PARAGUAY

Landlocked Developing Countries (LLDCs) in The Americas Region
CONNECTIVITY CHALLENGES AND OPPORTUNITIES
PARAGUAY

Telecommunication Development Sector

Connectivity challenges and opportunities – Paraguay

Landlocked developing countries (LLDCs) in the Americas region

December 2017

The present report was prepared by International Telecommunication Union (ITU) expert Jaume Salvat, under the direction of the Least Developed Countries, Small Island Developing States and Emergency Telecommunication (LSE) Division of the ITU Telecommunication Development Bureau (BDT).

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1 Introduction

The Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014 to 2024 (VPoA)[1] aims to help the LLDCs overcome their challenges towards and inclusive and sustainable development. Landlocked developing countries are usually poorer than neighbouring countries, with limited capacities and dependence on a very limited number of commodities for their export earnings.

The main challenges facing landlocked developing countries include lack of territorial access to the sea, remoteness, isolation from world markets, improvement of their connectivity to the global markets, dependency on neighbouring and coastal countries for communication connectivity, low interest to invest 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. Furthermore, poor ICTs and poor telecommunication infrastructure contribute to the relative poverty of landlocked developing countries, substantially inflating transportation costs and lowering effective participation in international trade. According to the World Bank, these inflating transportation costs, both importation and exportation costs increase, limit market competiveness and profitability (The World Bank, 2010).

The difficult environment in which LLDCs are immersed, including poor infrastructure, limited access to world markets, poor logistics systems and no access to the sea, increase the costs of transport and trade transactions compared with countries General Assembly by the United Nations, 2014) (UN-OHRLLS, 2013a). According to the analysis made in the Almaty Programme for Action (ITU and UN-OHRLLS, 2013a) and the World Bank's Doing Business 2013 (The World Bank[2] and The International Finance Corporation, 2012) reports, revealed that the average costs of exporting a container for LLDCs are higher than transit countries and have increased from USD 2 200 in 2006 to USD 3 000 in 2013, while transit developing countries pay only 50 per cent of this cost. These high costs present a tremendous trade-reducing effect that has a direct negative impact on economic growth and puts them at a disadvantage in fully harnessing the potential to support sustainable development efforts.

ICTs improve connectivity to international markets, facilitate trade transactions, boost enterprise competitiveness, and can speed up customs and border crossing procedures. Information and knowledge is critical for innovation, social and economic development, and ICTs are playing a key role in helping the development of all economic sectors and competitiveness. The ICT sector is rapidly evolving, allowing the emergence of new and innovative services, which is why it is critical to deploy adequate infrastructure that allow LLDCs to ensure the pace of change needed to grow and to have a competitive advantage. There is a need to have the right broadband infrastructure in place to cope with the needs of actual and future services. Broadband can help LLDCs address their challenges such as increased costs due to lack of access to the sea, long distances to the ports, inadequate telecommunication/ICT infrastructure, cumbersome customs and border crossing processes.

The growth of GDP can be reinforced with the correct use of ICTs. According to ITU analysis, by improving affordable broadband access to the Internet to households and the private sector, GDP could increase annually by 1.5 per cent. The increase in GDP correlates directly with the increase in Internet penetration[3], for example, in developing economies if penetration rises by 10 per cent, GDP increases by between one and two per cent[4]. (ITU and UN-OHRLLS, 2013b.)

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1 www.lldc2conference.org/custom-content/uploads/2014/11/Vienna-Programme-of-Action1.pdf
2 Doing Business 2013: World Bank and International Finance Corporation, 2012.
3 www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf
4 ITU and UN-OHRLLS, 2013b

The versatility and the increased use of ICTs allows the execution and implementation of border procedures to be carried out faster and cheaper, as well as reducing the costs of transactional trade. For example, the use of services such as electronic payments, the concept of the single window and the automated system for customs data (ASYCUDA) (UNCTAD, 1981) has triggered an improvement in the efficiency and competitiveness of customs procedures and services, impacting directly on export performance and, therefore, in economic growth.

E-commerce, through ICT, presents an unprecedented opportunity to incrementally improve the trade capacity of LLDCs, but must be supported by an effective trade and transport system and an efficient ICT infrastructure, which will improve LLDC capacity to participate in international trade. E-commerce is changing the global economy and trade landscape rapidly, opening up the international market such as cross border e-commerce. Though the average number of required administrative procedures, documents, and time to export and import has decreased for LLDCs between 2006 and 2015, it is still much higher than transit countries. According to the World Bank Doing Business 2013 Report (The World Bank and The International Finance Corporation, 2012), the average number of documents that LLDCs use to export has decreased from nine in 2006 to eight in 2012, and from 11 to 10 for importing over the same time. In addition, the average time taken by LLDCs to complete export formalities has decreased from 48 to 42 days and to import from 57 to 48 days. However, LLDCs still need to do more to reduce delays as they compare badly to transit developing countries, which take an average of 23 days to export and 27 days to import.

Digital divide remains the main challenge between LLDCs and the developed world, and the transit countries. The speed of development of LLDCs may not be enough to overcome this challenge, and in addition, the digital divide exists within the LLDCs themselves such as between urban and rural areas, between social classes, between men and women.

The importance of ICT in accelerating the competitiveness of LLDCs is widely recognized and the following recommendations (UN-OHRLLS, 2013a) will go a long way to enable this transition[5]:

- Expand telecommunication facilities. Promote the participation of the private sector in the planning and management of telecommunication facilities.
- Create cargo-monitoring systems to significantly reduce delays. The international community must support LLDCs and transit countries to establish information technology (IT) systems and make improvements in facilitation and transparency. LLDCs should share knowledge and experiences on trade facilitation and take advantage of trade facilitation tools, developed under the UN Centre for Trade Facilitation and Electronic Business (UNCEFACT) (UN, 1996) such as single window implementation toolkits and guides[6] in implementing the Trade Facilitation Agreement (TFA)[7].
- Develop hard infrastructure, ICT infrastructure. Promote implementation of infrastructure sharing between transport, energy and ICT; improve the access of LLDCs to international optical fibre networks; enable LLDCs to use satellite by lowering costs through space segment consolidation efforts.
- Urge LLDCs to develop national broadband plans to be an integral part of national development frameworks and strategies and include broadband in universal access and service definitions. Make broadband more affordable.

5 UN-OHRLLS, 2013a

6 The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) was established to develop and improve worldwide coordination and cooperation in these areas: www.unece.org/cefact/

7 The TFA entered into force in 2017 and contains provisions for the movement, release and clearance of goods, including goods in transit, and sets out measures for effective cooperation between customs and other authorities on trade facilitation and customs compliance issues, amongst other things. https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm

- Develop and implement domestic ICT laws that must conform to others and to the global ICT policy, and improve regulatory frameworks for an enabling environment that can facilitate and support improved ICT connectivity.
- Promote technology transfer, e-Business, e-Government, e-Banking, e-Trading, cyber security; and facilitate access to ICTs.
- Forge partnerships between governments, inter-governmental organizations and the private sector in developing and implementing ICT plans.
- Establish ICT Public-private partnerships for viable business models, long-term institutional investors, and push those partnerships to allocate a greater percentage to infrastructure in the LLDCs.
- Collect ICT statistics and indicators, and report regularly.
- Explore innovative funding for ICT such as regional infrastructure funds, infrastructure public-private partnerships (PPPs), debt markets, and use of universal service funds.

There are several ITU conferences that adopted resolutions aimed at improving the access of LLDCs to international optical fibre networks, and their connectivity:

- The Plenipotentiary Conference of the International Telecommunication Union (Guadalajara, 2010) adopted Resolution 30 (Rev. Guadalajara, 2010). The resolution has provisions for special measures for least developed countries, small island developing states, landlocked developing countries and countries with economies in transition.
- The World Telecommunication Development Conference 2014 adopted Resolution 16 (Rev. Hyderabad 2010). The resolution contains special actions and measures for the least developed countries, small island developing states, landlocked developing countries and countries with economies in transition.
- The World Conference on International Telecommunications adopted Resolution PLEN/1 (Dubai, 2012), which contains special measures for landlocked developing countries and small island developing states 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 for Paraguay to improve the use of ICTs. It will also outline synergies between Bolivia and Paraguay, and propose some common or shared projects. To do so, the report will analyse the evolution of ICT indicators in Paraguay, compared with both developed and developing countries, other LLDCs and countries in South America.

The report will also examine both legal and regulatory aspects, and those related to connectivity, services and prices. It will differentiate between different areas in each country, and between access, national backbone and international connectivity. It will further review the use of ICT in economic, public, and social sectors of each country. It also identifies initiatives, which can lead to improvements in the efficiency of each sector, proposes new and innovative services, and analyses the challenges and opportunities for Paraguay to significantly improve the development of ICTs.

2 Paraguay today

Recognizing the importance of ICTs for LLDCs to become more efficient and competitive in all economic sectors, it is paramount to measure the evolution and status of all economic aspects related to ICTs in the Americas region. These include policy and regulatory aspects, connectivity of fixed and mobile telephony, broadband connectivity and Internet use. They will be analysed from the perspective of

both fixed and mobile networks, with developed and developing country benchmarks, and compared with other LLDCs and countries in South America.

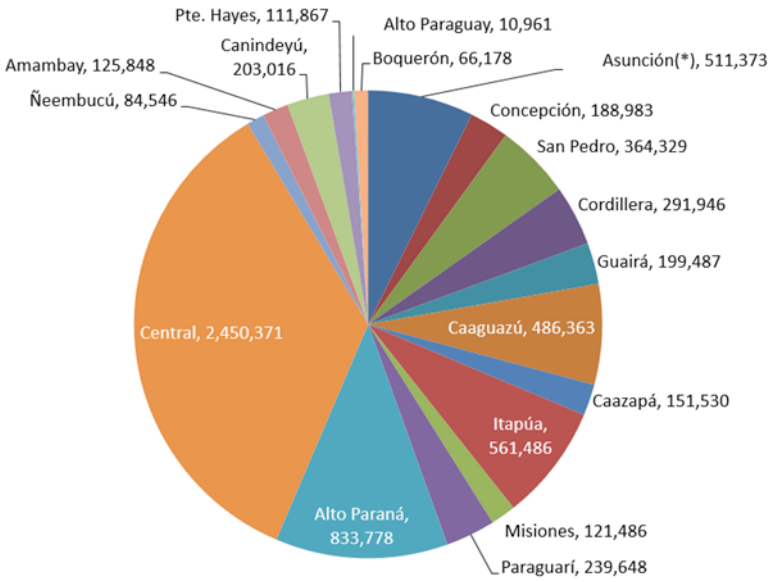
The Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014 to 2024[8] aims to help the world's 32 LLDCs create sustainable, inclusive and rapid economic growth and development. This programme has six priority areas, among these priorities the importance of information and communication technology infrastructure to improve productivity growth in a sustainable and inclusive manner was highlighted, such as: decreasing costs, facilitating market expansion (beyond borders), improving access to services, providing access to broadband infrastructure, increasing participation in governance, and accountability and transparency. However, for LLDCs, it is difficult to keep up-to-date with fast paced technical advances and policy, especially as broadband costs are, as a share of gross national income, so much higher than countries with coastlines. In addition, the small size of the markets, and the lack of a suitable regulatory environment are two other important factors that impact directly on ICT costs and coverage in LLDCs.

Analysis of the ICT Development Index (IDI) and evolution of economic indexes (prices) of the Americas region LLDCs will give to a better understanding of the critical factors needed to achieve high penetration of ICTs. The 2030 Agenda for Sustainable Development and the SDGs will also impact LLDCs through implementation support, relevant strategies and programmes of action, and follow-up reviews, which require enhanced capacity-building support for LLDCs including the strengthening of national data systems and evaluation programmes.

2.1 Demographics and economic indicators

According to the official data published by the *Dirección General de Estadística, Encuestas y Censos*, 2015, the population reached 7 003 196 people, of whom 50.57% are women. With a low population density of around 17 per km^2, Paraguay is divided into 18 different departments. Figure 1 shows the distribution of population.

Figure 1: Population distribution (by department)



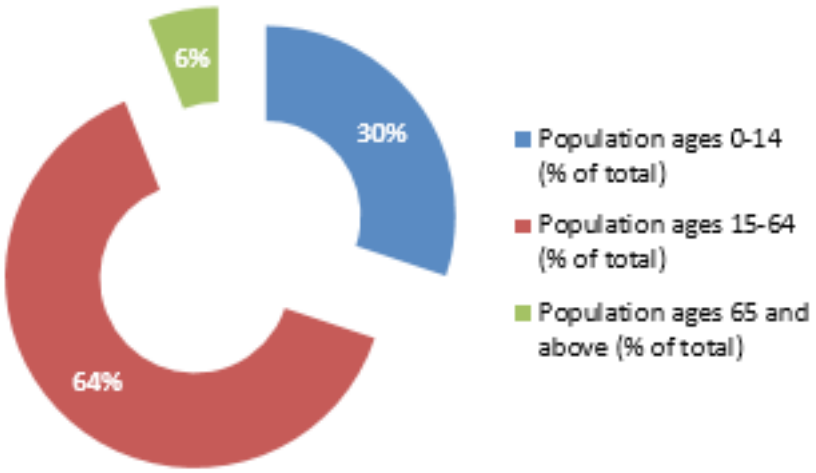
Source: Dirección General de Estadística, Encuestas y Censos, 2015

[8] https://unohrlls.org/custom-content/uploads/2015/03/Vienna-Programme-of-Action.pdf

Age distribution of population

The age distribution of the population in Paraguay (Figure 2) show that 6 per cent over 65 years old, 30 per cent of young people between 0 and 14, and 64 per cent between 15 and 65.

Figure 2: Age distribution of population

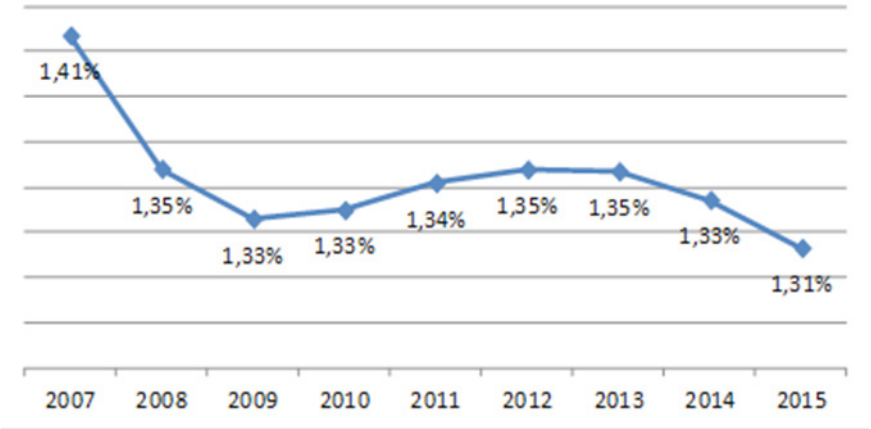


Source: The World Bank, 2017

Population growth

Figures from the World Bank indicate that the Paraguay population has been in overall decline in recent years, from 1.41 per cent in 2007 to 1.31 in 2015, although relatively stable from 2009 to 2014 (The World Bank, 2017).

