixed- and mobile-telephony services and all telecommunication/ICT networks and services.

The **Agency for the Development of the Information Society in Bolivia (ADSIB)**, set up by Decree No. 26553 of 2002, under the oversight of the Vice-Presidency of the Republic or the Presidency of the National Congress, as applicable, is responsible for proposing policies, implementing strategies and coordinating actions aimed at reducing the digital divide in the country, through the promotion of ICTs in all areas.

The **Plurinational Committee for Information and Communication Technologies (COPLUTIC)** (Comité Plurinacional de Tecnologías de Información y Comunicación, 2011) was created for the purpose of proposing policies and development plans for the ICT sector and coordinating projects and lines of action among all the actors involved, as well as defining the mechanisms for their implementation and monitoring of the results. It comprises representatives from of the Ministry of Public Works, Services and Housing, the Ministry of Communications, the Ministry of Education, the Ministry of Development Planning and the ADSIB.

The **PRONTIS Project Implementation Unit (UEPP)**, under the Ministry of Public Works, Services and Housing, through the Vice-Ministry of Telecommunications, implements projects on universal access to ICTs and telecommunication services for all Bolivians, especially in rural and social areas, for their social and economic development.

The **Sectoral Council for Telecommunications and Information and Communication Technologies (COSTETIC)** (Consejo Sectorial de Telecomunicaciones y Tecnologías de Información y Comunicación, 2011) is an advisory body for the coordination of sectoral issues, between the central level of the State and the autonomous governments.

Decree No. 2514 of 2015 (Gobierno de Bolivia, 2015) establishes the **Agency for Electronic Government and Information and Communication Technologies (AGETIC)**[17] The agency's main purpose is to elaborate, propose and implement e-government and ICT policies, plans and strategies for entities of the public sector.

According to Decrees Nos. 29894 of 2009 (Gobierno de Bolivia, 2009b) and 429 of 2010 (Gobierno de Bolivia, 2010a), the **Vice-Ministry of Science and Technology**[18], as part of the Ministry of Education, is responsible for designing and proposing policies for science, scientific research, technology and innovation. It is mainly associated with the country's education system and other organisms at the central and territorial level.

Supreme Decree No. 0423 (Gobierno de Bolivia, 2010b) was enacted on 10 February, 2010, creating the **Bolivian Space Agency (ABE)**[19], to which the following specific functions were assigned:

- Manage and execute implementation of the Túpac Katari communications satellite project
- Promote the development of new satellite and space projects
- Promote technology transfer and training of human resources in space technology
- Promote the implementation of satellite applications for use in social, productive, defence, environmental and other programmes.

[17] *Agencia de Gobierno Electrónico y Tecnologías de Información y Comunicación,* http://www.agetic.gob.bo/
[18] *Viceministerio de Ciencias y Tecnología*, http://www.minedu.gob.bo/index.php/inicio-vcyt
[19] *Agencia Espacial Boliviana*, https://www.abe.bo/

**Telecom operators:**

There are many registered telecommunication operators, for specific services, offering services at national, departmental or local levels. The main ones are:

**Entel Bolivia** is the largest telecommunication operator in Bolivia, and is State-owned. It has an excellent fibre-optic backbone network, which reaches all the departments of the country and is the subject of important expansion plans. It offers mobile services (in which it holds a 43.04 per cent market share as at March 2017) and fixed services, both national and international. Entel Bolivia has an extensive national presence and offers its services to almost half the population of Bolivia. Recently, it has introduced the broadband technologies LTE in the mobile network and FTTH in the fixed network. Entel is currently deploying an FTTH access network in the capitals of the nine departments and in another 52 localities.

**Telefónica Celular de Bolivia S.A.**, known under the trade name Tigo Bolivia, is the subsidiary of the Millicom International Cellular group[20] in Bolivia. Tigo was launched in 2005, as part of the integration of the national brand Telecel Bolivia with international brands. It offers mobile-telephony services (35.52 per cent market share in March 2017) and Internet access. LTE technology is available in its network. Tigo has a large backbone network and is currently deploying an HFC network in selected areas.

**Nuevatel PCS de Bolivia** has been operating in Bolivia since 1999 under the brand Viva, as a subsidiary of Trilogy International Partners Inc.[21]. The Cooperativa de Telecomunicaciones Cochabamba (COMTECO)[22] is also a shareholder of the company. Nuevatel offers mobile telephony (18.85 per cent market share as at March 2017), public telephony, long-distance, mobile and wireless Internet services. LTE technology is available in its network. Viva has completed the installation of an international fibre-optic network that connects Bolivia to Peru, providing an alternative to routing traffic through Chile.

**AXS Bolivia** is a telecommunication company providing a range of services, including long-distance, local telephony, voice over IP (VoIP), Internet, data transmission, call centre, as well as rental circuits and carriers. One of the main products offered by AXS Bolivia is the backbone and access fibre-optic network, which covers the cities of La Paz, El Alto, Cochabamba, Santa Cruz and Oruro, and has two international outlets in Peru and Chile.

In Bolivia there are departmental telecommunication cooperatives, which offer telephony, data, Internet access and television services, the most important being:

- Cooperativa de Telecomunicaciones La Paz (COTEL)[23], in La Paz
- Cooperativa de teléfonos automáticos de Santa Cruz (COTAS)[24]
- Cooperativa de Telecomunicaciones Cochabamba (COMTECO)[25]

## 3.2 Special projects

### 3.2.1 Installation of radio base stations for communications

This project (UEPP, 2017) provides for the deployment of radio base stations with UMTS technology to offer mobile telephony and Internet access services to 8 882 localities that do not have any type

[20] Millicom International Cellular group, http://www.millicom.com
[21] Trilogy International Partners Inc., http://www.trilogy-international.com/
[22] COMTECO, http://www.cometco.com.bo
[23] COTEL, http://www.cotel.bo
[24] COTAS, http://www.cotas.com
[25] COMTECO, http://www.cometco.com.bo

of service. The connection to the networks of the telecommunication operators can be terrestrial or satellite.

The breakdown of localities by department is as follows:

Table 4. Bolivia: Planned UMTS stations by municipality/department (UEPP, 2017)

| | # | % localities |
|---|---|---|
| Beni | 423 | 16.88% |
| Chuquisaca | 865 | 34.45% |
| Cochabamba | 1 369 | 31.80% |
| La Paz | 2.111 | 32.87% |
| Oruro | 603 | 27.54% |
| Pando | 216 | 41.14% |
| Potosí | 1 810 | 37.35% |
| Santa Cruz | 1 078 | 31.91% |
| Tarija | 407 | 34.11% |
| **TOTAL** | **8 882** | **31.87%** |

Bolivia is a country with a large surface area where a large proportion of the population lives in rural areas, with no possibility of immediate access to fibre-optic networks. The project would benefit a large number of people:

Table 5. Bolivia: Population benefiting from the project (UEPP, 2017)

| | Locations | Inhabitants | % Population |
|---|---|---|---|
| > 200 2.000 Chuquisaca | 4 261 | 1 762 226 | 17.60% |
| 100 to 200 | 5 863 | 821 864 | 8.20% |
| 50 to 100 | 6 148 | 447 311 | 4.50% |

A sustainability plan is established, based on the use of basic services, such as telephony and Internet, with an initial contribution by State agencies.

### 3.2.2 Internet access service for educational units in rural areas

Projects aimed at ensuring universal access to telecommunication services and ICTs for all localities with more than 50 inhabitants offer an excellent opportunity for initiatives with synergy across sectors. The Internet access service for educational units project (UEPP, 2016a) aims to benefit primarily students in rural areas, hitherto disadvantaged in terms of access to Internet and state-of-the-art technology. It is proposed to implement the project in localities reached with new coverage of telecommunication services resulting from social inclusion projects.

The project will benefit 311 educational units, belonging to 270 localities in rural areas. The beneficiaries will be a total of approximately 39 100 students from these communities.

Table 6. Bolivia: Educational units benefiting from the project (UEPP, 2016a)

| | Rural communities | Educational units |
|---|---|---|
| Beni<br>Chuquisaca | 8 | 11 |
| Chuquisaca | 19 | 22 |
| Cochabamba | 58 | 63 |
| La Paz | 84 | 95 |
| Oruro | 17 | 18 |
| Pando | 6 | 6 |
| Potosí | 29 | 34 |
| Santa Cruz | 36 | 47 |
| Tarija | 13 | 15 |
| **TOTAL** | **270** | **311** |

### 3.2.3 Installation of fibre-optic communications

The objective of this project (UEPP, 2016b) is to deploy optical fibre to 100 per cent of the municipality capitals in the medium term. Four phases are planned, corresponding to the periods 2016-2017, 2017-2018, 2018-2019 and 2019-2020.

The following table shows the number of municipalities per department, indicating those that already have fibre-optic links, and those that have not yet been reached with this type of connection, which are the target beneficiaries of this project.