Figure 3: Population growth 2007-2015



Source: The World Bank, 2017

Main economic indicators

Table 1 summarizes the main economic indicators for Paraguay

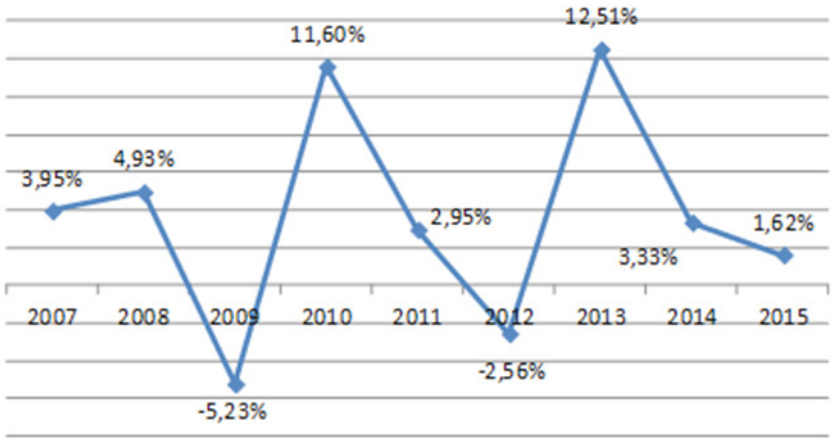
Table 1: Main economic indicators for Paraguay

GDP (constant 2010 USD)	2015	25.380 (Millions)
GDP per capita (constant 2010 USD)	2015	3.822
GDP per capita (current USD)	2015	4.081
GINI index (World Bank estimate)	2014	51.7
GNI (constant 2010 USD)	2015	24.002 (Millions)
GNI per capita (constant 2010 USD)	2015	3.615
GNI per capita, Atlas method (current USD)	2015	4.190
Exports of goods and services (% of GDP)	2015	42.68
Imports of goods and services (% of GDP)	2015	41.78
Gross national expenditure (% of GDP)	2015	99.10
Gross savings (% of GDP)	2015	14.65

Source: The World Bank, 2017

Figure 4 shows that GDP growth has been uneven, between 2007 and 2015 in Paraguay, reaching 12.51 per cent in 2013; the worst year was 2009, with a negative growth of 5.23 per cent.

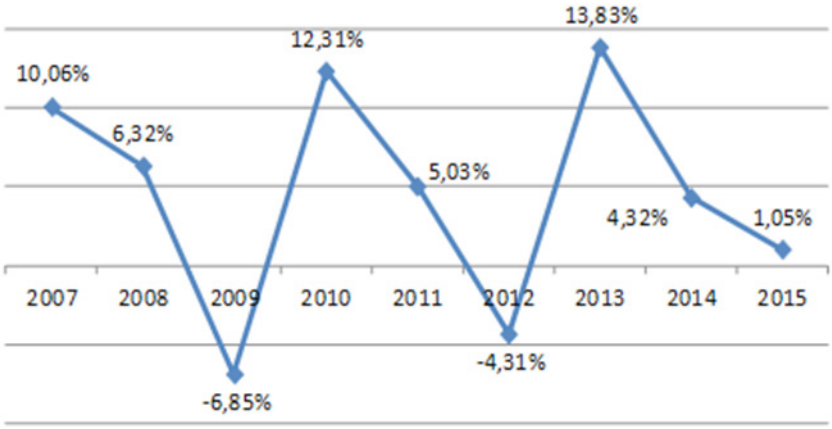
Figure 4: GDP per capita growth (annual %)



Source: The World Bank, 2017

In Paraguay, the growth trend of GNI per capita is very similar to GDP, with a low of-6.85 per cent in 2009 and a high of 13.83 per cent in 2013.

Figure 5: GNI per capita growth (annual %)

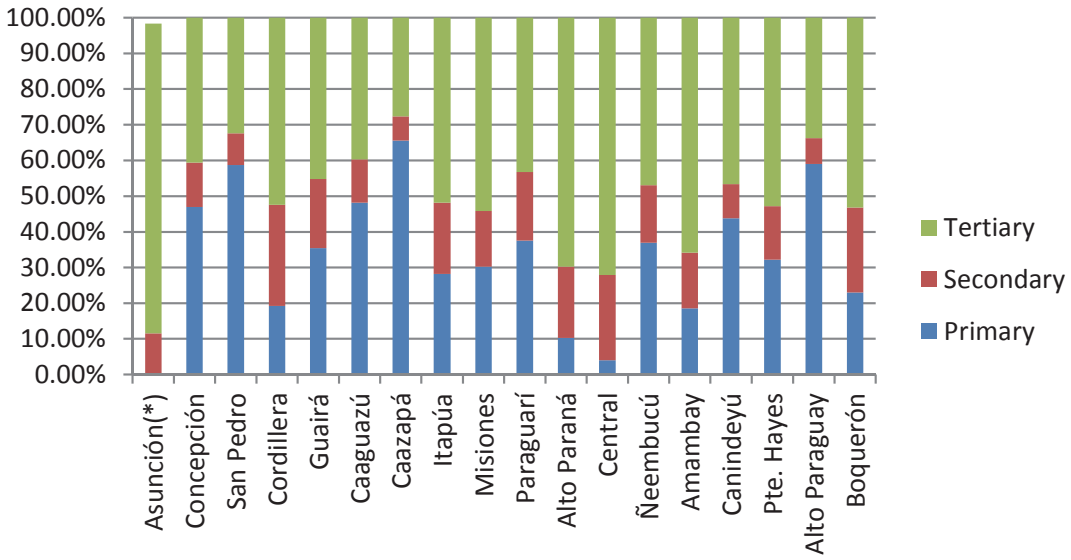


Source: The World Bank, 2017

Employment by economic sector

Figure 6 shows the distribution of employment among the different sectors, by department. In the departments of Concepción, San Pedro, Caagazú, Caazapá, and Alto Paraguay, the primary sector is dominant and, in the other departments, the tertiary sector is the most important.

Figure 6: Employment by economic sector



Source: The World Bank, 2017

2.2 Regulation and policy

There has been an evolution in recent years of the policy, by approving new telecommunication legislation, and adapting regulation to better address the needs of the ICT market in order to ensure higher penetration of services and lower prices. The telecommunication market is evolving very rapidly with new technologies and services and Paraguay needs to continue the pace of this evolution. Other regulations and policies should encourage the deployment of broadband infrastructure, services, and Internet access, which have become essential to ensure the competitiveness of any country.

2.2.1 National legislation

Telecommunication Law (No. 642/95) (Comisión Nacional de Telecomunicaciones, 1995)

The State is responsible for the promotion, control and regulation of telecommunications through CONATEL (Comisión Nacional de Telecomunicaciones) within the framework of an integrated policy of services, providers, users, technology and industry. It establishes the free and equal right of access to the use and provision of telecommunication services; and in promoting the inclusion of the most remote places as connection in these remote areas has not been legalized yet. The following types of services have been defined in the telecommunication law:

1. Basic service: the telephone service.
2. Broadcasting services: those that allow the transmission or emission of communications in one direction to several points of reception simultaneously.
3. Other services:
    - value added services;
    - private services;
    - radio amateur;
    - small and medium-scale broadcasting services or community radios;
    - state related services.

Telecommunications Law (No. 642/95) also establishes the compulsory nature of interconnection of public telecommunication services. It is also notable that Paraguay has established a universal services fund administered by CONATEL.

Decree nº 14135 Regulatory Rules of Telecommunications Law nº 642/95 (Gobierno de Paraguay, 1996)

This decree establishes the general rules for the provision of telecommunication services, the organic structure of CONATEL, the administration of the radio-electric spectrum, the standardization and homologation of telecommunication equipment and devices, and the regulation of the services market, according to the objectives and principles established in the Telecommunications Law (No. 642/95).

Law creating the framework for the application of ICT in the public sector: Law No. 4989-2013 (Secretaría Nacional de Tecnologías de Informaciόm, 2013)

This law creates the framework for the application of ICT in the public sector, emphasizing that ICT research, promotion, and development is a national policy involving all sectors and levels of public administration and society, to contribute to educational, cultural, economic, social and political development, to increase productivity, competitiveness and social inclusion, among others. ICT must serve the general interest, and it is the duty of the State to promote its efficient access and equal opportunities to all inhabitants of the national territory.

In addition, this law created SENATICs (*Secretaría Nacional de Tecnologías de la Información y Comunicación*), which is an executive institution responsible for implementing the principles and aims of ICT in the public sector and that, in turn, created a national fund for technologies in education (FONTED) that operates under SENATICs in order to achieve the national ICT programmes in education, as well as the digital inclusion objectives linked to Law 4989-2013 and regulated by Decree No. 11624 of 2013 (Ministerio del Interior, 2013).

The main guiding principles of the law are to:

- prioritize access and use of ICTs;

- use infrastructure and scarce resources in an efficient manner;
- protect the rights of citizens;
- allow free technology adoption;
- maximize use of e-Government.

Other relevant decrees

Decree PE No. 7052/17 (Ministerio de Relaciones Exteriores, 2017): The National Cybersecurity Plan (*Secretaría Nacional de TIC*, 2016) is approved and the National Cybersecurity Commission is integrated.

Decree No. 6234/2016 (Gobierno de Paraguay, 2016b): The application and use of ICT in public management is declared of national interest.

Decree No. 5323/2016 (Gobierno de Paraguay, 2016a): Establishes the framework for the application of ICTs in the public sector and establishes the coordination of the specialized units of specialized ICT units of public institutions.

2.2.2 National telecommunication plan 2016 to 2020

The national telecommunication plan (Comisión Nacional de Telecomunicaciones 2016-2020, 2016) constitutes a basic reference document to ensure a planned and coordinated action of the investment, stimulus, and development efforts that will allow Paraguay to advance towards a more connected, inclusive society with a more intense use of communications and information, to accelerate the progress of the population and society.

The plan covers all telecommunication services that are considered as part of the national infrastructure, including applications and services, which together constitute the telecommunication networks that meet the demands of the population. It is based on analysis of the present ICT environment, a broad analysis of possible alternatives, and it sets out policies and actions to achieve objectives with specific milestones.

It is of fundamental importance for the efficient and effective management of a country that all governmental bodies have the same priority guidelines for the development of the country. In this context, the national telecommunications plan is a sector plan that is immersed in a larger plan, the National Development Plan 2030 (Gobierno de Paraguay, 2014) approved by Decree 2794/14 (Ministerio de Hacienda: *Plan Nacional de Desarrollo Paraguay 2030*).

The main directives of the National Development Plan 2030 are:

- **A connected society**: Expand accessibility to telecommunication services. The main objectives of this axis are to offer telecommunication services with international quality standards and enable the majority of the population to access these services.
- **Digital inclusion**: Identify, collaborate and accompany public and private initiatives for the adoption and use of telecommunication services to reduce information asymmetry. It has themes ranging from incentives to develop digital services and provide digital literacy and skills, and train people for the use of these services.
- **Regulatory efficiency**: Promote regulatory efficiency. This includes topics ranging from transparency plans for information to the population, to structuring and prioritizing the regulatory activities of CONATEL.

2.2.3 Regulation of the universal services fund

Chapter II Article 97 of Law 642 (1995) established the terms and conditions of contribution to the Universal Services Fund (USF) and that it will be administered by CONATEL with the purpose of subsidizing public telecommunication service providers.

The objectives of the USF are:

- Promote the expansion of public telecommunication services in rural areas, and places of public and social interest.
- Promote efficient access to public telecommunication services, provide quality services at reasonable prices taking into account the levels of income of the beneficiary population.
- Maximize the economic benefit in the provision of telecommunication services by reducing costs in the provision of the most basic services such as health and education.

Contributions to the USF resources come from:

- Percentage of telecommunication operators total gross revenues (turnover) (20%)[9].
- Assignments, donations, bequests, transfers or other contributions that are destined to be used to further the objectives of USF.

2.3 Connectivity and benchmarking

Telecommunication networks are important and facilitate access to ICTs from a wide range of the population. Governments generally try to create the right environment to attract private investment, for example, to renew or deploy infrastructure, they invest public funds or use public-private partnerships, which has helped in the positive evolution of the connectivity indicators, especially in mobile networks, both for telephony and broadband.

This section analyses indicators related to connectivity such as fixed telephony subscriptions, mobile telephony, broadband connections (fixed and mobile network), availability of computers and Internet access, and especially interesting to LLDCs, the availability of international bandwidth per user.

The figures in the next sections compare indicators of both developed and developing countries, the world average of all countries, and the world LLDCs, with South America countries. And this report compares the indicators of Bolivia and Paraguay, the only two Americas region LLDCs.

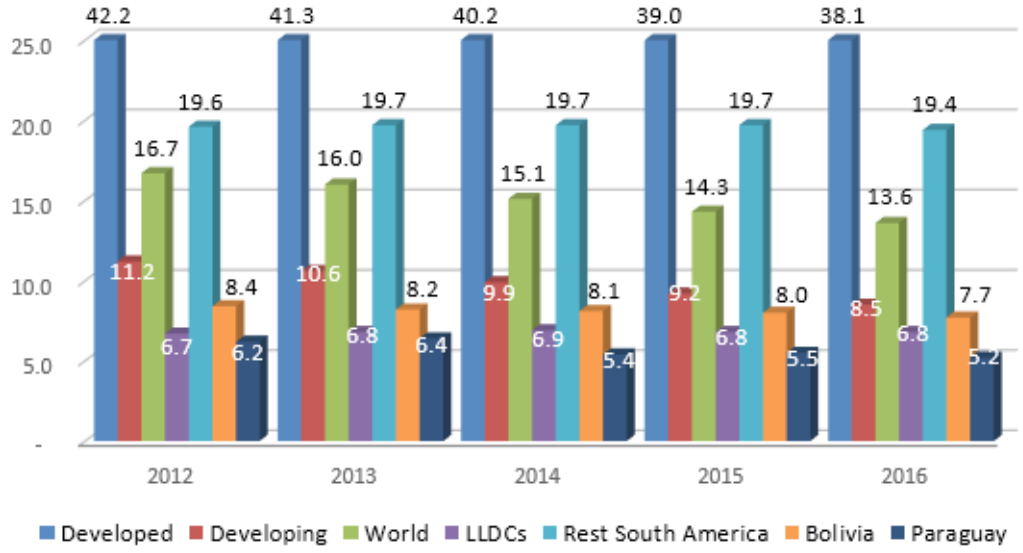
Furthermore, the report will compare the indicators with the evolution in recent years in developed and developing countries, the world average of all countries and, with the LLDCs and the rest of the South America countries that will give us a better idea of the gaps with Bolivia and Paraguay.

2.3.1 Fixed telephone subscriptions

There is a very large gap, as illustrated by Figure 7, between the numbers of fixed telephone subscriptions in developed countries and other countries, especially LLDCs. The penetration rate of Bolivia (7.7% in 2016) is higher than that of Paraguay (5.2% in 2016), and both are considerably lower than other countries of the region (19.4% in 2016).

[9] Special tariffs were established for the use of the spectrum for operators using satellite technology.

Figure 7: Benchmarking fixed telephone subscriptions

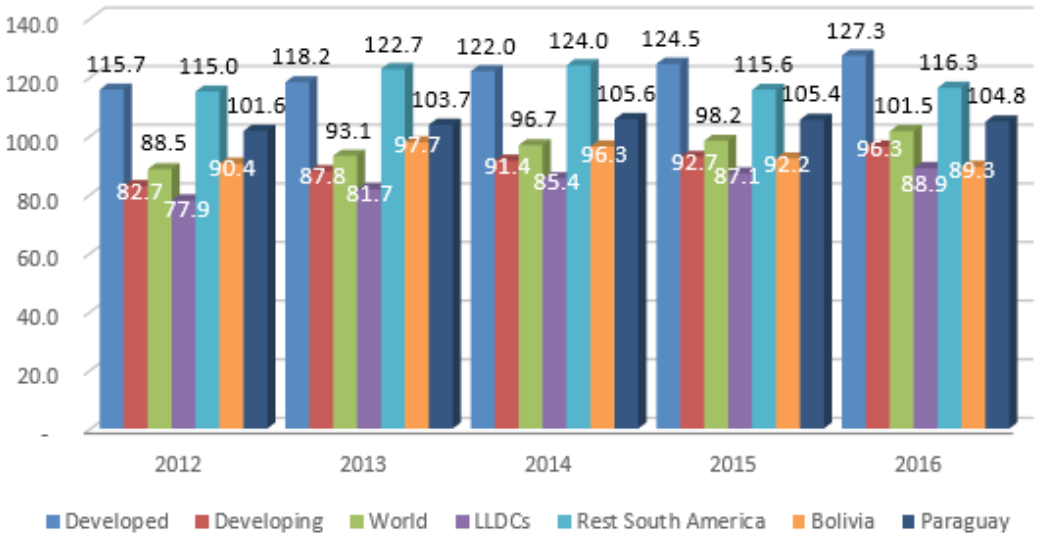


Source: ITU

2.3.2 Mobile telephone subscriptions

The availability of mobile networks has increased considerably in recent years, leading to relatively high penetration levels. There is little difference in penetration rates in mobile networks in Bolivia (89.3% in 2016) and Paraguay (104.8% in 2016), and with those in the developed countries (127.3% in 2016) and the rest of South America (116.3% in 2016) and slightly higher than the average of LLDCs (88.9% in 2016).

Figure 8: Benchmarking mobile-cellular telephone subscriptions

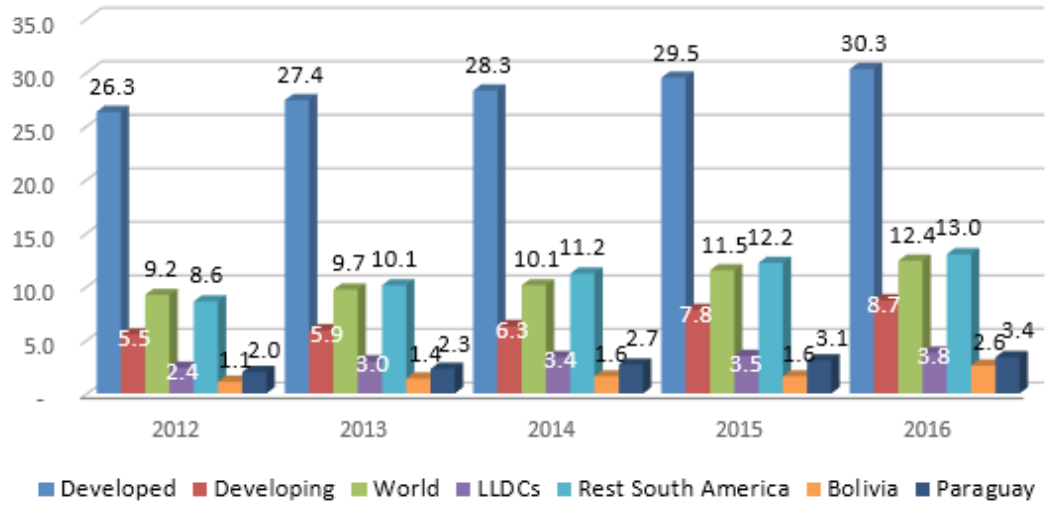


Source: ITU, 2017b

2.3.3 Fixed broadband subscriptions

Following the trend of the deployment of fixed networks, subscription to fixed broadband services is low both in Bolivia (2.6% in 2016) and Paraguay (3.1% in 2016). The developed countries have much higher penetration rates, around 30 per cent in 2016 while South America country rates only reached 13 per cent in 2016.

Figure 9: Benchmarking fixed broadband subscriptions

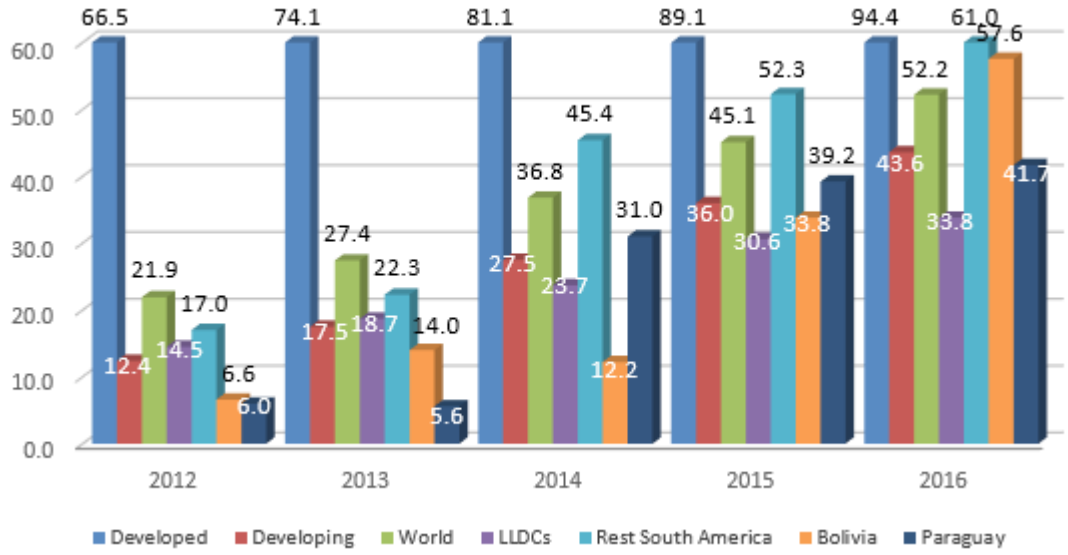


Source: ITU, 2017b

2.3.4 Active mobile broadband subscriptions

In the last three years, there has been a very important increase in the penetration of mobile broadband services, both in developing countries (43.6% in 2016) as well as in LLDCs (33.8% in 2016). This is also the case in Bolivia (57.6% in 2016) and Paraguay (41.7% in 2016), closing the gap that existed with developed countries (94.4% in 2016). The penetration of Americas region LLDCs is slightly lower than the rest of the South America countries (61.0% in 2016), but with a faster growth.

Figure 10: Benchmarking active mobile broadband subscriptions

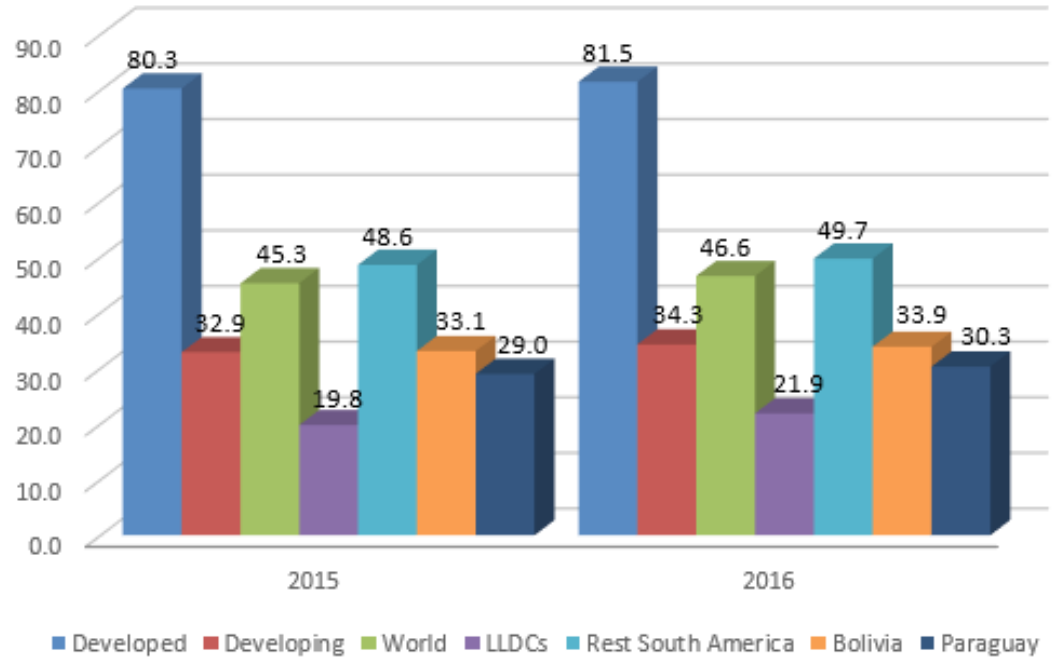


Source: ITU, 2016e

2.3.5 Households with a computer

The availability and use of computers by people at home gives us a clear idea of how the use of new technologies in the residential environment is evolving, as well as the increase of digital training. The levels of penetration in Bolivia (33.9% in 2016) and Paraguay (30.3% in 2016) as shown in Figure 11, is closing the gap with other countries in South America (49.7% in 2016).

Figure 11: Benchmarking households with a computer

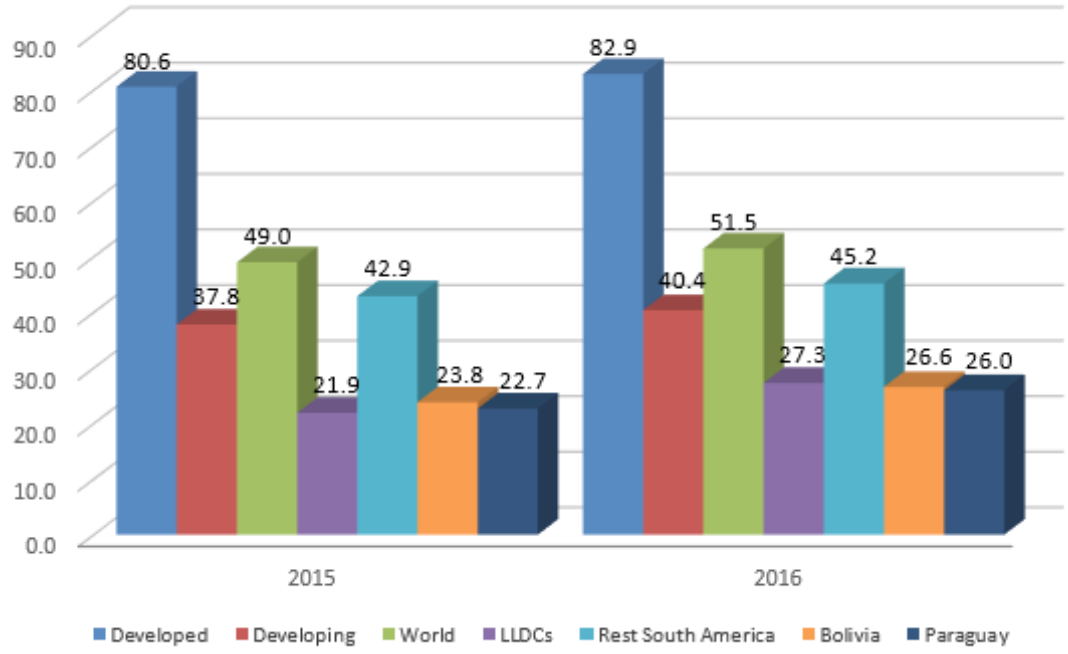


Source: ITU, 2016e

2.3.6 Households with Internet access

Ideally, Internet access from home should not be very different from the penetration of computers in households, with penetration levels playing catch-up in the following years. For 2016, the difference in Bolivia was 7.3 per cent, while in Paraguay it was 4.3 per cent, similar to other countries in South America (4.5% in 2016).

Figure 12: Benchmarking households with Internet access at home

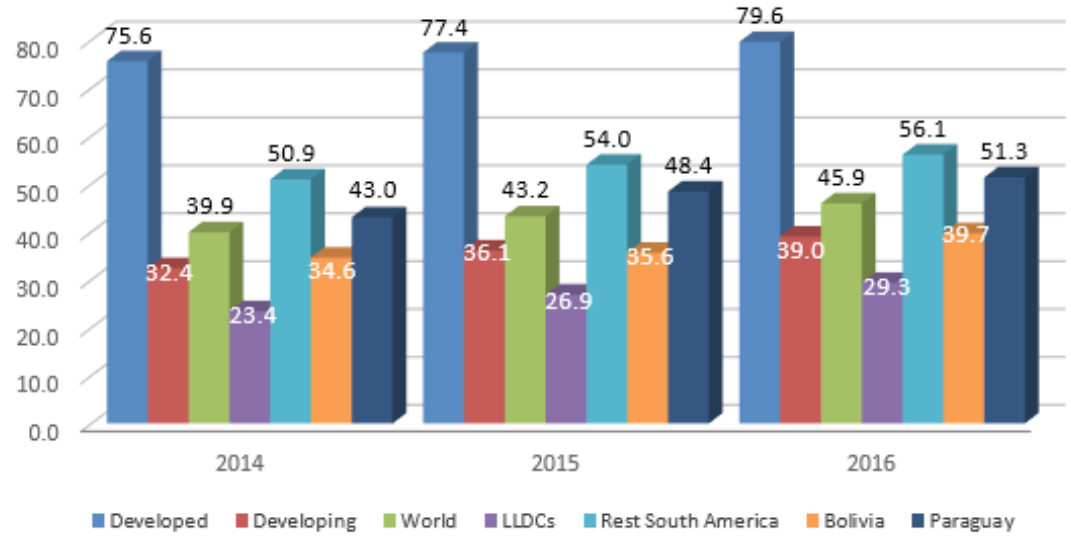


Source: ITU, 2016e

2.3.7 Individuals using Internet

Figure 13 shows that from 2014 to 2016, Internet access has risen consistently in both Bolivia from 34.6 to 39.7 per cent and Paraguay 43 to 51.3 per cent, closing the gap with respect to other countries in South America at 56.1 per cent in 2016.