Table 7. Bolivia: Municipalities without fibre-optic connection (UEPP, 2016b)

| | Municipality capitals | With FO connection | Without FO connection |
|---|---|---|---|
| Beni<br>Chuquisaca | 19 | 13 | **6** |
| Chuquisaca | 29 | 7 | **22** |
| Cochabamba | 47 | 11 | **36** |
| La Paz | 87 | 7 | **80** |
| Oruro | 35 | 5 | **30** |
| Pando | 15 | 5 | **10** |
| Potosí | 40 | 7 | **33** |
| Santa Cruz | 56 | 26 | **30** |
| Tarija | 11 | 7 | **4** |
| **TOTAL** | **339** | **88** | **251** |

There are thus 251 capitals of municipalities to be connected, benefiting a total of 640 938 inhabitants belonging to these localities.

To ensure sustainability of the project, it is proposed that up to 20 per cent of the budget invested in equipment and installation be earmarked to cover maintenance and operating costs during the first six months. The telecommunication operator shall undertake all necessary commercial actions to attract and incorporate local users, whose consumption will then serve to guarantee the sustainability of the facilities.

### 3.2.4 Túpac Katari satellite

The launch of the Túpac Katari satellite (operated by the Bolivian Space Agency) opened up new prospects for offering telecommunication services in Bolivia:

- Space segment:
  - Comprehensive coverage of Bolivia and several countries in the region
  - Free capacity in Ku and Ka band
  - Fractionable in MHz or fractions of MHz
  - Occasional use capacity (live transmissions)
  - High power and sensitivity for signals in Bolivia
  - Availability greater than 99.99 per cent of the time.
- Radio and digital television via satellite:
  - High-quality image and sound
  - Comprehensive coverage of Bolivia and several countries in the region
  - Grid of 20 radio stations and 20 television channels, constantly growing
  - TV channels with high definition.
- Rural satellite Internet:
  - Comprehensive coverage of Bolivia and several countries in the region
  - Variety of speed plans and prices
  - No data volume limit
  - Shared access in 10 to 1 ratio to offer lower costs.

Other services are offered, such as data circuits, digital broadcasting of radio and television and virtual satellite network.

### 3.2.5 E-government plan

The e-government implementation plan (Comité Plurinacional de Tecnologías de Información y Comunicación, 2016) has been structured to take full advantage of the potential of ICTs to improve efficiency and quality in public administration, as well as the possibilities for generating better processes and procedures, promoting social participation and control and promoting the country's productive development. With this in mind, the plan proposal has delimited four strategic areas: sovereign government, efficient government, comprehensive and complementary government, and transparent government, around which a set of strategic lines of action are deployed that group together the corresponding programmes.

Table 8. Bolivia: E-government implementation plan (Comité Plurinacional de Tecnologías de Información y Comunicación, 2016)

| | Targets for 2020 |
|---|---|
| Sovereign government | • 40% of the public entities of the central level of the State use the services of the sovereign cloud.<br>• 100% of e-government services are accessible free of charge.<br>• 70% of exchanges of data and information between public entities at the central level of the State are carried out by electronic means and/or interoperability mechanisms.<br>• 100% of e-government services are accessible through the digital citizenship platform.<br>• 50% of e-government services and tools are developed in the country.<br>• 100% of public servants responsible for the planning and policy and technical implementation of e-government in public entities have the relevant thematic training.<br>• 60% of public entities are certified by the Computer Emergency Response Team (CERT). |
| Efficient government | • 50% of formalities are carried out through the single portal.<br>• Use of paper in public entities is reduced by 30%.<br>• 100% of the current legislation is adequate for the implementation of e-government. |
| Comprehensive and complementary government | • 100% of e-government services related to fundamental rights can interoperate with each other.<br>• 100% of the entities that offer services are incorporated in the e-payment and e-commerce system.<br>• 5% of transactions are made through e-commerce.<br>• 20% of companies use e-payment and e-commerce platforms.<br>• 100% of companies are registered in the digital company platform.<br>• 5% of micro, small and medium enterprises (MSMEs) use electronic means for their operations.<br>• 70% of Autonomous Territorial Entities (ETAs) have e-government facilities. |

| | Targets for 2020 |
|---|---|
| Transparent government | • 50% of the population has access to mechanisms of access and social participation through electronic means.<br>• 30% of citizens participate in State planning and decision-making processes through electronic means.<br>• 50% of public entities use electronic means to generate processes of citizen participation in planning and decision-making.<br>• 100% of the electoral processes are carried out through electronic means.<br>• 50% of public institutions gear their services to meet quality standards.<br>• 80% of the population is aware of e-government services.<br>• 50% of the population can use e-government services.<br>• 50% of State information and data is available on digital media. |

## 3.3 International cooperation

### 3.3.1 General cooperation agreement between Bolivia and Peru

Presidential-level meetings were held between Bolivia and Peru in 2015 and 2016 to promote collaborative projects between the two countries (Gobierno de Bolivia y Gobierno de Perú, 2015) (Gobierno de Bolivia y Gobierno de Perú, 2016a).

The aim of the meetings was to support and facilitate exchange of information and sharing of experiences and best practices in regard to the progress made in both countries, with a view to developing and implementing programmes and projects of mutual benefit. The outcomes led to the decision to promote cooperation in science, technology and innovation.

The meetings analysed the significant progress made in identifying the core areas of physical integration:

- Comprehensive and articulated development of infrastructure projects between the two countries, benefiting the populations living on both sides of the border
- The agreements reached in terms of integration in telecommunications, to promote sustainable development and improve the quality of life in both countries.

Also, in November 2016, the Bolivian government sent a consultation for the deployment of fibre-optic infrastructure from Bolivia to the Pacific Ocean (Gobierno de Bolivia y Gobierno de Perú, 2016b).

### 3.3.2 Elaboration of studies for deployment of the South American Connectivity Network for Integration

On 10 February, 2015, a cooperation agreement was signed between the Union of South American Nations (UNASUR)[26] – whose member states are the Argentine Republic, the Plurinational State of

[26] *Unión de Naciones Suramericanas*, https://www.unasursg.org/en

Bolivia, the Federative Republic of Brazil, the Republic of Chile, the Republic of Colombia, the Republic of Ecuador, the Cooperative Republic of Guyana, the Republic of Paraguay, the Republic of Peru, the Republic of Suriname, the Eastern Republic of Uruguay and the Bolivarian Republic of Venezuela – and the Andean Development Corporation – Development Bank of Latin America (CAF)[27] to support the elaboration of studies for deployment of the South American Connectivity Network for Integration and its corresponding socialization.

The object of the resulting international public tender (Concurso para la elaboración de los estudios para el despliegue de la Red de Conectividad Suramericana para la Integración, 2015) is the provision of consulting services to support the preparation of studies for deployment of the South American Connectivity Network for Integration by means of fibre-optic links or other available technologies. The study comprises three components, namely: a socio-demographic analysis to diagnose the specific characteristics of supply and demand in each country, taking into account the national objectives of each country and of UNASUR; a technical analysis of the existing and planned infrastructures in the next five years, identifying their owners and nature (closed or open and neutral), and of commercially available technological alternatives for the deployment of the network; and an economic and financial feasibility analysis of the deployment of the South American Connectivity Network.

# 4 Challenges and opportunities

This section of the report will analyse the main challenges facing Bolivia in increasing the use of ICTs/ broadband to bring it closer to the rest of the South American countries in this regard.

While it is true that, in some respects, the Americas' LLDCs are not at the same level as their neighbouring countries in terms of the deployment and use of ICTs, they are however developing very interesting initiatives that may constitute a unique opportunity to allow them to make significant progress, positioning them as a reference in some respects among the surrounding countries, improving the quality of life of their citizens and increasing their competitiveness.

## 4.1 Challenges

**Regulation:** Given the status of ICTs in Bolivia and the evolution of the sector, the regulatory body needs to become more agile and better adapted to current and future needs, developing regulations and taking the necessary measures to ensure a stable regulatory framework and proper application of the existing legislation.

**Simplicity**: Bolivia has a complex institutional structure with multiple State entities exercising responsibilities and competences in the ICT sector, which can lead to duplication of functions and, more importantly, impede an overall vision of all functions and initiatives.

**Governance**: The Government of Bolivia is engaged in a very significant effort to promote the availability and use of ICTs. Effective governance will be essential, at both the management and operational level, to ensure the necessary coordination between all the institutions and initiatives, affording all stakeholders a cross-cutting view.

**National broadband plan**: The National Broadband Plan is a well-designed and oriented plan, especially for the public sector. It should incorporate the vision in respect not only of infrastructures but also of services, promoting participation of the private sector, benefiting the entire economy of the country and ensuring the viability of infrastructure and services.

[27] *Corporación Andina de Fomento - Banco de Desarrollo de América Latina*, http://www.caf.com

**National interconnection conditions:** Access to the fibre-optic backbone networks under acceptable commercial conditions is a key factor for ensuring the principle of universality of telecommunication services and enabling all operators to provide services to the entire population.