Figure 13: Benchmarking individuals using Internet

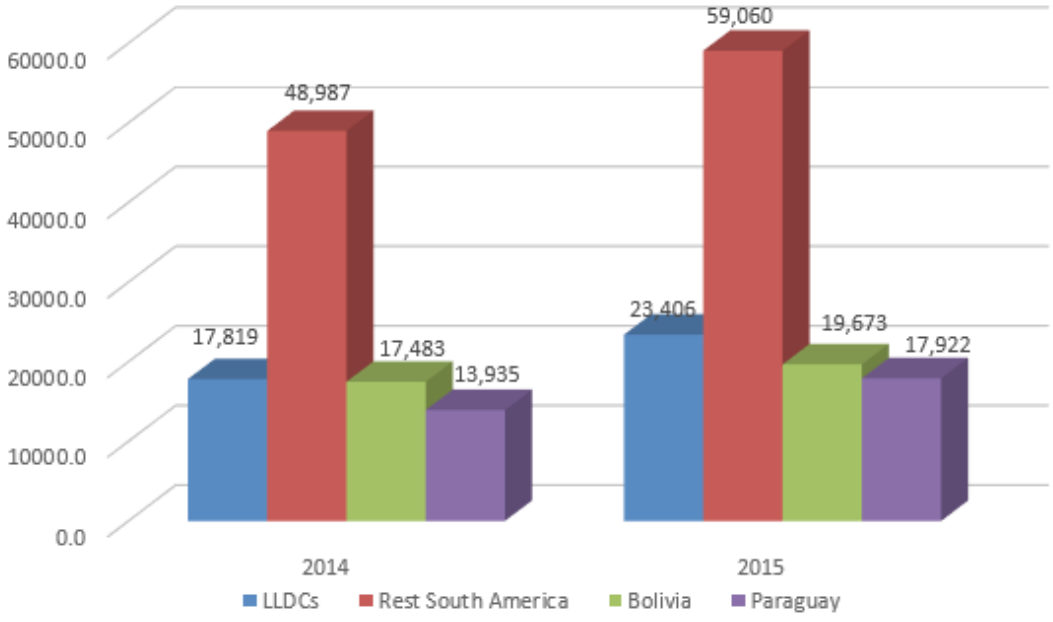


Source: ITU, 2017b

2.3.8 International Internet bandwidth per Internet user

Measuring and comparing the level of international bandwidth per Internet user is essential to better understand the difficulties faced by LLDCs in increasing the use of new technologies. Most Internet content is outside their countries and, since they do not have direct access to international submarine cables, the cost of Internet access is higher. Fees associated with both peering and transport increase the costs of accessing both cables and IP traffic exchange points. The current situation in Bolivia and Paraguay is challenging. Since 2015, the international bandwidth has been between 20 and 30 per cent below the LLDC average, and far below other countries in South America.

Figure 14: Benchmarking Internet bandwidth (bit/s) per Internet user



Source: ITU, 2016e

2.4 ICT Development Index 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, but to better understand access and use of these services in LLDCs, other indicators are useful, such as the ICT Development Index (IDI) and the ICT price basket, related to the GNI per capita in each country.

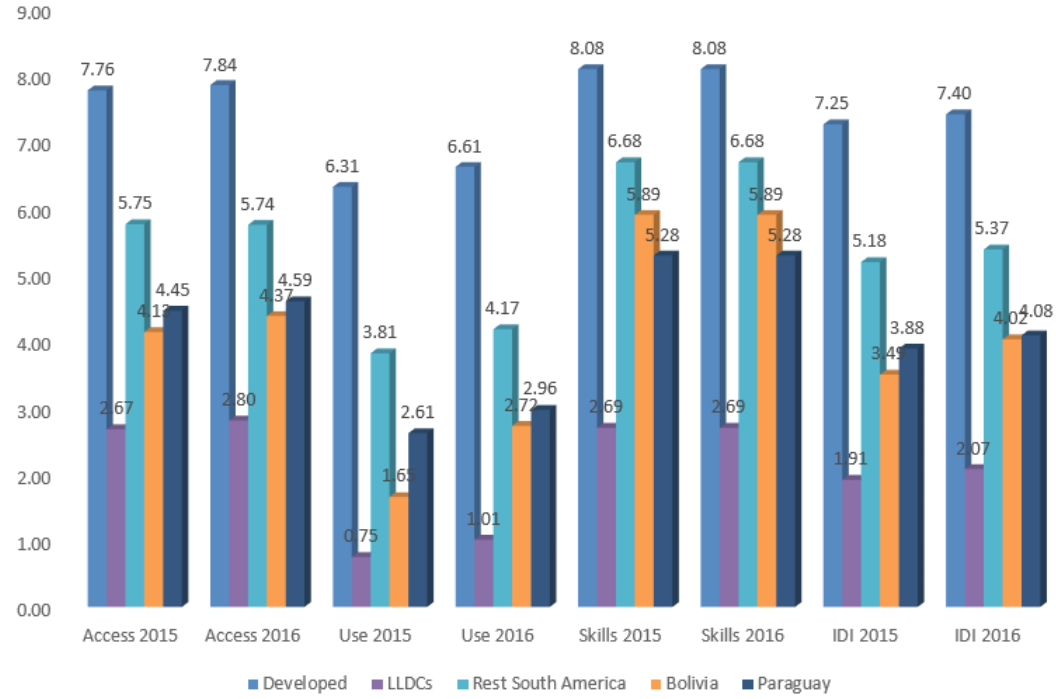
The ICT Development Index (IDI) (ITU, 2016e) is a composite index combining several indicators into one benchmark measure that serves to monitor and compare developments in information and communication technology (ICT) across countries. The main objectives of the IDI are to measure:

- 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:

1. 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).
2. 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).
3. 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 therefore is given less weight in the computation of the IDI compared with the other two sub-indices.

Figure 15: Benchmarking



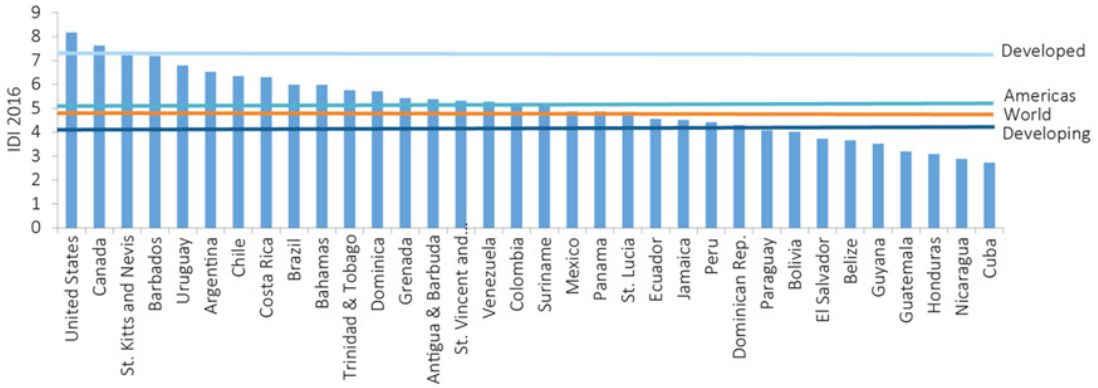
Source: ITU, 2016e

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. The highest values are in the Europe region LLDCs. The Asia Pacific region, and Americas region LLDC values are similar, with the Africa region having the lowest values in all sub-indexes.

The IDI of Bolivia and Paraguay increased in 2015 to 2016 (+15.2% in Bolivia and +5.2% in Paraguay), due to the increase in the use sub-index (+64.8% in Bolivia and 13.4% in Paraguay), since the access sub-index (+5.8% in Bolivia and +3.1 in Paraguay) has grown little and the skills index has remained stable (the same in both countries). With the average of other countries in South America, the difference has decreased for Bolivia and continues to be stable for Paraguay.

The information provided in Figure 16 is also interesting as it includes details of all countries of the Americas region and shows the averages of IDI values of developed countries, developing countries, the Americas region, and the world average. IDI indexes for Paraguay and Bolivia are similar, very close to the developing country average.

Figure 16: Benchmarking the Americas region IDI



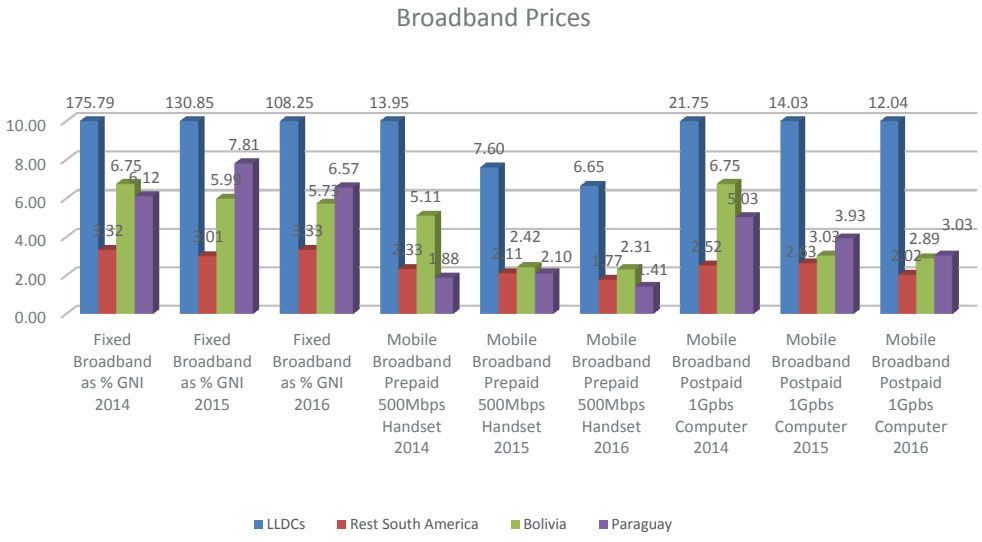
Source: ITU, 2016e

2.4.2 Prices

An essential aspect when measuring the possibility of the use of telecommunication services by the population of a country is the cost that it represents in relation to its purchasing power. ITU annually publishes (ITU, 2016e) the cost of fixed and mobile broadband services as a percentage of average gross national income (GNI) per capita. It allows the evaluation of price and affordability of ICT services in every country, and for them to be benchmarked against those in other countries. However, it is very difficult to compare similar prices due to the variety of offers and bundles available in all countries.

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

Figure 17: Benchmarking broadband prices

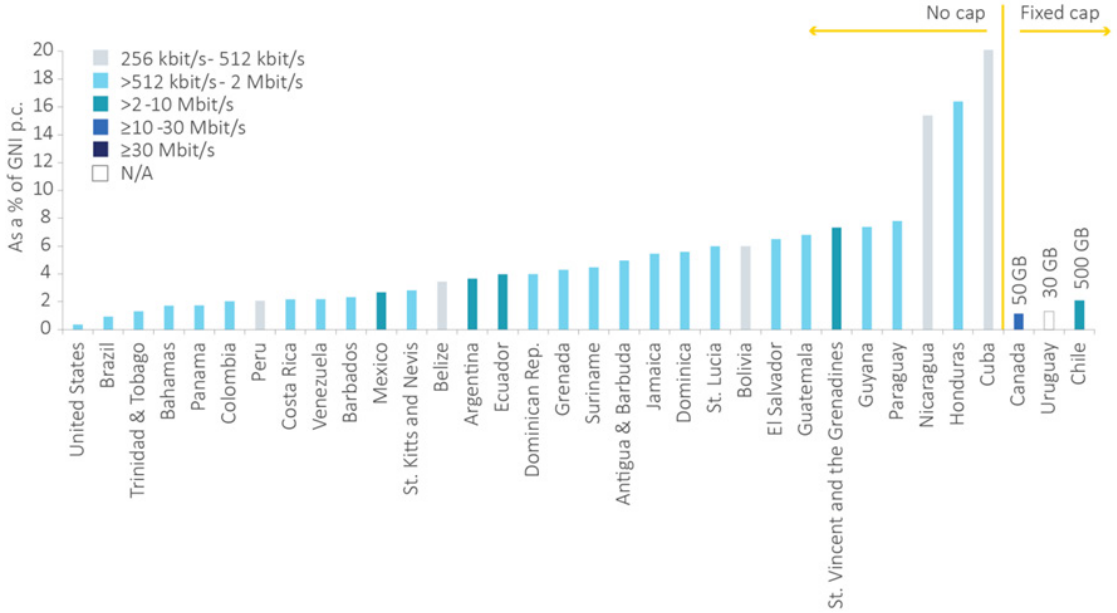


Source: ITU, 2017b

The fixed broadband price indicators in 2015 for Bolivia and Paraguay suggest that prices remain relatively high, compared with the rest of South America. While the evolution between 2014 and 2016 has been positive for Bolivia, prices in Paraguay increased in 2016, compared to 2014. However, the differences in indicators for mobile broadband have followed a positive trend for both countries, being very close to the average of the rest of the South America in 2016.

Figure 18 compares fixed broadband prices of the Americas region with average connection speeds and shows that in Paraguay the average speed is higher than in Bolivia but that the cost with respect to GNI per capita is also higher in Paraguay.