**Improving telecentres**: There is a determined commitment on the part of the Bolivian government to deploy telecentres in the most remote areas of the country, with the aim of providing connectivity and services to the entire population, as shown by the deployment plans announced. It would be advisable to expand the use of telecentres with public and social services and applications, in order to improve the economy in the areas concerned and the activities of their inhabitants and, at the same time, guarantee the telecentres' sustainability.

**Increasing use of the IXP**: The creation of the IP traffic exchange point has been an excellent initiative, but there is a need to increase the number of service providers and the amount of traffic the PIT handles.

**Private-sector participation**: State initiatives should incorporate participation of the private sector in order to strengthen and prioritize the execution of public-private cooperation strategies and, hence, private financing of projects for increasing the use of ICTs, whereby stakeholders in the sector can participate more actively and in a coordinated manner in all projects. It is important to emphasize that the involvement of the private sector, whether through public-private partnerships or private enterprise initiatives, will help to overcome the development challenges.

**Local content and applications**: While there is a willingness on the part of the State to develop local content and applications, it would be advisable to formulate an implementation plan aimed at producing rapid improvements in all relevant economic and social sectors, especially in rural areas.

**Interconnection and infrastructure-sharing**: Bolivia has a legislative framework that recognizes the importance of interconnection and infrastructure-sharing between different service providers, and this should probably be promoted so as to allow more efficient investment, with the aim of accelerating the deployment of broadband infrastructures.

**Focus on services**: The availability of broadband networks for the development of services is undoubtedly necessary, but the focus should be on the creation and availability of services, and not only infrastructure, ensuring the necessary connectivity to make this possible.

**Reducing barriers to deployment**: The deployment of fixed FO access networks requires significant time and investment, although the bulk of the investment is related to civil engineering works. It is crucial to reduce the number of barriers to rapid deployment as far as possible, especially those imposed by territories or municipalities in the processing of permits, licences and authorizations for the installation of towers, antennas, fibre, cables, etc. Barriers range from prohibitions on the installation of infrastructure in certain areas and delays in the procedures for requesting and issuing permits, licences and authorizations, to the dispersion and lack of uniformity of regulations that exist in this regard.

**Fixed access networks**: We have noted the limited deployment of the fixed access network, below the levels found in most South American countries, and way short of the situation in developed countries, where the existence of a robust access network has made it possible to adapt very rapidly to the changing needs of users and to offer innovative fixed- and mobile-broadband services, as well as enabling them to face the future with the necessary tools to sustain the desired rate of growth and evolution.

**Uniform mobile services in all areas**: In contrast to the situation with fixed access networks, mobile operators have made significant efforts in recent years to expand mobile network infrastructures and improve their services, gaining widespread acceptance by users, as can be seen from the penetration of mobile services among the population. To achieve a balance throughout the whole territory, it would be good to guarantee the same services with the same quality in all areas of the country.

**Improving Internet access speed**: We have noted high penetration in mobile telephony and increasing use of Internet access. Content and services evolve quickly, calling more and more for greater Internet access speeds, so operators must plan for this, in both the backbone and access, to make it a reality, both for prepaid users – the great majority in the country – and for postpaid contracts, where the trend towards increasing access speed is already visible.

**Adult digital literacy**: As a complement to the efforts made by the Bolivian government to provide connectivity to all schools in the country and ensure training in and use of ICTs among younger generations, adult training in digital literacy should also be expanded, especially in rural areas, thereby fostering greater use of ICT services among adults across the country, for an inclusive society.

**Affordability**: The price trend in respect of broadband services is positive, but it is still some way off the rest of the countries of the region. It would be desirable to ensure that this trend continues and that the cost of access, as well as of terminals, is affordable to the majority of the population. It would also be beneficial to increase the availability of public access points for ICT services.

**Internet use**: Increasing the use of Internet among the population, including from home, is an issue that can be addressed by tackling some of the challenges mentioned above, such as both institutional and human capacity building, lower prices, greater coverage and improved local services, content and applications, among others.

**Territorial balance**: There is a large disparity among departments in terms of the use of ICTs. It would be advisable to draw up an action plan to improve ICT availability and use in the least developed departments, so as to improve the quality of life of their citizens, foster growth of their economies and ensure a better territorial balance in the country.

**International connection**: Increasing international bandwidth and improving international Internet access costs, with direct connectivity to the most important peering points, are very complex challenges, but ones that have to be tackled if Bolivia is to solve other challenges that the country faces for the improvement of ICTs.

## 4.2 Opportunities

### 4.2.1 Policy and regulation

Despite the present situation in terms of ICT development in Bolivia, opportunities do exist for improving ICT connectivity in the realm of policy, regulation and legislation, and for leveraging the impact broadband can exert in agriculture, education, health, environment, climate-change adaptation and in other social and economic domains. In order to improve Bolivia's competitiveness vis-à-vis its neighbouring countries, it is very likely that Bolivia should plan the actions to be taken for the promotion and usage of ICTs differently from its neighbours. Knowing the experience of other, more advanced countries, it will probably not be necessary to follow exactly the same path as them, and Bolivia may be able to shorten or skip unnecessary stages and focus on what the current and future situation demands.

It is very important to move forward with legislation and regulation that focuses on ICT development aimed at improving the quality of life of citizens, business competitiveness and the availability of innovative public and social services for the entire population. The trend in ICTs is towards convergence, which means that it is essential to have a common vision and strategy that takes into account not only connectivity but also services, encompassing all the different elements of the ICT ecosystem.

Competition in the development of telecommunication services has had a positive impact by ushering in a greater choice of services and better prices; but boosting competition has probably not been sufficient in itself to ensure that these services stretch to all the territory. The Americas' LLDCs are in a position to redesign policy so as to ensure the availability of broadband services, in a manner that

provides the predictability and confidence needed to attract investment, promotes and facilitates initiatives that support the deployment of broadband networks and develops services in an efficient way, which will have a positive impact on the cost for users.

### 4.2.2 Infrastructure

It has been a natural tendency for all operators, especially at the beginning, to try to differentiate themselves from their competitors, including through efforts to offer better coverage of their services, especially in both backbone and access networks. When coverage ceases to be a differentiating factor, they are faced with significant operating costs to maintain an infrastructure much like that of their competitors. As a result, we have witnessed a similar pattern of behaviour in mobile telephony in almost all countries, with many operators determined to share these costs. The level of sharing of the different parts of the network – backbone, access network, passive elements and active elements, among others – may vary greatly, however, depending on the area and business expectations.

The same trend towards sharing is observed in some advanced countries with respect to the fixed network, which entails much higher deployment costs than the mobile network. Considering the limited fixed-network deployment in Bolivia, the country has the opportunity to propose a different solution for deployment of a fixed network, based on sharing, which could in turn enable it to accelerate the availability of services in the fixed network.

### 4.2.3 National telecommunication plans

Bolivia has drawn up a National Plan, which is extremely important for the positive development of the country's economy. Bolivia can leverage this plan to promote all economic sectors, by encouraging the creation and development of domestic ICT enterprises and related services that need to be implemented in order to improve efficiency and productivity, promote job creation and enhance the country's competitiveness.

There is a unique opportunity to supplement these initiatives, involving all relevant sectors of the country, civil society, associations, and so forth, to ensure a 360º vision, by prioritizing and supporting harmonious development of services and applications, both public and private. The opportunity to target the development of innovative services for end users, not just those related to pure connectivity, opens the way to setting a framework that is capable of fostering the necessary joint investment on the part of all stakeholders, harmonious development of infrastructures and services, network deployment, optimal use of investment and increased profitability.

We have commented that one of the important challenges consists in optimizing the assignment of responsibilities and harmonizing the development of initiatives. This may be turned into an opportunity to ensure effective executive and operational governance in order to optimize the development of plans, ensuring that all data are obtained, if possible, in real time, so as to support effective decision-making and a cross-cutting and integrated view for all stakeholders.

### 4.2.4 Improving international communications

The recent interconnection of the networks of Entel Bolivia and Copaco Paraguay opens up new potential for international interconnections for both countries since, in addition to upgrading the resilience of their international networks, it adds a new option in terms of connection to submarine cables in the Atlantic and Pacific oceans.

The creation of the IP Traffic Exchange Point in both countries was an important and correct decision. We have mentioned that the major challenge associated with this initiative is to increase the traffic it handles. Although it is true that Brazil has fibre-optic interconnections with almost all the South American countries, having a border with many of them, if Paraguay and Bolivia can guarantee good connectivity with the submarine cables of the Atlantic and Pacific oceans through neighbouring

countries there is an opportunity for the existing IXPs to become an important peering point for all countries in the region.

### 4.2.5 Collaboration between Bolivia and Paraguay

Bolivia and Paraguay have many features in common. Exploring collaboration and coordination on the development of ICTs would have positive effects for both countries, sharing best practices and perhaps undertaking projects with common components. It could serve to form a bigger market for some aspects, enable faster development of innovative services and yield improvements in terms of cost.

It is true that Paraguay and Bolivia suffer the handicap of greater constraints in international communications due to their geographical position; but, although they will need to seek improvements in terms of the costs involved, they have the opportunity to focus their efforts on their respective national ICT growth, by developing innovative services for the various market segments, which they should do with a regional vision, so as to significantly increase their specific weight in the region.