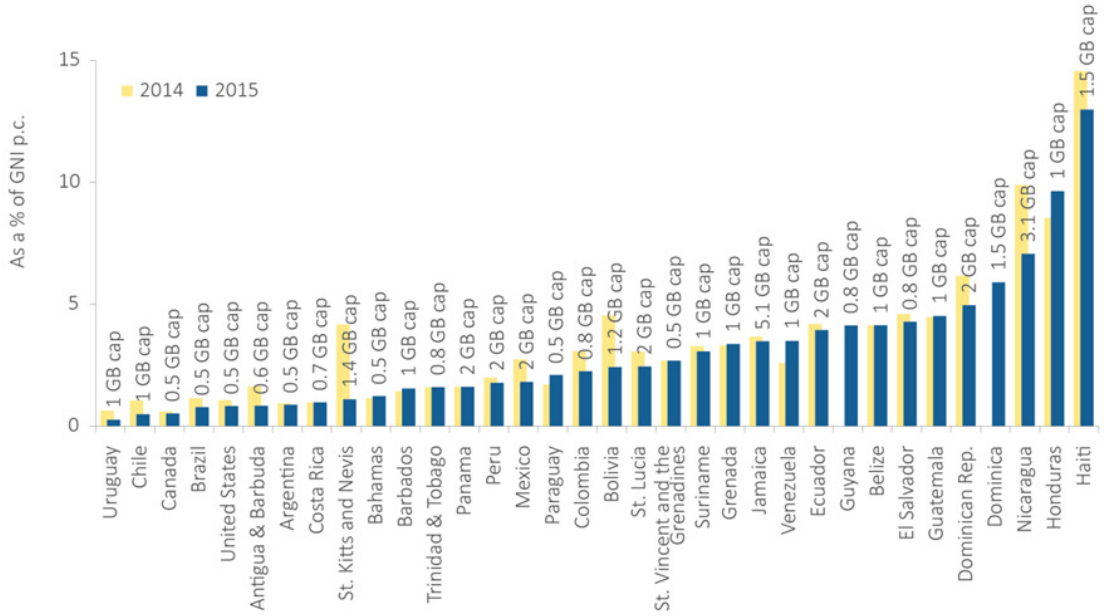
Figure 18: Fixed-broadband prices as a percentage of GNI per capita speeds and caps



Source: ITU, 2016e

The mobile broadband indicators of Bolivia and Paraguay, compared to the rest of the countries of the Americas region, improve substantially compared with those of fixed broadband. It is worth mentioning the improvement made by Bolivia between 2014 and 2015, substantially reducing the difference with Paraguay.

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



Source: ITU, 2016e

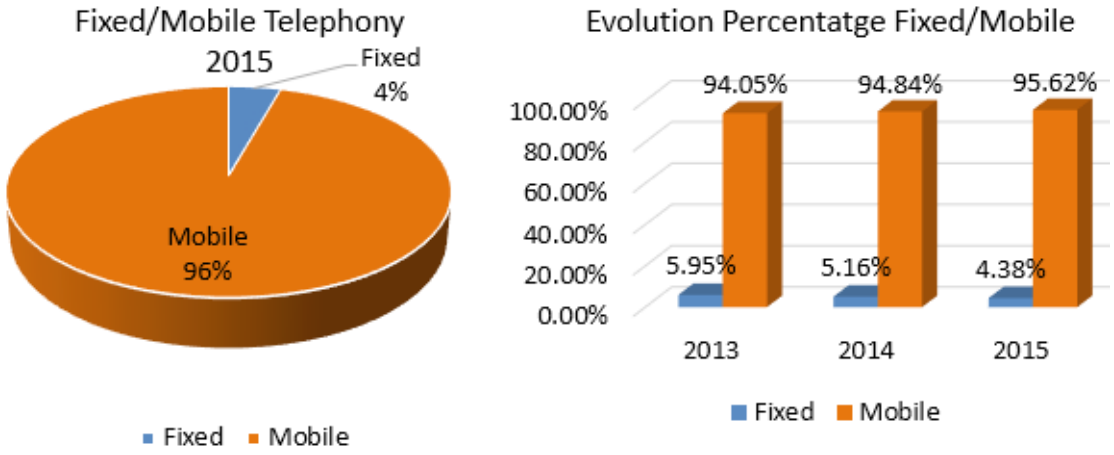
2.5 Paraguay main indicators broadband and Internet access

According to the benchmarks, there are many differences between the two Americas region LLDCs. This section looks at Paraguay's indicators in relation to access technologies, both fixed and mobile, especially broadband and Internet access. The situation in any country is not always uniform, so to see departmental indicators and the fibre backbone that connects them is important to better understand the availability of services in them.

2.5.1 Access technologies

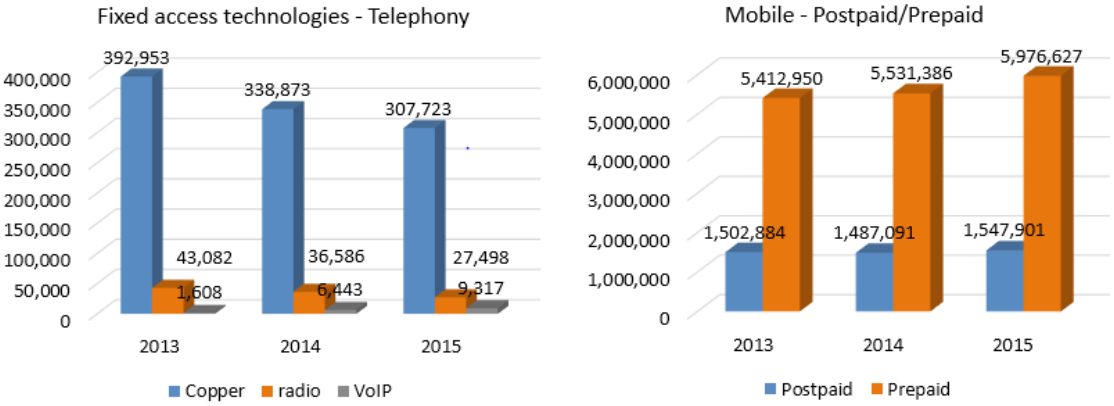
The graphs in the following figures show that the clear majority of telephony is mobile (95.62 per cent by the end of 2015), with a distribution of 79.4 per cent for prepaid and 20.5 per cent for post paid. Likewise, there is a gradual decrease of around 10 per cent in fixed telephony.

Figure 20: Access technologies: fixed/mobile



Source: CONATEL 2016b

Figure 21: Access technologies

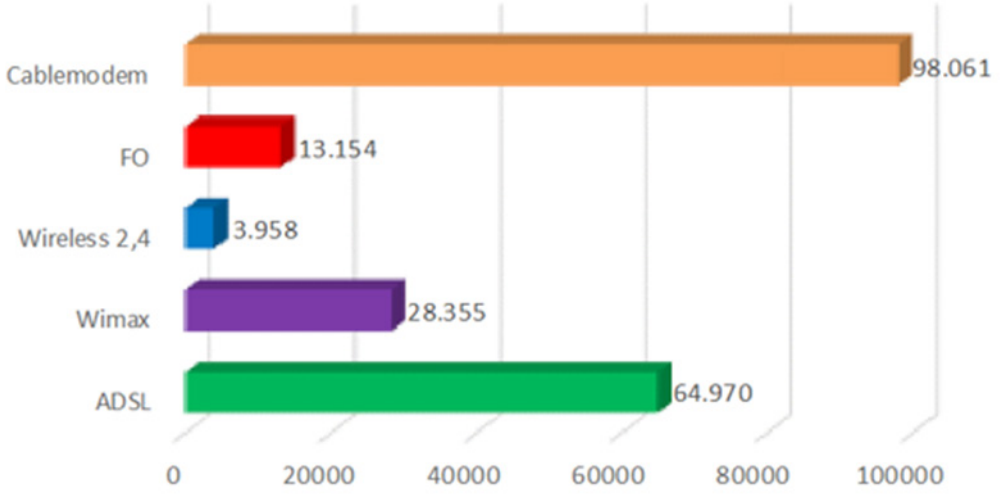


Source: CONATEL 2016b

Fixed access technologies

Access from the fixed broadband network is limited in Paraguay, with the dominant technology being cable modem, followed by ADSL and WiMAX, and there are few FTTx (fibre to the x) broadband network deployments to provide last mile connections.

Figure 22: Access technologies: Fixed

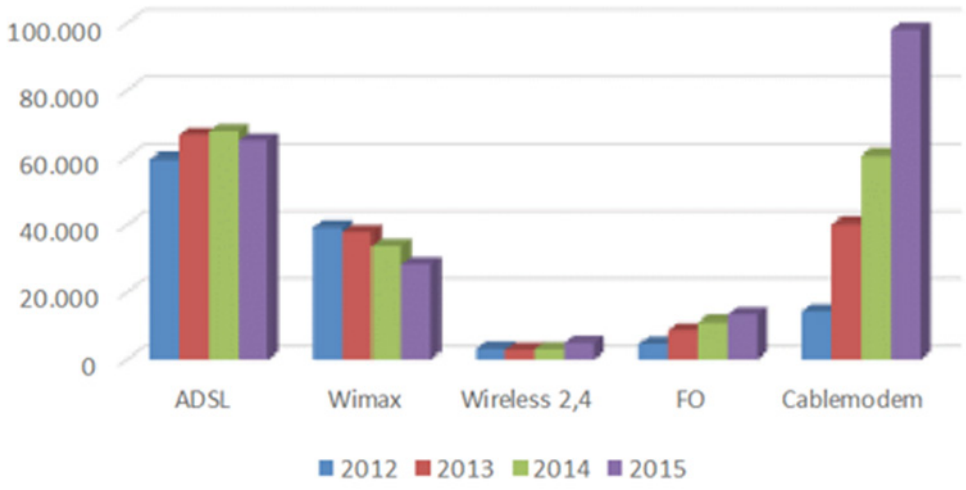


Source: CONATEL 2016b

Looking at the evolution in recent years, there has been a rapid growth of hybrid fibre coaxial (HFC) networks, maintaining the total number of ADSL connections. There is a downward trend in WiMAX connections, probably being replaced by other technologies, and the growth of FTTx is not significant.

While most operators in Paraguay recognize the importance of being able to offer converged services, under current conditions, rapid and massive deployment of fixed networks is unlikely.

Figure 23: Access technologies: Fixed broadband evolution

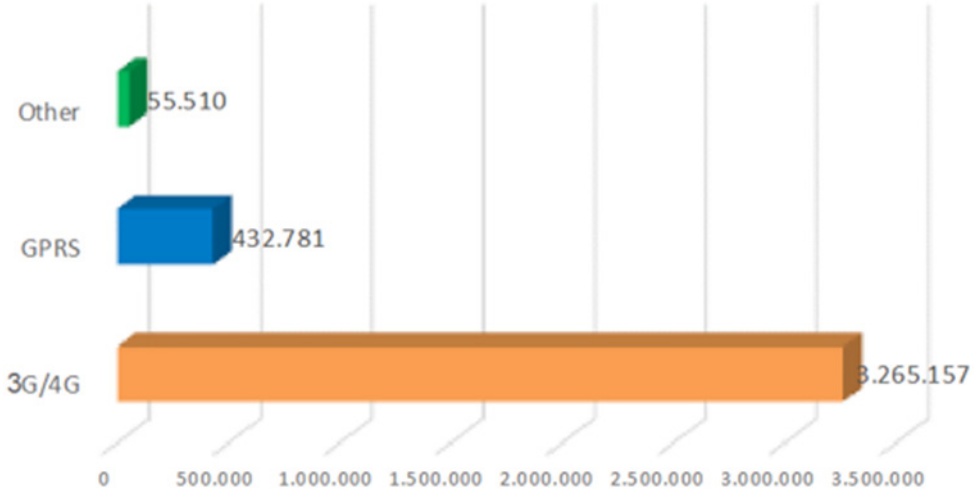


Source: CONATEL 2016b

Mobile access technologies

Mobile operators are making a significant effort in the deployment and availability of LTE-Advanced (4G), but the clear majority of handsets are 3G, with coverage in most of the country.

Figure 24: Access technologies: Mobile subscriptions

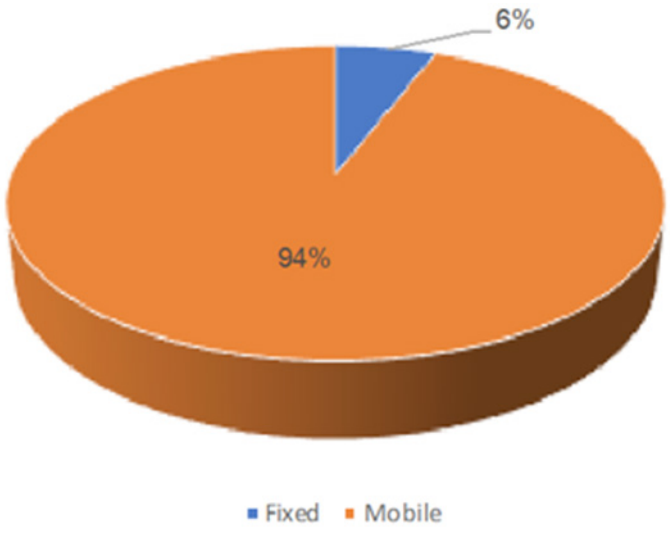


Source: CONATEL 2016b

2.5.2 Internet access

Considering the limited availability of fixed access networks, it is not surprising that most of the population access the Internet through the mobile network (around 94%). The recent launch of 4G networks will progressively increase access speed.

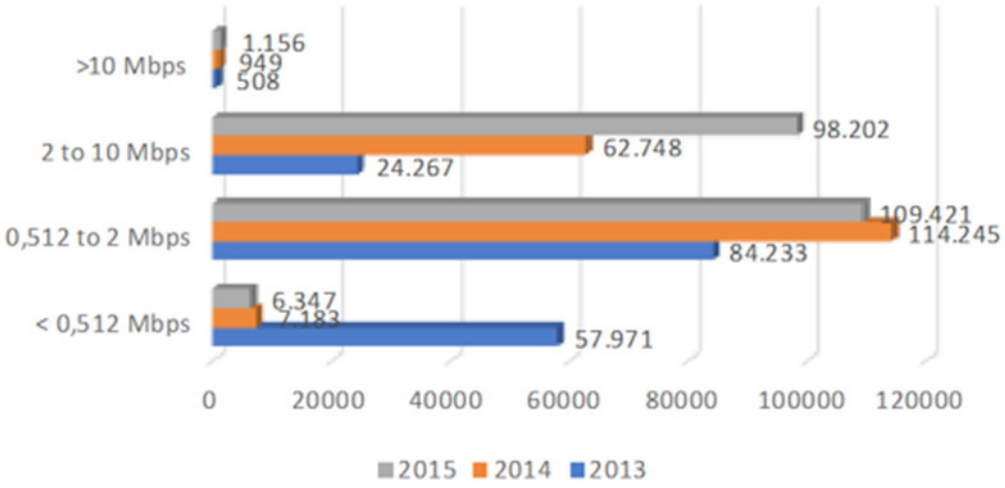
Figure 25: Internet connectivity



Source: CONATEL 2016b

The average speed of Internet access in the fixed network is relatively low, with most connections below 2 Mbit/s, but there is a clear upward trend in 2015 for an increased access speed of between 2 and 10 Mbit/s.