# 5 Recommendations

## 5.1 Harmonization of policy and regulation

**Scope**

The ICT sector is probably the most dynamic, in constant evolution. The world of ICTs seems to tend to convergence: manufacturers and telecommunication operators are moving in this direction and, even more importantly, so are the vision and needs of end users. This calls for integrated solutions combining basic and value-added services tailored to each sector and its respective needs. In this context, broadband services are the most crucial because they really make a difference and underpin development and evolution towards the desired economic goals.

The importance of ICTs for improving the other sectors of an economy is also well documented. Accordingly, it would be advisable for ICT policy and regulation to focus on ensuring not only access to broadband networks, but also the availability of advanced broadband services, in a comprehensive and integrated approach to respond more effectively to the challenges that countries face. It is important not to concentrate solely on access to the traditional ICT services, i.e. voice, video and data, but to also expand the scope to the provision of public services for the entire population, such as e-government, e-commerce, e-health, e-education, emergency communications, environmental protection, climate-change mitigation and cybersecurity, among others.

**Broadband**

ICT policies and regulations for the coming years in relation to connectivity should aim to boost the development of broadband networks, both mobile and fixed, in order to support the necessary economic growth of countries. Broadband services should be included in the definition of basic telecommunication services.

Provision will have to be made for mechanisms to facilitate the deployment of networks and services in areas that are not profitable for operators, be it public investment, public-private schemes or other types of incentives.

**Universal service**

It is essential to improve ICT governance and affordability, ushering in enabling environments that promote economic growth and innovation all around the country.

Regardless of the management model adopted for the Universal Service Fund, which varies from country to country, it has been proven that the latter is not sufficient to overcome the digital divide. Under current rules, it is very difficult, if not impossible, for private operators to invest in unprofitable areas, so the responsibility for infrastructure and services development in these areas lies with the public institutions, which usually do not have the resources to cover the necessary investments.

It would be desirable to define as universal services not only basic connectivity services, but all the public services that are essential for the entire population, such as e-government, e-commerce, e-health, e-education, emergency communications, environmental protection, climate-change mitigation and cybersecurity, among others.

Broadband access should be considered as a universal service, thus ensuring that all the population will have access to the corresponding technologies and services. Policies should have, as an objective, eradication of the digital divide in the future, securing the same opportunities for all and allowing rural areas to improve their economies.

The reference speed defined as broadband should be permanently raised, matching the needs of the population and advances in services and applications, in line with technological developments.

***In view of the need to establish strong collaboration among countries in order to advance more rapidly in the creation of innovative broadband services and applications, in the availability and use of these services by the greatest possible number of people, and in the deployment of broadband, both national and international, it would be advisable to achieve a degree of harmonization of policies and regulation, especially in regard to scope, broadband and universal service issues. The Universal Service Fund policy should be reviewed, as it is currently not sufficient to ensure that services reach the entire population within a reasonable time-frame.***

## 5.2 Open fixed-broadband access, backbone sharing

In developed countries, the deployment of fixed-broadband networks has had a significant impact in terms of access to broadband services for the population and for businesses. In the Americas' LLDCs, the sole option for access to broadband for the clear majority of the population will, for the time being, be through the mobile network.

In order to offer a broadband service with the required bandwidth, it is very important for mobile networks to be able to rely on fibre-optic national backbone networks connecting most of their base stations. Having a fixed fibre-optic access network in densely populated areas would facilitate connection to the mobile base stations. In the Americas' LLDCs, fixed networks are only deployed in dense areas and business districts. It would be important to plan and facilitate the evolution of the access network from existing copper and prepare for migration to fibre-optic access networks in order to deliver higher performance.

The deployment of fixed-broadband access networks is very costly, and it would be unrealistic to contemplate encouraging competition in these networks; but the availability of an open-access fibre-optic network, to be used by all operators and service providers, would facilitate the development of new services and accelerate the penetration of broadband services.

Another way to reduce network deployment costs is infrastructure-sharing. In early deployments, having their own infrastructure could be a differentiator for operators; but, in general, this is no longer the case, since the real differentiation resides in the services catalogue and pricing. The goal should thus be to concentrate efforts on ensuring greater coverage and offering better services at better prices, and on reducing infrastructure costs. In this context, infrastructure-sharing initiatives are becoming increasingly common in developed countries, and they should be promoted and encouraged in the Americas' LLDCs.

Nationwide installation of fibre-optic transmission systems is expensive and probably uneconomic for operators. Thus, alliances with other utility companies, such as electricity, railways, etc., whose existing and future infrastructure could facilitate the installation of fibre-optic networks, would be essential for accelerating the roll-out of optical fibre connections across the country. Moreover, the practice of installing conduits or fibre-optic cables when building or improving roads throughout the country should be encouraged. This would represent only a small increase in planned investments, but would bring tremendous value.

***It is recommended to establish the basis for the deployment of open-access fixed-broadband networks in order to optimize investment, increase coverage, improve both fixed and mobile services and enhance market penetration.***

***It is also advisable to share broadband transport infrastructures throughout the territory, so that services and applications can reach the entire population faster. It is especially important and advisable to ensure access to the international interconnections of all service providers.***

## 5.3 From national broadband plan to digital society

The goal of countries everywhere is to promote increased connectivity through targeted development of innovative services for all the sectors of their economic activity, geared to affordability for businesses and individuals, with the aim of increasing the volume of subscriptions and the use of broadband networks. It is crucial for LLDCs to develop ICT infrastructure in order to reinforce all economic sectors and promote competitiveness, innovation and inclusion, through time and cost reduction.

As stated in the report *Planning for progress: Why national broadband plans matter* (ITU, Broadband Commission for Digital Development, and Cisco, 2013), national broadband plans are an important mechanism for governments to set the vision and strategy of how technology can move their own country forward. Among ICTs, broadband adoption has demonstrated the greatest impact on GDP growth. A national broadband plan is a statement of clear vision for the development and future evolution of broadband, both as a sector in its own right, and with consideration of its relationship with other sectors. The full benefits of broadband for enhancing national competitiveness and empowering citizens are most likely to be realized where there is strong partnership between government, industry and other stakeholders and where governments engage in a consultative, participatory approach to the policy-making process.

We are convinced that the definition of national broadband plan should be wider, encompassing the creation and use of digital services, both public and private, rather than just connectivity, and promoting the active participation of society as a whole.

It should be expanded to include stakeholders not only of the ICT sector but also of the main sectors that can benefit from the use of broadband. There is a need to move away from vertical thinking in each sector towards a more general concept that cuts across them all.

It is also necessary to consider the challenges of creating an enabling environment and to identify the social, institutional and economic drivers, with the aim of building a realistic and sustainable scenario.

The basic principles of the national broadband/digital plan could be as follows:

- **User focus**: Benefit all citizens, companies and institutions.
- **Market driven**: To the maximum extent possible, broadband infrastructure provision and service delivery should be the responsibility of the market players.
- **Universal access**: Broadband infrastructure and services should be considered as universal, and be accessible for all communities, ensuring affordability and quality of service.
- **Promoting advanced and innovative services**: The scope of the plan should not be restricted to promoting the deployment of broadband infrastructures, but should focus on the development of new and innovative services, affording a unique growth opportunity and, at the same time, the capability to improve citizens' quality of life, help businesses and institutions to become more innovative and efficient, and benefit all economic sectors.
- **Promoting the right investments**: Formulating sustainable business plans.
- **Government led**, with the participation of all national stakeholders.
- **Efficient and goal-oriented**, with realistic objectives to be measured.
- Foster innovative **public-private partnerships**.
- Strong **governance**, **accountability** and **management**

The main goal of the national broadband/digital services plan would be to improve the quality of life of citizens, encourage more efficient and competitive enterprises in the territory and provide more and better public services in a sustainable manner.

The implementation of these plans is complex, so it is necessary to establish objectives and associated indicators for every project, and how they contribute to the overall goals. It is recommended to ensure continuous measurement, if possible in real time, of all indicators. In this fast-moving sector, the plan should be reviewed regularly to take on board changes and evolution.

A digital society requires the development of content, services and applications in local languages and adapted to the reality of the country. It would be important to ensure cooperation and coordination in defining a comprehensive strategy for the development of local content and applications, with a regional vision and vocation, in order not only to promote local industry and grow the country's economy, but also to make the use of ICT tools more attractive and productive for users. SMEs can play a relevant role through the development of their own applications that allow them to offer their services. To stimulate this type of initiative, there is a need for greater promotion of human talent and ICT training.

***It is recommended that Bolivia progress from a National Broadband Plan to a Digital Society Plan, adapted to the reality of the country, ensuring ongoing coordination of initiatives between the LLDCs in the Americas in order to benefit from the sharing of experiences and the common development of services and applications, thereby optimizing investment and associated expenses and, in some cases, avoiding possible duplication.***

## 5.4 Telecentres

The deployment of broadband infrastructures reaching all corners of the country requires considerable time and investment. Telecentres are an attractive option for accelerating the use of new technologies by the population in the most remote areas, who probably do not have the necessary resources to access these technologies. Shared use of the infrastructure offered by a telecentre constitutes an excellent solution for the entire population of its catchment area.

One of the major challenges associated with telecentres is their sustainability, which generally hinges on payment for basic connectivity services, such as telephony and Internet access.

It is necessary to equip telecentres with a broadband connection, so as to expand the services they can offer, and turn them into the point of distribution of all digital services, including all public and social services, like e-learning, e-health, e-government, disaster prevention, etc.; services related to the area's economy, like agriculture, fishing, etc., to improve productivity; and other services, like entertainment. These services would then contribute to ensuring the telecentres' sustainability. There will also be a need to organize active, creative and adapted continuous capacity building.

It is essential that the community served by a telecentre be fully convinced that the telecentre is key to its development, facilitating improved services and diversification of its economy. People should feel and regard it as their own, actively participating in its management and in development and promotion of the services it offers, empowering the participation of women in management and organizational activities. Clearly defined and measured indicators are vital to ensuring sustainability.

The development of ICTs in rural and remote areas will fail if ICTs are not an integral part of the definition of the country's overall development, with proper planning and budgeting.

***It would be advisable to evolve the concept of telecentre by introducing the entire range of digital services for its population, supporting availability and use of these services, facilitating their evolution and ensuring sustainability.***

## 5.5 Improving international interconnection

The development of a national broadband policy with a view to improving access to international high-capacity fibre-optic cables and high-bandwidth backbone networks is one of the specific ICT infrastructure objectives described in the VPoA (United Nations General Assembly, 2014). A further noteworthy objective is promoting digital bridges to interconnect national backbones so that countries far from submarine cables also have access to affordable broadband and are able to expand the telecommunication and related services sector in order to facilitate the provision of affordable, accessible and high-quality telecommunication services. (ITU, 2016e)

It is well known that, since most content is generated outside of Bolivia, the bulk of Internet traffic is international. Broadband growth in countries gives rise, in turn, to increased demand for international capacity, estimated at around 50 per cent per year. This places countries without direct access to submarine cables at a major disadvantage, on account of the cost involved.

Interconnection, with fibre-optic technology, has recently been established between Bolivia and Paraguay. Good coordination between the two countries would be desirable in order to ensure they have effective connectivity with the submarine cables in the Atlantic and Pacific oceans, strengthening the necessary actions to identify and implement alternative solutions and routes, such as joint planning and shared deployment costs. The aim is to ensure reliability of, and reduce the costs associated with, access to the Internet, thus improving affordability for the citizens of both countries, especially those with low purchasing power and those located in rural and remote areas. To this end, it is recommended to ensure access to the infrastructure under non-discriminatory and efficient conditions.

In the case of bilateral agreements between Bolivia or Paraguay and third countries, consideration could be given to accommodating the joint needs of both countries.

It would be desirable to have a regional vision in planning the deployment of the necessary infrastructure for broadband networks, so as to harmonize the required efforts and improve cost efficiency, seeking potential partnerships with other utilities, in order to accelerate the availability of infrastructure in all countries. The deployment of a South American high-capacity transport network connecting all countries would add much value to the efforts made by each country to improve the quality and current prices of connectivity.

Regional cooperation would be advisable in order to develop a larger market and more opportunities than can be offered by the domestic markets of each country, with the concomitant potential for cost

improvement, increased penetration ratios for broadband services and more efficient application development and services, creating the basis for better sharing of the knowledge and experiences of countries in South America.

Building and operating cables across country borders is a challenging task. First, authorizations and licences are required for each jurisdiction. Secondly, cabling by ducting is generally more secure, but expensive. Cabling by towers and poles is less expensive, especially where facilities-sharing may be envisaged, but more vulnerable to extreme weather and other causes of damage. In either case, selecting routes and obtaining permissions is time-consuming and will entail expense. Thirdly, local carriers may raise objections if the cable operators are seen as commercial rivals. Fourthly, regulations governing cross-border transit charges, interconnection charges, or accounting rates need to be established in an efficient manner; and local open-access provisions are likewise necessary to ensure that the additional capacity is available at competitive prices. Fifthly, the neighbouring countries concerned need to enjoy a good working relationship, unencumbered by conflicts.

The availability of an Internet traffic exchange point in Bolivia has a direct bearing on improvement of the service, costs and requisite capacity for access to the most important international hubs. It keeps data local, thereby reducing costs to operators and improving network performance for end-users, as well as enhancing local navigation, security, branding, control and management of local content and domain name services. It makes it easier for international and local web services to gain traction and ensures better data sovereignty. It helps to attract foreign content distribution networks (CDNs), thereby reducing the amount of international capacity required.

The very low costs of transit capacity at the global hubs highlights the need for developing countries to establish their own regional traffic consolidation points. This will create sufficient traffic to give the large international carriers the incentive to build out their own infrastructure to reach them, rather than the developing countries having to foot the cost for all their international traffic.

**Rwanda case study**

Rwanda offers a good example of an LLDC which has understood the importance of having excellent international communications and has undertaken a series of actions to achieve this.

Rwanda is a low-income, landlocked and predominantly agricultural country of around 12 million people, where even prepaid wireless broadband is relatively expensive for most inhabitants.

Nevertheless, Rwanda has been proactive in securing access to the closest submarine cable landing stations, and is connected to two submarine cables on the east coast. The first, the Eastern Africa Submarine Cable System (EASSy) is accessed through Uganda to the landing station in Kenya, with a 10 Tbit/s, two fibre-pair configuration, upgraded in 2010 to 40 Gbit/s wavelengths and in 2014 to 100 Gbit/s wavelengths. The second is the 5 000 km East African Marine System (TEAMS).

Rwanda, along with Burundi, Kenya, Tanzania and Uganda, is a member of the East African Community (EAC) which, with backing from the African Development Bank (AfDB), has been supporting a number of initiatives that promote an integrated regional approach to broadband infrastructure. Under its Connect Africa framework, AfDB helped finance EASSy and is supporting the East African Broadband ICT Infrastructure Network (EAC-BIN). The latter is an effort to integrate the broadband networks of EAC Member States to promote cross-border broadband traffic and trade, link the landlocked countries to coastal landing stations and encourage the harmonization of broadband regulations across the region

***It would be very useful to foster close collaboration for the planning and deployment of inter-connectivity between Bolivia and Paraguay, while seeking to forge a consensus among all South American countries to equip themselves with a regional broadband network so as to be able to respond to current needs and cope successfully with the required evolution. As a complement to this initiative, it is also recommended to promote and enhance the Internet traffic exchange points in Bolivia and Paraguay.***

# 6 Project proposal

The project proposed for Bolivia is aligned with recommendations 3 (From national broadband plan to digital society) and 4 (Telecentres).

- In regard to recommendation 3, the proposed project should focus on evolution from the National Broadband Plan to a Digital Society in Bolivia: designing the evolution of the National Broadband Plan; adding the vision of services pertaining to all the country's economic sectors, public and private; incorporating the private sector and civil society; and putting in place a governance system to manage the ecosystem effectively, providing the necessary cross-cutting vision of all initiatives, optimizing investment and ensuring monitoring of project indicators.
- In regard to recommendation 4, it is proposed to elaborate a study on converting a telecentre, in a rural area, into the digital services distribution centre for the population it serves, and ensuring its sustainability.

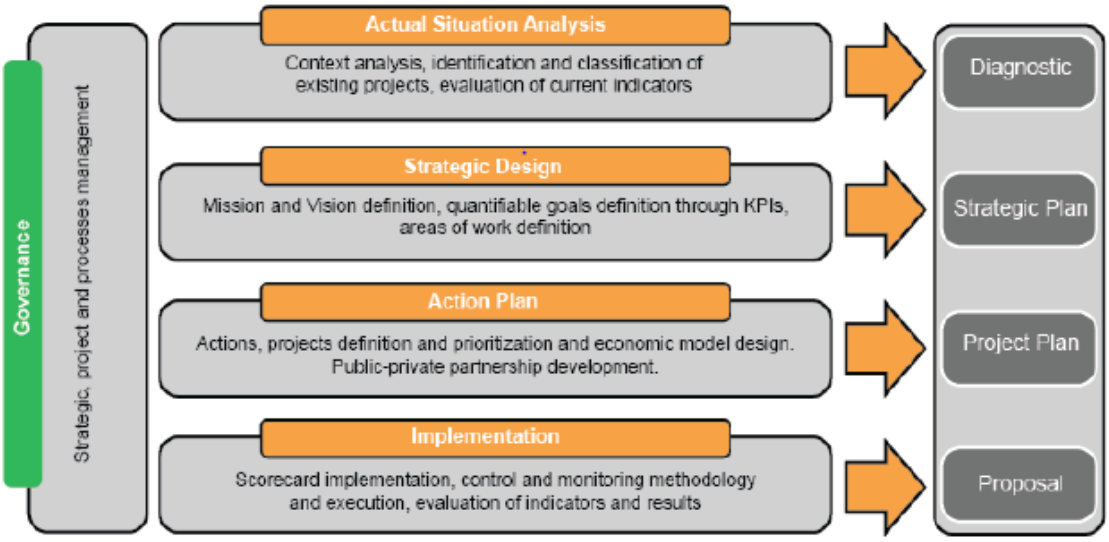
The main objective of the proposed project is to secure a substantial improvement in the national availability and use of ICTs, which could represent a competitive advantage for the country. Bolivia will continue to face challenges linked to its landlockedness, and this initiative will help to address these challenges, by accelerating the creation, implementation and use of ICTs in Bolivia, and by creating more regional content and applications in less time and in a more efficient way. This would also help to empower national companies and create more jobs.