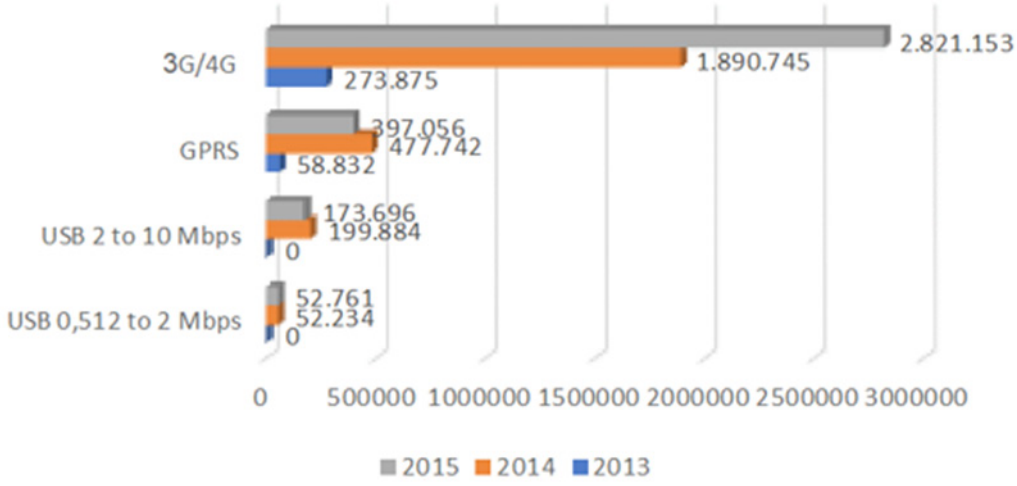
Figure 26: Fixed Internet connectivity



Source: CONATEL 2016b

There has been a very significant increase in access through 3G / 4G, reaching almost a tenfold increase in the number of users between 2013 and 2015, which is a result of the efforts made by all mobile operators, decreasing the number of GPRS connections to around 20 per cent between 2014 and 2015.

Figure 27: Mobile Internet connectivity



Source: CONATEL 2016b

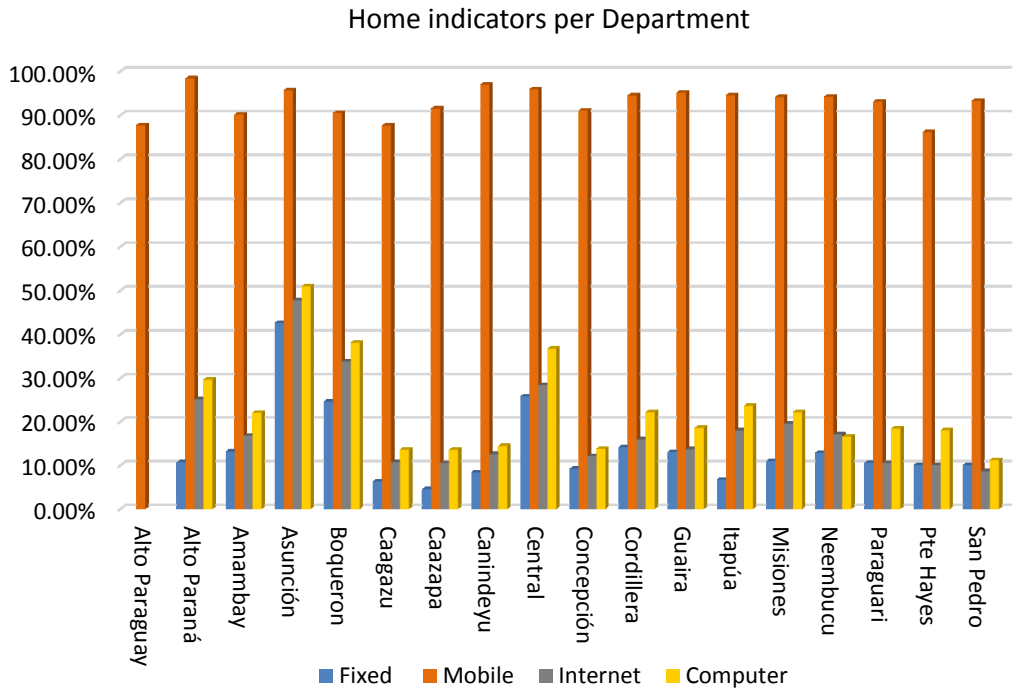
Figure 28 illustrates the indicators for fixed access, mobile access, Internet access, and computer availability per home and for each department in Paraguay. It shows significant differences and diversity among the 17 departments (plus the capital, Asunción) in the main indicators, except in the penetration of mobile telephony (around 90%). The Presidente Hayes department has the lowest mobile telephony penetration (86.08%), with the highest in Alto Paraná (98.31%).

The differences are accentuated in the fixed network, home computer, and Internet access via home computer indicators. These indicators are not available for the department of Alto Paraguay, which is likely to have the lowest penetration.

In the fixed network, Asunción (42.57%) is followed by the Central and Boquerón departments (25%), and the graph clearly shows the lowest penetration is in Itapúa (6.67%), Caaguazú (6.29%)

and Caazapá (4.48%). This trend is similar for computer indicators and Internet access with home computers, with Asunción having the highest (50.90% and 47.72% respectively) and San Pedro the lowest (11% 17% and 8.57%, respectively).

Figure 28: Home indicators per Department



Source: CONATEL 2016b

2.5.3 National backbone

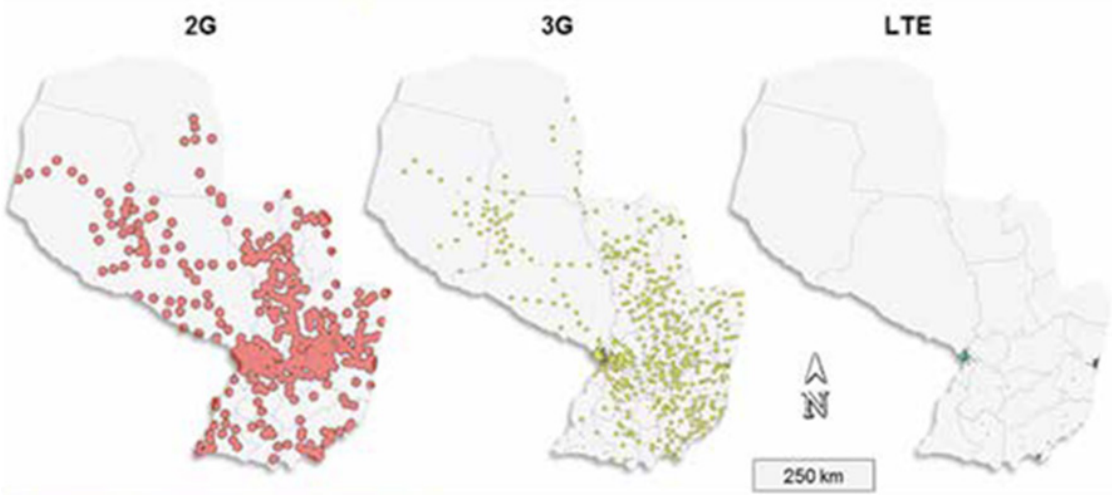
All major Paraguay operators (Copaco, Telecel, Núcleo and AMX) have deployed a fibre optic backbone, which combine to connect all departments, although the capillarity (the number of connection points) within each department varies widely. There are also smaller operators, such as Teisa and Reider, which have deployed fibre optic trunks between major cities.

In addition to the fibre infrastructures of these operators, the Ande (*Administración Nacional de Electricidad*) electric company has a fibre backbone for its own use, with excess capacity (Deloitte, 2016).

Figure 29: Backbone network, 2015

Source: CONATEL

Figure 30: Mobile coverage 2015



Source: CONATEL

2.5.4 Internet exchange point

In Paraguay, an Internet exchange point (IXP) has recently been created, involving an international company and 14 national companies. The services offered are:

- exchange of national traffic;

- technical support;
- housing;
- Facebook content.

The current national traffic is 472 Mbit/s, and 5 600 Mbit/s for international traffic.

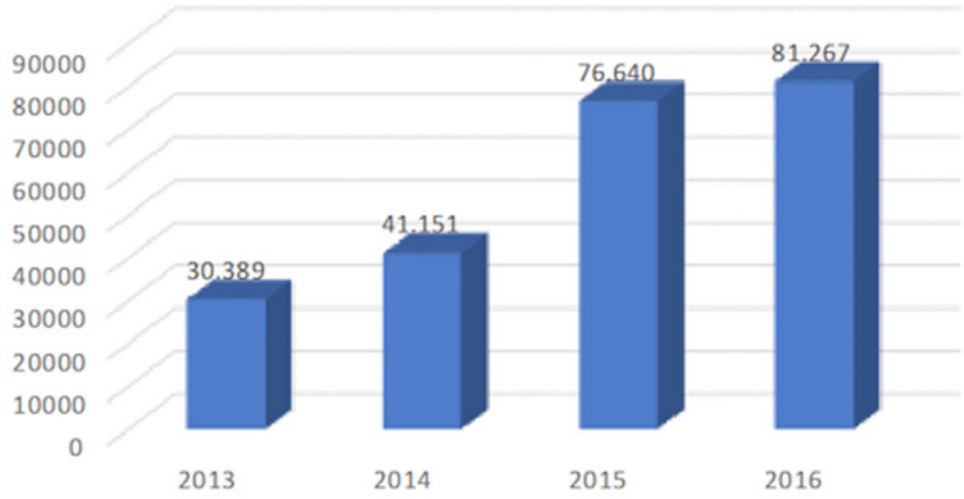
2.5.5 International connectivity

In 2009, CONATEL liberalized the international terrestrial Internet connection, generating an incentive for the increase in the maximum average Internet speed in subsequent years. In turn, according to information provided by CONATEL, efforts have been made to find solutions and alternative routes to achieve connections through, for example, Argentina and Brazil to the Atlantic Ocean, and Bolivia and Peru to the Pacific Ocean, with the purpose of reducing the costs associated with international access to the Internet and, therefore, in the tariff plans of Internet access offered to users.

In Paraguay, there are 12 different operators with international connectivity, ten different connections with Argentina, ten with Brazil, and one with Bolivia.

In addition to terrestrial links, there are ten satellite companies with landing rights to provide international connectivity in Paraguay: Satmex, Inmarsat, New Skies Satellites, Telesat Canada, Intelsat-SSLC (Panamsat), Loral Spacecom, Star One, Hispasat, Eutelsat, SES Americom, and Iridium.

Figure 31: International bandwidth (Mbit/s)



Source: CONATEL 2016b

3 Use of ICTs in Paraguay

The government and citizens of Paraguay are convinced of the benefits and potential of using ICTs as a catalyst for social inclusion and economic growth to fast-forward their sustainable development. Investments made in recent years by operators, facilitating the availability of broadband to users, have resulted in significant increases in penetration, especially in mobile access.

The Government of Paraguay recognizes the driving role of adopting new technologies through the commitment and allocation of resources to the development of specific programmes for most public services.

3.1 Main ICT players

The Ministry of Public Works and Communications (Ministerio de Obras Públicas y Comunicaciones) is responsible for establishing telecommunication policies, and coordinates between the executive power and the agencies and institutions active in the ICT sector. CONATEL is authorized under the telecommunication law to regulate the telecommunication sector to:

- mandate telecommunications regulations;
- approve the technical standards;
- develop and implement the national telecommunication plan and the national frequency plan;
- manage the radio electric space;
- grant licences and authorizations;
- study and propose tariff regimes, rates, duties and tariffs;
- propose the security regime in telecommunication systems;
- establish technical standards and the approval of networks and services;
- establish the basis for interconnection contracts;
- prevent anticompetitive behaviour;
- administer the universal service fund;
- propose to the government changes to the telecommunication legislation;
- stimulate the growth of national industry.

SENATICs formulates ICT policies, promotes the access and use of ICTs in the public sector and by its citizens in order to improve quality of life, reduce the digital divide, and support sustainable development.

The four ICT development strategies of SENATICs are service, opportunity, growth, and procedure, were aligned with quality of life for all, social inclusion and overcoming poverty and inequality, inclusive economic growth, and institutional capacity strengthening and efficiency in social investment, which were all suggested in the national development plan, Paraguay 2020. Therefore establishing a basis to reduce the digital divide and to strengthen the development of the state and local industries through the use of ICTs.

A wide range of services is provided by SENATICs to the population through both government and public sector institutions listed in Table 2.

Table 2: Range of SENATICs services

Advice and technical support	Hardware technical specification standards
Automation of procedures for citizenship	Hosting
Capacity building	Incident management
Citizen applications	Online document management – GDL2G
Cloud	Open data portals
Consultancy in ICT projects and technical support	Portal Paraguay
Consulting and project preparation	Public systems for institutions- public software

Digital literacy	System of information exchange
Digital signature	Virtual servers
Electronic document management – zero paper	Vulnerability audits
Free courses	Web portals
Free Wi-Fi	Web mail

Telecommunication operators

COPACO (Compañía Paraguaya de Telecomunicaciones) was created in 2001 with the main objective of providing public telecommunication services within the national territory and abroad, as well as broadcasting and offering value added services. It is a state owned company that offers broadband services over ADSL, fibre optic, and fixed LTE (offering broadband fixed access, wireless Internet, using an LTE Wi-Fi router) especially to homes and small and medium-sized enterprises (SMEs).

Núcleo S.A. has been offering the 'PERSONAL' mobile telephone service in Paraguay since June 24, 1998. The company is 32.5 per cent owned by ABC Communications and 67.5 per cent by Telecom Personal, Telecom Group, made up of W de Argentina- Inversiones S.L. and TIM (Telecom Italia Mobile) of the Telecom Italia Group. Nucleo has licences nationwide in the 850 and 1900 MHz bands. The networks deployed are D-AMPS and GSM / GPRS / EDGE / 3.5G.

Telecel S.A. is owned by Millicom International Cellular S.A. (MIC), based in Luxembourg. It is one of the world's largest cell phone system operators in terms of geographic presence, serving 20 countries in the Americas, Europe, and Asia-Pacific regions. It offers mobile telephony and Internet access, fixed access services through a hybrid fibre coaxial (HFC) network, and satellite TV services under the Tigo brand. The mobile network offers 4G in the most populated cities.