This proposal is in line with the mandate of the ITU Telecommunication Development Bureau (BDT), and should enable the two landlocked countries in the Americas to mitigate any disadvantage they may suffer in comparison with their neighbouring countries, through national growth of ICTs. It may serve as a reference for other LLDCs and developing countries.

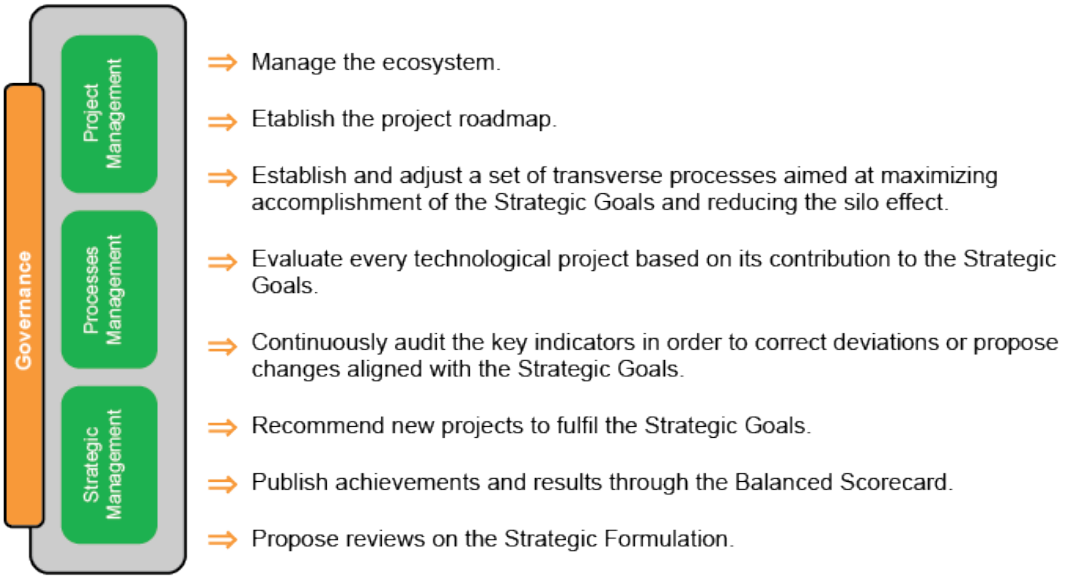
## 6.1 Moving to a digital society

Bolivia's National Plans focus primarily on connectivity and the public sector. It would be advisable to usher in a 360º vision, covering all economic, social and public services, and promoting the participation of the private sector and civil society. This type of initiative requires strong governance from the outset in order to manage the ecosystem, track indicators and provide the right data to decision-makers, to ensure a cross-cutting view and avoid any tendency towards a silo vision.

The proposed methodology is depicted in the following chart:




It would be good to review the current situation and the formulate the strategy and project plans, as appropriate; but the core focus should be on supporting the creation of the right governance for the entire initiative, ensuring a unified view of all ICT projects, as portrayed in the following figure:




## 6.2 Sustainable telecentres in rural areas

One of the major challenges associated with telecentres is their sustainability, which generally hinges on payment for basic connectivity services, such as telephony and Internet access.

It is necessary to equip the telecentre with a broadband connection, so as to expand the services it can offer, and turn it into the point of distribution of all digital services, including all public and social services, like e-learning, e-health, e-government, disaster prevention, etc.; services related to the economy of the rural area concerned, with the aim of improving the productivity; and other services, like entertainment. These services would then contribute to ensuring the telecentre's sustainability.

When defining the evolution from national broadband plan to digital society, all rural areas, in many cases served by telecentres, would be taken into account.

It would be necessary to study a business plan model for a telecentre in a rural area, providing for the inclusion of digital services and adapted to the economy of the population dependent on the telecentre.

## Annex 1: Bolivia mission and workshop

An important part of the work carried out for the preparation of this study was the mission to La Paz conducted on 26 and 27 June 2017, to the main institutions and companies of the Bolivian ICT sector, with the objective of exchanging information and documents relevant to the study.

Meetings were held with the Vice-Ministry for Telecommunications, ATT, UEPP and the telecommunication operators Entel, Telecel and Nuevatel.

In addition, an interactive workshop was held, the content of which is presented below (in Spanish).

# Bolivia

## Los retos y las oportunidades de conectividad de las TIC

*Junio 2017*

## *ÍNDICE*

1. INTRODUCCIÓN
2. SITUACIÓN ACTUAL
3. USO DE LAS TICs
4. RETOS
5. OPORTUNIDADES
6. RECOMENDACIONES



# 1. Introducción

## 1. Introducción

### *Antecedentes*

- Desventajas de los países sin salida al mar: menor conectividad, precios altos.
- TIC como dinamizador del resto de sectores, incrementado GDP y mejorando competitividad del país.
- Varias conferencias de la UIT adoptaron resoluciones encaminadas a mejorar el acceso de los países en desarrollo sin litoral a las redes internacionales de fibra óptica y desarrollo interno de las TIC.



## 1. Introducción

### *Objetivo del estudio*

- Formulación de recomendaciones para mejorar la adopción y uso de las TIC
- Para ello:
  - Estudio situación actual
  - Proyectos TIC en el país
  - Retos
  - Oportunidades
- Recomendaciones
- Buscar posibles sinergias entre Bolivia y Paraguay

# 2. Situación actual



## *2. Situación actual*

### *Política y Regulación*

- Reconocimiento de la importancia de las TIC, especialmente banda ancha y universalidad de servicios (Constitución, Agenda patriótica, Ley telecomunicaciones,…)
- Plan Nacional de Banda Ancha.
- Programa Nacional de Telecomunicaciones de Inclusión Social.
- Creación de Instituciones para la ejecución de los Planes.

## 2. Situación actual

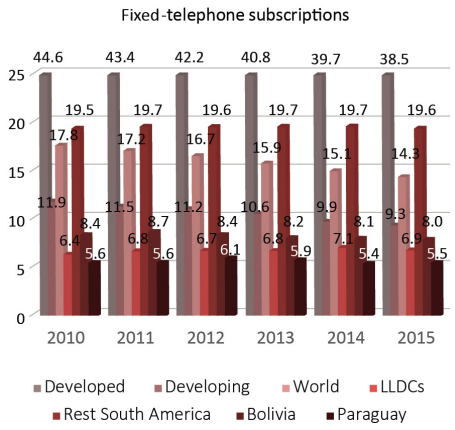
### *Conectividad*

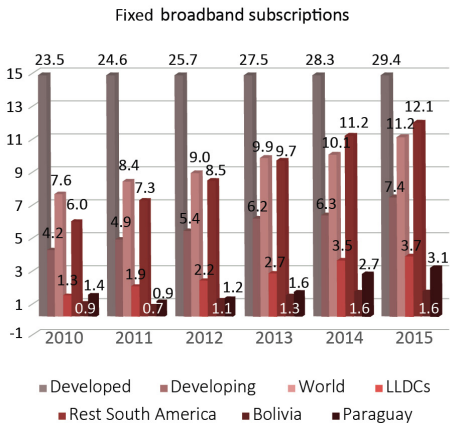
- Red fija escasa. Incremento despliegue FTTH.
- Fuerte evolución penetración de los servicios móviles.
- Incremento hogares con ordenadores y acceso a Internet, a distancia del resto de Sudamérica.
- Evolución positiva del uso individual de Internet.
- Bajo ancho de banda internacional por usuario de Internet.
- Uso bajo del Punto de Interconexión IP.