Hola Paraguay started commercial operations in 1999, and in 2010, local state run telecommunication operator Copaco acquired the company from the KDDI Corporation. The firm uses GSM technology in the 1.9 GHz band, and possesses 3G and 4G licences. Its network offers 4G in Asunción with significant deployment plans to the most populated areas of the country. The services are commercialized under the Vox brand.

AMX Paraguay, formerly a subsidiary of Hutchison Telecommunications International, operates under the brand name Claro. It was acquired by América Móvil in July 2005. It offers mobile telephony, Internet, and television. Recently, it was awarded a 4G licence.

3.2 Special projects

3.2.1 The national telecommunication plan[10] (Comisión Nacional de Telecomunicaciones 2016-2020, 2016a)

The national telecommunication plan, developed and coordinated by CONATEL, has three main axes detailing its strategic programmes and projects:

1. Towards a connected society.
2. Digital inclusion.
3. Regulatory efficiency.

Towards a connected society: This includes the following strategic programmes and associated structural projects.

[10] Comisión Nacional de Telecomunicaciones 2016-2020, 2016a

Integrated broadband expansion: This strategic programme is focussed on increasing broadband services to the home, increasing the number of homes passed (a network nearby, easy to connect to), households connected (already with an active connection), increasing the number of households with computers to access the Internet, and increasing the average Internet speeds. The following actions are planned:

1. Expansion of the national backbone network: To facilitate the increase of connections faster than 10 Mbit/s using FTTx. Transport networks should ensure coverage to 700 000 homes passed, 200 000 companies passed, and 100 per cent of government institutions passed.
2. Expansion of access network: This will increase the number of households with FTTx and xDSL to up to 40 per cent of the population, and 70 per cent of companies, in addition to:
    - promoting the deployment of FTTH networks in urban areas with higher purchasing power;
    - ensuring 4G coverage in urban areas and 3G in rural areas;
    - improving connectivity for companies;
    - connecting 2 500 educational institutions in urban areas;
    - connecting all health centres in urban areas;
    - encouraging the implementation of broadband collective access centres with satellite technology in isolated rural areas;
    - implementing Wi-Fi access points in educational, health, and administrative centres.

Moreover, in support of this strategy, efforts will be focussed on improving spectrum management efficiency and promoting end-user equipment, for example, to increase to 60 per cent the number of households with computers with access to the Internet.

Affordability: This strategic programme includes two projects that focus on reducing the cost of Mbits or Mbit/s:

1. To reduce international connectivity costs by at least 80 per cent, by:
    - promoting cooperation among the south America countries;
    - creating an Internet exchange point (IXP);
    - creating a national centre to develop digital content and applications for development, focused mainly on education, health, production, e-government; and
    - encouraging the availability of a content distribution network (CDN).
2. To increase network efficiency by reducing costs of national network structures, by:
    - improving interconnection rates;
    - introducing infrastructure sharing;
    - enabling national roaming.

Most often, costs relate to operational expenses (Opex) to find means to lower costs, and the capital expenditures (Capex) are linked to investment.

Digital inclusion: Until 2020 priority will be given to two strategic programmes and six structural projects:

1. Promote adoption and use of ICTs: In this strategic programme two structural projects are planned, focused on development of digital education and virtual services:

a. Development of digital education, with the aim of reducing the digital divide, by promoting the use of the Internet among students, developing ICT applications for companies, supporting the

agricultural sector through ICTs, improving digital literacy, developing the software industry, promoting teleworking, increasing training in companies and developing applications for the population.

b. Development of financial inclusion and e-banking: promotion of financial services online.

2. Promote e-Society: In this strategic programme, four structural projects are planned, focused on bringing more efficiency between social service institutions and the population:

a. e-Government: To promote the transparency and efficiency of the Government for the benefit of the population.

b. e-Health: To promote e-health and bring awareness about its efficiency among the population, through computerization.

c. e-Safety: To reduce the rates of crime and violence, by improving the capacity of law enforcement agencies.

d. e-Education: To promote the digitalization of content and management of schools, as well as the training of teachers.

Regulatory efficiency: The objectives for the coming years, in terms of network structure, are reflected in two strategic programmes:

1. Promotion of transparency and participation of society: This strategic programme includes two structural projects focused on bringing more transparency and coordination to planned actions for the development of telecommunications in Paraguay:

a. Transparency and communication: This aims to involve civilian stakeholders in Paraguay in the regulatory decision making processes and to give a deeper understanding of the sector through improved information and updated indicators.

b. Coordination of relationships with other stakeholders of society: This aims to improve the coordination of efforts and to develop greater efficiency and coherence of the telecommunication sector of Paraguay.

2. Regulation and control: This strategic programme includes two structural projects focused on bringing greater information, control, and prioritization of CONATEL actions:

a. Implementation of the regulatory agenda, and analysis of the regulatory impact, with the objective of organizing and prioritizing regulations that will be developed in the short, medium and long term.

b. Structuring information, with the aim of developing a system containing organized and structured information of the telecommunication sector to accompany CONATEL initiatives.

3.2.2 Universal service fund projects

The main achievements of the use of the universal service fund have been:

- More telecommunication infrastructure.
- Connectivity to state institutions such as the Ministry of Public Health and Welfare, the National Police, the Ministry of Education, the Paraguay National Post Office, and the Armed Forces Units.
- Joint efforts with the '*Sowing opportunities*' programme.
- Development of telecommunication services in areas lacking electricity and road infrastructure.

Table 3 shows the subsidies granted with the universal service fund.

Table 3: Subsidies: Universal Service Fund

1/2014	Expansion of fibre optic transmission infrastructure and other telecommunication equipment in 15 municipalities.	On-going
3/2014	Implementation of network infrastructure expansion that serves as a platform for mobile telephone services (cellular and/or PCS) and the basic service and the Internet access and broadband data transmission service in areas of public or social interest (ZIPS) to 26 places in the western region and 10 places in the eastern region.	On-going
6/2014	Provision of the Internet access and data transmission service with the purpose of providing connectivity to the Ministry of Public Health and Social Welfare for the promotion of telemedicine to 176 health establishments.	On-going
8/2013	Expansion of fibre optic transmission infrastructure and other telecommunication equipment in three municipalities.	On-going
7/2013	Provision of free access to the Internet and data transmission in public places and / or places of entertainment to 36 municipalities (50 places with free Internet access).	On-going
9/2012	Expansion of fibre optic transmission infrastructure and other telecommunication equipment in 84 municipalities.	On-going
2/2011	Expansion of infrastructure of networks that serve as a platform for mobile telephony services (cellular and / or PCS) and basic service in public or social interest areas (ZIPS) to 147 municipalities.	Concluded
14/2011	Expansion of fibre optic transmission infrastructure and other telecommunication equipment in 28 municipalities.	On-going
1/2010	Expansion of infrastructure of the networks that serve as a platform for mobile telephony services (cellular and/or PCS) and basic service in public or social interest areas (ZIPS) to 59 municipalities.	Concluded
4/2009	Expansion of infrastructure of the networks that serve as a platform for mobile telephony services (cellular and / or PCS) and basic service in public or social interest areas (ZIPS) to 35 municipalities.	Concluded

3.2.3 National cybersecurity plan

Government and national policies establish the lines of action that strengthen the security and protect critical assets and achieve a safe, reliable and resilient cyberspace. The evermore sophisticated cyberattacks require dynamic and equivalent responses, which is why, without a coordinated strategic response, national efforts in cybersecurity will be unsustainable, sporadic, redundant, and inefficient. The national cybersecurity plan is a set of concrete measures, initiated by the government and implemented by SENATICs, to increase levels of commitment, collaboration, and coordination.

3.2.4 SENATICs initiative

SENATICs is responsible for the following projects:

e-Government

The following services have been developed:

- Portal Paraguay[11] provides access to the catalogue of public institutions, electronic procedures, online systems, mobile applications, free resources, citizen participation tools, state news, and government policies and plans.
- Transparency and anti-corruption portal for complaints and anticorruption.[12]

As a result of these initiatives, Paraguay has climbed 27 places in the United Nations electronic government index, ranked 122 in 2014, rising to 95 in 2016. Paraguay significantly improved the e-participation index, ranked 122 in 2014 rising to 72 in 2016, up 50 places.

Infrastructure

SENATICs is responsible for public administration infrastructure projects, such as:

- Government data centre.
- Integration and optimization of public sector networks.
- Free Wi-Fi in public spaces.
- Empowerment of the Paraguay research and education network.
- Cyber emergency response centre: In 2016, 232 computer security incidents were addressed, such as website defacement, server compromise, spam, intrusion, malware, and denial of service attacks. There were 101 incident investigations and 39 audits and security assessments carried out on governmental institutions, where vulnerabilities, risks and problems in networks and systems were identified and corrected. A web page disfigurement monitoring system is also in place that carries out rapid and automated detection of incidents for 352 government domains.

4 Challenges and opportunities

This section analyses the challenges and opportunities in Paraguay that can increase the use of ICTs and broadband. Although in some respects the Americas region LLDCs are lagging behind neighbouring countries in the deployment and use of ICTs, they are developing very interesting initiatives to bring them in line with other countries in South America. These initiatives could become benchmarks for neighbouring countries and they represent a unique opportunity to make significant progress in the deployment and use of ICTs to improve quality of life and international competitiveness.

4.1 Challenges

Policy and regulation: The telecommunication law in force since 1995 no longer reflects the reality of 2017, especially in the categorization and definition of services. The concept of broadband needs to be taken into account in the definition of basic services, in the formulation of the universal services policy, and the actions and funds required for its implementation. CONATEL should consider, in addition to the connectivity services and the services provided by operators, other services that are essential to the population.

[11] www.paraguay.gov.py
[12] www.denuncias.gov.py

Universal service funds: The universal service fund is a mechanism used by many countries to carry out public initiatives that bring ICT services to underserved areas. In Paraguay, projects associated with the use of the universal service fund need to be more speedily implemented, and new mechanisms found, for project realization because the USF mechanism alone is not enough to ensure universal service.

Coordination: It is of utmost importance to improve collaboration between CONATEL and SENATICs and to make initiatives more efficient through a joint and closely shared vision of boosting connectivity and services. To this end, economic resources should be secured to enable them to move forward together in the development of ICT in Paraguay.

National telecommunication plan: At the end of 2015, a new national telecommunication plan (2016 to 2020) was published, with well-defined actions, objectives, and milestones. The ICT sector is characterized by a rapid and constant evolution of technology and services, and consequently, the telecommunication plans must not only have the necessary resources allocated for their swift implementation, but also up-to-date information and accurate data for the correct actions and decisions to be taken, which could include the vision and objectives of other relevant sectors, to achieve the telecommunication plan objectives.

Internet exchange point: The creation and implementation of an Internet exchange point has been an important step towards improving the exchange of national traffic. It should be strengthened to increase the volume of data exchanged and thus improve the service and reduce costs to users. Measures needed to significantly improve international traffic should also be explored.

Improving 'Infocentros': The creation and installation of *Infocentros* will accelerate the arrival of essential services needed by people living in remote and underserved communities through broadband access. It is recommended that the current policy, and ensuring the associated resources, should be continued.

Private sector participation: Including the private sector in government initiatives will improve the execution of strategies, increasing public-private cooperation and, therefore, of private financing of projects that will increase the use of the ICTs. Such a strategy should coordinate and enable all sector stakeholders to participate in projects. It is important to emphasize that the involvement of the private sector, whether through public-private partnerships or private enterprise initiatives, will help overcome many development challenges.

Local content and applications: While there is a willingness on the part of the state to develop local content and applications, to produce rapid improvement in all relevant economic and social sectors, especially in rural areas will require well planned implementation.

Interconnection and infrastructure sharing: The legislative framework recognizes the importance of interconnection and infrastructure sharing between different service providers. This should be promoted with the aim of accelerating the deployment of broadband infrastructure, thus allowing more efficient investment.

Focusing on services: The availability of broadband networks for the development of services is undoubtedly necessary, but the focus should also be on the creation and availability of services, not on infrastructure alone.

Reducing deployment barriers: The deployment of fixed fibre optic access networks requires significant time and investment, although most of the investment is related to civil works. It is crucial to reduce the maximum number of barriers that prevent rapid deployment, especially those imposed by the territories or municipalities when processing permits, licences, and authorizations for the installation of towers, antennas, fibre, cables, etc. This includes prohibitions on the installation of infrastructure in certain areas, delays in the procedures for requesting and issuing such permits, licences and authorizations, and the lack of uniformity of regulations.

Fixed access networks: The level of deployment of fixed access networks is lower than in most South America countries, and much lower than in developed countries, where the existence of a robust access network has allowed a very rapid growth of innovative fixed and mobile broadband services.

Same mobile services in all areas: In contrast to 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, reflected in the penetration of mobile services among the population, however more can be done to guarantee the same services, with the same quality in all areas of the country.

Improving Internet access speed: There has been a high penetration in mobile telephony and increasing use of Internet access. Content and services evolve quickly, requiring ever greater speeds of access to the Internet that operators must plan for, including the backbone and access networks planning.

Adult digital literacy: Connectivity should be provided to all schools and to ensure the training and use of ICTs among younger generations, adult training in digital literacy should be increased, especially in rural areas, to guarantee a greater use of services that promote inclusiveness.

Affordability: The downward price trend of broadband services although desirable is still above other countries of the region. It would be beneficial to ensure that this trend continues and that the cost of access, as well as equipment that enables access (PC, workstation, device, etc.), is affordable to most of the population. It would also be beneficial to increase the availability of public access points to ICT services.

Internet use: Increasing the use of the Internet among the population, including residential access, is a challenge that can be improved through institutional and human capacity building, lower prices, greater coverage and improvement of local services, content and applications, etc.

Territorial balance: There is a big difference among departments in the use of ICTs. An action plan would improve the availability and use of ICTs in the less developed departments to improve the quality of life of its citizens, favouring the growth of the economy of these departments and ensuring a better territorial balance.

International connection: Increasing international bandwidth and reducing costs of Internet access, with direct connectivity to the most important peering points, although very complex, will offer solutions to other challenges that the country faces.

4.2 Opportunities

4.2.1 Policy and regulation

Despite the present situation of ICT development in Paraguay, opportunities exist to improve ICT connectivity through policy, regulation and legislation, and have a positive impact of ICTs on agriculture, education, health, environment, climate change adaptation, and other social and economic opportunities. In order to improve Paraguay competitiveness with neighbouring countries, planned innovative actions can promote and harness the use ICTs. The experience in other countries will help to shorten or skip unnecessary stages of ICT development and help focus on what the current and future situation requires.