## 2. Situación actual

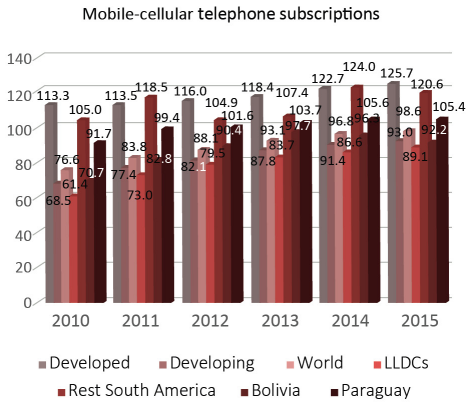
### *Conectividad – Red Fija*

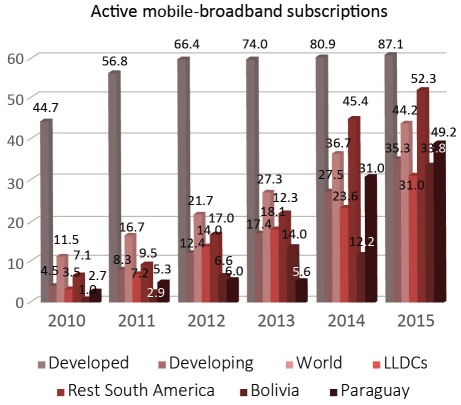


# 2. Situación actual

## Conectividad – Red Móvil

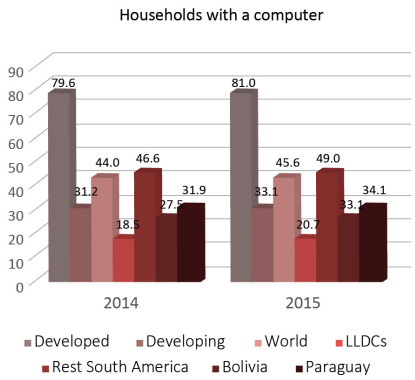


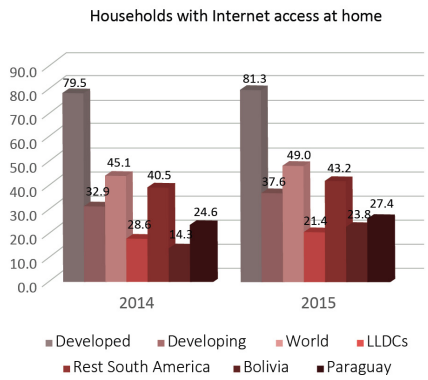






# 2. Situación actual

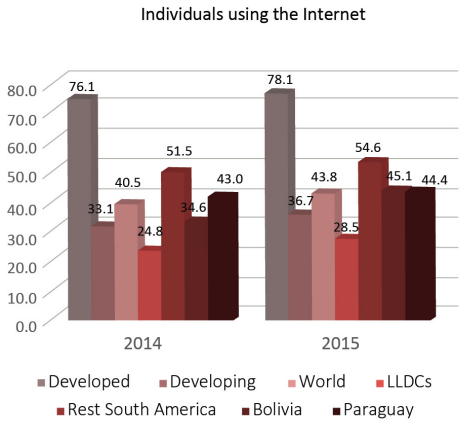
## Conectividad – Hogares con ordenador y acceso a Internet

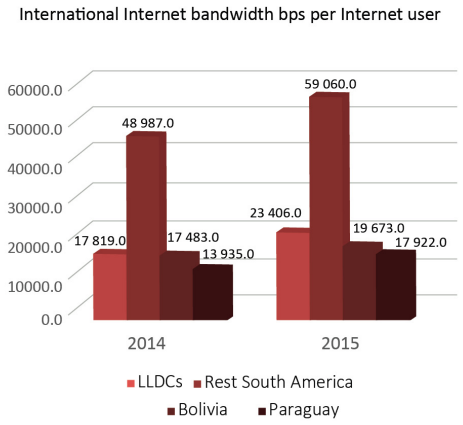


# 2. Situación actual

## *Conectividad – Uso y ancho de banda internacional*

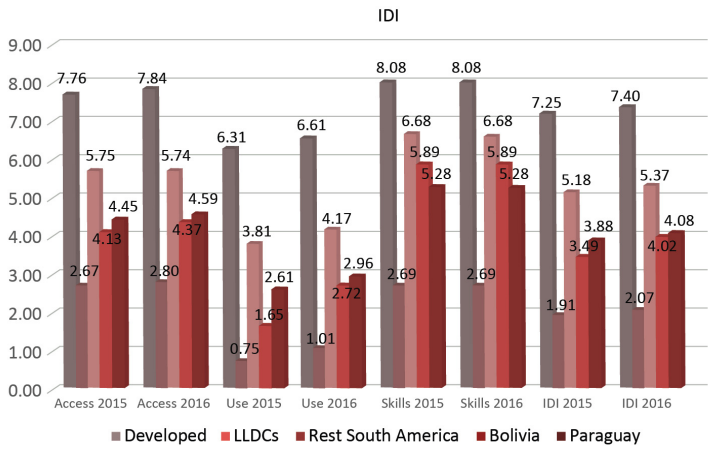




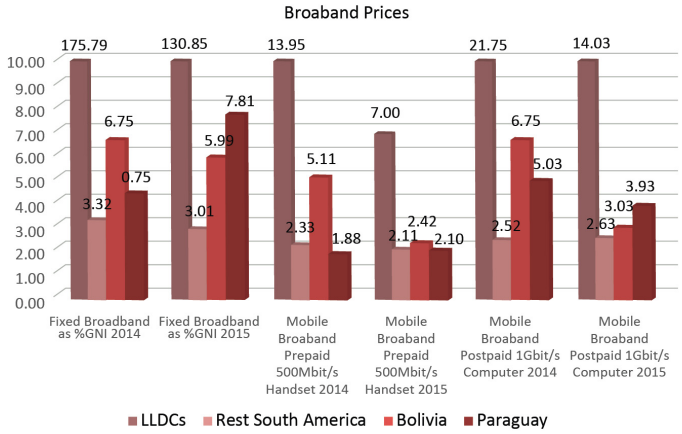

# 2. Situación actual

## *Desarrollo*



## 2. Situación actual

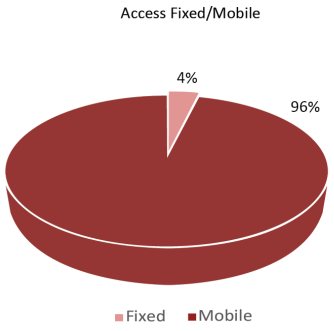
### Precios

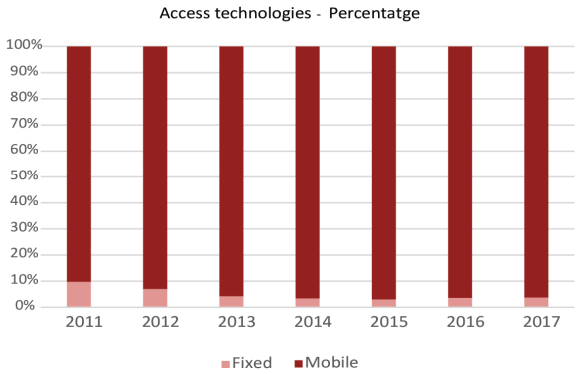





## 2. Situación actual

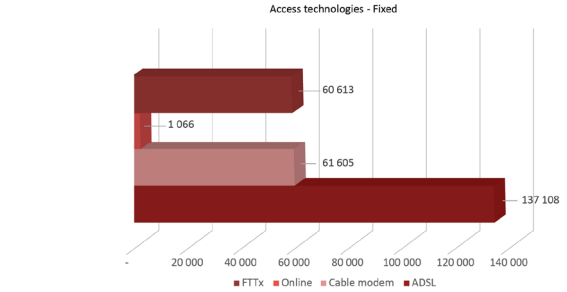
### Bolivia: tecnologías de acceso

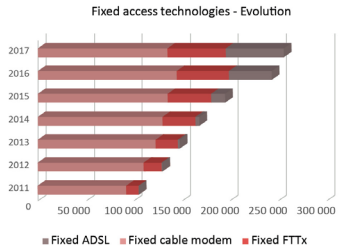


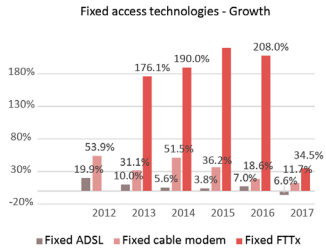



# 2. Situación actual

## Bolivia: acceso red fija



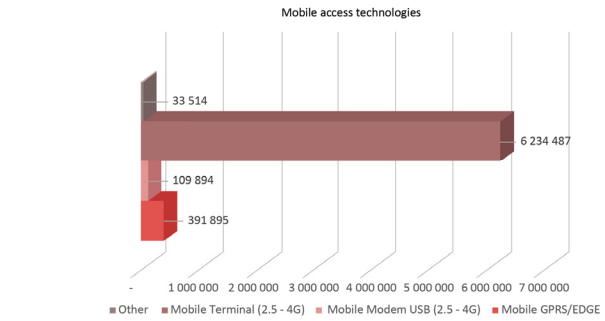



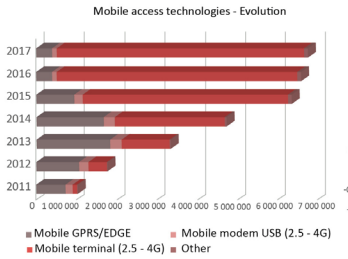



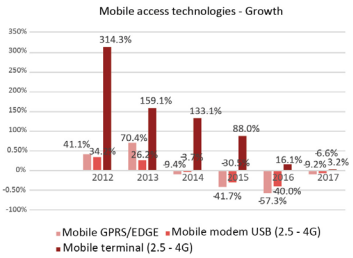



# 2. Situación actual

## Bolivia: acceso red móvil

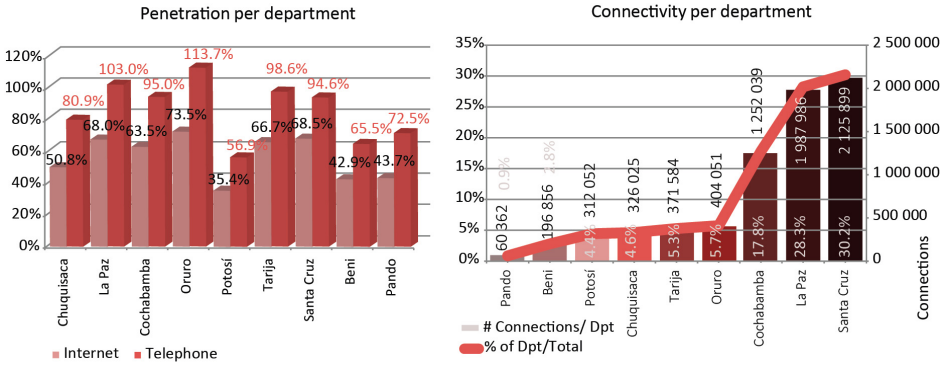


# 2. Situación actual

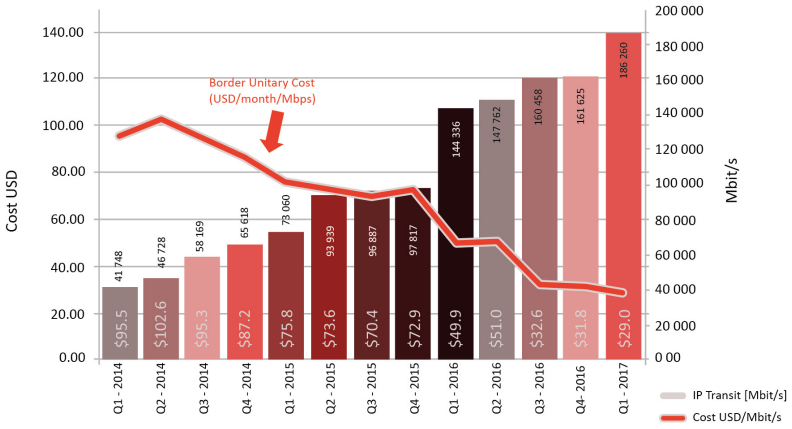
## Bolivia: visión por Departamento






# 2. Situación actual

## Bolivia: conectividad internacional



## 2. Situación actual

### Bolivia: telecentros

| | Community Telecentres 1 | Community Telecentres 2 | Military Telecentres | Satellite Telecentres Phase 1 | Satellite Telecentres Phase 2 | TOTAL |
|---|---|---|---|---|---|---|
| Beni | 17 | 11 | 8 | 66 | 35 | **137** |
| Chuquisaca | 73 | 4 | 16 | 116 | 102 | **311** |
| Cochabamba | 129 | 2 | 28 | 107 | 239 | **505** |
| La Paz | 104 | 9 | 63 | 246 | 531 | **953** |
| Oruro | 57 | 7 | 20 | 34 | 49 | **167** |
| Pando | 8 | 4 | 8 | 17 | 26 | **63** |
| Potosí | 48 | 5 | 26 | 232 | 252 | **563** |
| Santa Cruz | 131 | 21 | 26 | 133 | 200 | **511** |
| Tarija | 33 | 10 | 5 | 53 | 69 | **170** |
| Mobile | | | 20 | | | **20** |
| **TOTAL** | **600** | **73** | **220** | **1004** | **1503** | **3400** |



# 3. Uso de las TIC

## 3. Uso de las TIC

*Actores*

- Viceministerio de Telecomunicaciones
- ATT
- Operadores: Entel, Nuevatel, Telecel, AXS, Cooperativas…
- Organismos e Instituciones: PRONTIS, ASDIB, COPLUTIC, COSTETIC, AGETIC
- Viceministerio de ciencia y tecnología



## 3. Uso de las TIC

*Proyectos especiales*

- Instalación de estaciones de radiocomunicaciones.
- Servicio de acceso a Internet para unidades educativas en zonas rurales.
- Instalación de comunicaciones de FO en todas las capitales de Municipio.
- Plan de Gobierno electrónico.

## *3. Uso de las TIC*

### *Cooperación internacional*

- Acuerdo de cooperación entre Bolivia y Perú
  - Posibilidad de conexión FO hasta cabecera de cable del Pacífico
- UNASUR: Elaboración de los estudios para el despliegue de la Red de Conectividad Sudamericana para la Integración.



# 4. Retos

## 4. Retos
### General

- Esquema institucional complejo: simplificar.
- Asegurar Gobernanza de todas las iniciativas.
- Programas de fomento de las TIC en todos los sectores productivos del país.
- Participación del sector privado.
- Aplicaciones y contenidos locales.
- Asegurar interconexión y compartición de infraestructuras.
- El foco deberían ser los servicios, no tan solo la conectividad.
- Simplificar trámites administrativos.
- Mejorar equilibrio territorial.



## 4. Retos
### Conectividad

- Despliegue de redes de banda ancha fijas.
- Reducir las barreras para el despliegue de redes.
- Universalizar lo antes posible el servicio de banda ancha móvil.
- Incremento continuo de la velocidad de acceso a Internet.
- Mejora de los servicios en los Telecentros.
- Incrementar uso del IXP.
- Asequibilidad de los servicios.
- Incrementar uso Internet.
- Mejora ancho de banda y precios conectividad internacional.

# 5. Oportunidades



## *5. Oportunidades*

- Complementar la situación actual con una visión 360º, enfocado a servicios y con todos los sectores de la sociedad boliviana.
- Obtener ahorros e incrementar eficiencia de las iniciativas, con una Gobernanza transversal unificada.
- Posibilidad de acelerar el despliegue y la cobertura de redes de acceso de banda ancha, mediante la compartición de iniciativas.
- Telecentros: incrementar oferta servicios digitales
- Potenciar el uso, no tan solo nacional, del IXP

# 6. Recomendaciones



## *6. Recomendaciones*

### *1. Armonización*

- Sería aconsejable intentar armonizar las políticas de telecomunicaciones y la regulación con los países de la región para facilitar proyectos supranacionales:
  - Banda ancha, considerando también servicios
  - Alcance, adaptándose a la rápida evolución del sector, no tan solo en tecnologías, redes y conectividad, sino sobretodo en servicios, especialmente los servicios públicos y sociales.
  - Aspectos que impactan directamente a los ciudadanos: Comunicaciones de emergencia, protección del medio ambiente, mitigación del cambio climático, ciberseguridad
  - Concepto y estrategia para asegurar universalidad de los servicios
  - Licencias,…

## 6. Recomendaciones

### 2. Optimización despliegue de redes

- Plantear la posibilidad del despliegue de redes abiertas, tanto de transporte como de acceso, ya sean activas o pasivas:
  - Acelerando el despliegue y cobertura
  - Optimizando los costes
  - Mejorando la competitividad y oferta de servicios
  - Posibilitando la mejora de los servicios de banda ancha móviles
  - Asegurando una gestión neutra de las redes compartidas



## 6. Recomendaciones

### 3. Evolución a Sociedad Digital

- Evolución de los Planes Nacionales de telecomunicaciones a Planes de Servicios Digitales:
  - Liderazgo del Gobierno
  - Participación de la sociedad civil y los sectores privados, no tan solo TIC
  - Poniendo el foco en los servicios, promoviendo la innovación.
  - Estableciendo de forma clara los objetivos e indicadores
  - Asegurando un fuerte gobernanza transversal.
  - Con una gestión, si es posible, en tiempo real para facilitar la toma de decisiones
  - Con el objetivo de mejorar la calidad de vida de los ciudadanos, mejorar la eficiencia y servicios de las empresas y ofrecer mejores servicios públicos.

## 6. Recomendaciones

### 4. Telecentros

- Convertir el telecentro en el punto de distribución de todos los servicios digitales para la población de su influencia:
  - Acelerando la disponibilidad de servicios para toda la población
  - Permitiendo el uso de los recursos compartidos para todos
  - Ayudando a mejorar la eficiencia y productividad de las actividades económicas
  - Asegurando la sostenibilidad y necesaria evolución de los mismos.



## 6. Recomendaciones

### 5. Conectividad Internacional

- Promocionar acciones conjuntas entre Bolivia y Paraguay para mejorar el acceso a las cabeceras de los cable submarinos del Pacífico y Atlántico:
  - Mayor conectividad y mejores precios
  - Rutas alternativas
  - Impulsar el desarrollo de una red de transporte de alta capacidad sudamericana
  - Crear un mercado mayor.
  - Creación y disponibilidad de aplicaciones y contenidos regionales
  - Promocionando el uso regional del IXP

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ISBN 978-92-61-25711-8

Printed in Switzerland
Geneva, 2018