It is critical to move forward with legislation and regulation that focuses on ICT development to improve the quality of life of citizens, the competitiveness of their companies, and the availability of innovative public and social services for the entire population. The trend in the ICT sector is convergence, and it is essential to have a common vision and strategy that takes into account both connectivity and services, encompassing all the different elements of the ICT ecosystem.

Competition in the development of telecommunication services has grown, ensuring a greater choice of services and lower prices. However, boosting the existence of competition has not ensured that these services reach all communities.

It is recommended that the Americas region LLDCs redesign their policies to ensure the availability of broadband services. This will provide the predictability and confidence needed to ensure investment, promote and facilitate initiatives that enable the deployment of broadband networks, and develop services efficiently that will have a positive impact on end user cost.

4.2.2 Infrastructure

All operators try to differentiate themselves from their competitors, making efforts to have better coverage of their services, especially in backbone and access networks. When coverage ceases to be a differential element, they are faced with significant operating costs to maintain an infrastructure much like their competitors. This has often led to sharing, however, the level of sharing of the different parts of the network, backbone, access network, passive elements and active elements, among others, can vary greatly depending on the area and business expectations.

The same trend of sharing is observed in some advanced countries with respect to the fixed network, which requires much higher deployment costs than the mobile network. Considering the limited fixed network deployment in Paraguay, the country has the opportunity to propose the deployment of a fixed network in a different way, based on sharing, that allows them to accelerate the availability of services in these networks.

4.2.3 National telecommunication plans

Paraguay has developed a national telecommunication plan, which is extremely important for the positive development of the economy. Paraguay can use this plan to encourage all economic sectors to create and develop domestic enterprise related services that, when implemented, will improve efficiency, productivity, and promote job creation and competitiveness.

There is a unique opportunity to complement these initiatives:

- by incorporating all relevant sectors, including civil society, associations, etc., to ensure a 360-degree vision;
- by prioritizing and ensuring a harmonious development of services and applications, both public and private;
- by targeting the development of innovative services for end users, not just those related to connectivity;
- by building a framework to enable the necessary joint investments by all stakeholders.

This will lead to a harmonious development of infrastructure and services, the deployment of networks, optimal use of investments, and increased profitability.

Important challenges remain, not least to optimize the assignment of responsibilities and to harmonize the development of initiatives. There is an opportunity to ensure effective executive and operational governance that will optimize the development of plans. There is also an opportunity to gather data, if possible obtained in real time, which will enable effective decision-making, and a cross-cutting and integrated view for all stakeholders.

4.2.4 Improving international communications

The recent interconnection of the Entel Bolivia and Copaco Paraguay networks opens new possibilities for international interconnection for both Americas region LLDC countries, because in addition

to guaranteeing better resilience of their international networks, it adds a new option to connect to submarine cables of the Atlantic and Pacific oceans.

The creation of an IXP in both countries has been an important decision. The great challenge associated with this initiative is to increase the traffic it manages. Although it is true that Brazil has fibre-optic interconnections with almost all countries in South America, if Paraguay and Bolivia guarantee good connectivity with Atlantic and Pacific ocean submarine cables 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 much in common. Exploring collaboration and coordination on the evolution of ICTs would have positive effects for both countries, as would sharing best practice and developing projects with common parts. Both countries could benefit from a greater market, faster development of innovative services and improvements in cost for some aspects.

Paraguay and Bolivia face greater difficulties in international communications due to their geographical position and, although it is necessary to seek improvements in the costs involved, they have the opportunity to focus their efforts on national growth of ICT, by developing innovative services for the various market segments, which they should do with a regional vision, so that their ICT specific weight in the region increases significantly.

5 Recommendations

5.1 Policy and regulation harmonization

Scope: The various strands to the ICT sector are tending to converge, with integrated solutions of basic and value-added services tailored to each sector, being brought together under the umbrella of broadband services. ICTs are bringing improvements and innovation to all other sectors. Consequently, ICT policy and regulation should focus on ensuring access to broadband networks and advanced broadband services, creating a comprehensive and integrated response to the challenges that countries face. It is important not to focus only on access to the traditional services of ICTs, i.e. voice, video and data, but also to provide 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: Policies and regulation of ICTs in relation to connectivity should aim to boost the development of broadband, both mobile and fixed networks, to ensure the necessary economic growth, and it is recommended that broadband services be included in the definition of basic telecommunication services.

It will be necessary to provide for mechanisms to facilitate the deployment of networks and services in non-profitable areas for operators, whether public investment, public-private scheme, or other types of incentive.

Universal service: It is essential to improve ICT governance and affordability, enabling an environment that promotes economic growth and innovation. Under current rules, it is very difficult, if not impossible, for private operators to invest in unprofitable areas, so the responsibility of infrastructure development and services in these areas lies with the public institutions that usually do not have the resources to cope with the necessary investments. Regardless of how the universal service fund is managed, it is not enough to overcome the digital divide.

Bringing broadband access into the universal service definition would ensure that the population could access all the associated technologies and services, including e-government, e-commerce, e-health, e-education, emergency communications, environmental protection, climate change mitigation, cybersecurity. Policies should also strive to reduce the digital divide and ensure the same opportunities for all, allowing rural areas to improve their economies.

Furthermore, policies should permanently increase the reference speed defined as broadband, together with the needs of the population and the development of services and applications, in line with technological developments.

In view of the need to establish a strong collaboration among countries in the deployment of broadband, to advance more rapidly in the creation of innovative broadband services and applications, and to increase availability and use of these services by the greatest possible number of people, it is recommended to harmonize the scope of policies and regulation, especially broadband and universal service related issues. The universal services fund policy should be reviewed, as it is not sufficient to ensure that the services reach the entire population within a reasonable time.

5.2 Open fixed broadband access, backbone sharing

In developed countries, the deployment of fixed broadband networks has given access to broadband services to most people, but in the Americas region LLDCs, access to broadband services for the majority will be, for the time being, through the mobile network.

Mobile networks need to have a fibre optic national backbone network to offer broadband. Having a fixed fibre optic access network in densely populated areas would facilitate the connection to the mobile network base stations. In the Americas region LLDCs, fixed networks are only deployed in densely populated areas and business districts. It is recommended to plan and facilitate the evolution of access networks from existing copper, and prepare for migration to fibre optic access networks, to deliver higher performance.

The deployment of fixed broadband access networks is costly, and it would be unrealistic to encourage competition in these networks, consequently 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 access to broadband services.

Another way to reduce costs in deploying networks is infrastructure sharing. In early network deployments, having separate infrastructures differentiated one operator from another, but in general, it is no longer the case, since differentiation is now related to such things as service bundling and pricing. Innovative services could also be a competitive advantage. The goal of reducing infrastructure costs should ensure wider coverage and offer better services at lower prices. These initiatives are increasingly common in developed countries, and they should be promoted and encouraged in the Americas region LLDCs.

The installation of fibre optic transmission systems throughout the country is expensive and probably uneconomic for operators. To seek alliances with other utility companies such as electricity, transport, etc., where existing and future infrastructure could facilitate installation, would be essential to accelerate fibre optic connections across the country. Installation of conduits or fibre optic cables when building or improving roads should be encouraged. This would represent a small increase in planned investment, but it would bring tremendous value.

It is recommended to establish a framework for the deployment of open access fixed broadband networks to optimize investment and increase coverage, improve both fixed and mobile services and market penetration. It is also advisable to share broadband transport infrastructure throughout the territory, so that services and applications can reach the entire population faster. It is especially important to ensure access to the international interconnections of all service providers.

5.3 From national broadband plans to digital society

The objective of the national plan for broadband is to promote increased connectivity through a targeted development of innovative services to all sectors of economic activity, adapted to the affordability of businesses and population, with the aim of increasing the subscription and the use of broadband networks. It is crucial that landlocked developing countries develop information and communications technology infrastructure in order to reinforce all economic sectors and promote competitiveness, innovation, and inclusion.

National broadband plans are an important mechanism for governments, they set out a vision and strategy of how technology can move the 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 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 partnerships between governments, industries and other stakeholders and where government engages in a consultative, participatory approach to the policy-making process.

The definition of a national broadband plan could be wider. By not focusing purely on connectivity but on the creation and use of digital services, both public and private, a national broadband plan will promote the active participation of the whole society. It should also include other sector stakeholders not just the ICT sector stakeholders. There is a need to re-evaluate the vertical thinking of each sector and move towards a more general approach that encompasses them all.

It is also necessary to consider the challenges of creating an enabling environment and identify the social, institutional, and economic drivers that will build a realistic and sustainable framework.

The basic principles of a digital services national plan could include:

- User focus: Benefiting all citizens, companies and institutions.
- Market driven: To the greatest extent possible, enable stakeholders and market players take responsibility for broadband infrastructure provision and service delivery.
- Universal access: Broadband infrastructure and services should be considered as universal, accessible to all communities, ensuring affordability and quality of service.
- Advanced and innovative services promotion: The scope of the plan should not be limited to promoting the deployment of broadband infrastructure, but focus on the development of new and innovative services, allowing a unique opportunity to grow and, at the same time, the ability to improve the quality of life for the population, helping companies and institutions to become more innovative and efficient, and benefiting all economic sectors.
- Promoting investments: Focus on investments with sustainable business plans.
- Inclusiveness: Government should take the lead with the participation of all national stakeholders.
- Efficient and goal-oriented: Realistic objectives should be set that can be measured.
- Foster innovative public-private partnerships.
- Strong good governance, accountability mechanism and management

The main goal of the digital services national plan would be to improve quality of life, by encouraging more efficient, sustainable, and competitive businesses and public services.

The implementation of these plans is complex, so it is necessary to establish overall goals as well as indicators associated to every project and how they contribute to the defined goals. It is recommended to ensure a continuous measurement, if possible, in real time of all indicators. In this fast-evolving sector, the plan should be reviewed regularly to consider any such changes and evolution.

A digital society requires the development of content, services, and applications in local languages and should be adapted to the reality of the country. It is 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. This can promote and increase local industry and develop the national economy, and make the use of ICT tools more attractive and productive. Greater promotion of human capacity and talent, and more availability of ICT training will lead to medium and small companies to develop applications that allow them to offer their services.

It is recommended that a digital society plan be developed for Paraguay, a plan that is adapted to the reality of the country and that will ensure coordination between the initiatives among Americas region LLDCs. Bolivia and Paraguay will benefit from the sharing of experiences and common development of services and applications, and be in a position to best optimize investment and reduce cost, avoiding, in some cases, possible redundancy.

5.4 Telecentres

The deployment of a nationwide broadband infrastructure requires considerable time and investment. Telecentres are an excellent option to accelerate the use of new technologies by people living in remote and underserved areas. In this case, shared use of the infrastructure offered by a telecentre is an excellent solution. However, one of the major challenges associated with telecentres is sustainability, which is generally related to the costs of basic connectivity services, such as telephony and Internet access.

With a broadband connection, the telecentre can expand the services it offers, becoming the point of distribution of digital services, including public and social services, including e-learning, e-health, e-government, disaster prevention, etc.,. In addition, services related to agriculture, fishing, etc., will improve productivity of the local economy, and contribute to the sustainability of the telecentres. Success of the telecentres will also require active, creative, and adapted continuous capacity building.

It is essential that each community served by a telecentre is fully convinced of the importance to its development and the diversification of its economy. Each community should be encouraged to actively participate in the management, development, and promotion of the services it offers, and empower women through their participation in the telecentre management and organization. Clear indicator definitions and measurements are vital to ensure the sustainability, and facilitate the improvement of services, of each telecentre.

The development of ICTs in rural and remote areas need to be an integrated part of the definition of the development of the country, with proper planning and budgeting, for them to succeed.

To ensure growth and sustainability of the telecentre concept, it is recommended that its scope covers all digital services required by the local population, and facilitates the availability and use of these services.

5.5 Improving international interconnection (ITU, 2016d)

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 objectives for information and communications technology infrastructure described in the Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014 to 2024. One of the notable actions in this report concerns the promotion of digital bridges to interconnect national backbones so that countries far from the sea cables also have access to affordable broadband and are able to expand the telecommunications and related services sector in order to facilitate affordable, accessible and high-quality telecommunication services.

Most Internet traffic is international, with the content source from outside Paraguay, and the growth of broadband provokes an increase in the need for international capacity, estimated at around 50 per cent a year. This is a major disadvantage for countries without direct access to submarine cables because of the extra cost involved.

The recent interconnection of fibre optic networks between Bolivia and Paraguay means that continued good coordination between the two countries will be needed to ensure good connectivity, especially with the possibility of accessing submarine cables from both the Atlantic and Pacific oceans. Strong actions will also be required to identify and implement alternative solutions and routes, such as joint planning and shared deployment costs, with the purpose of ensuring reliability and reducing the costs associated with access to the Internet and thus be able to improve affordability for the citizens of both countries, especially those with low purchasing power and those located in rural and remote areas.

In the case of bilateral agreements between Bolivia or Paraguay with third countries, consideration should be given to include the needs of both countries.

It would be desirable to have a regional vision to plan the deployment of necessary infrastructure for broadband networks, to harmonize the required efforts and reduce costs, and to look for potential partnerships with other utilities that will accelerate the availability of infrastructure. The deployment of a South America high capacity transport network connecting all countries would add much value to the efforts made by each country to improve the quality and reduce current prices of connectivity.

Regional cooperation would develop a larger market and offer more opportunities than the domestic markets of each country, with the possibility of lower costs, higher penetration rates for broadband services, and more efficient application development and services, creating the basis for a better sharing of knowledge and experiences of countries in South America.

Building and operating cables across country borders is challenging:

- Authorizations and licences are required for each jurisdiction.
- Cabling by ducting is generally more secure, but expensive. Cabling by towers and poles is less expensive, especially where facilities sharing may be involved, although more vulnerable to extreme weather and other causes of damage. In either case, selecting routes and permissions is time consuming and will incur costs.
- Local carriers may raise objections if the cable operators are seen as commercial rivals.
- Efficient regulations governing cross-border transit charges, interconnection charges, or accounting rates need to be established. Similarly, local open access provisions are necessary to ensure that the additional capacity is available at competitive prices.
- Relations between neighbouring countries need to be good, unimpeded by conflict.

The availability of an Internet exchange point in Paraguay has a direct relationship with the improvement of the service, costs, and capacity needed to access the most important international hubs. It keeps data local and therefore reduces costs to operators and improves network performance for end-users as well as improving local navigation, security, branding, control and management of local content and domain name services. It improves ability for international and local web services to gain traction and better data sovereignty. It helps to attract foreign content distribution networks, thereby reducing the amount of international capacity required.

The very low costs for 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 for the large international carriers to have the incentive to build out their own infrastructure to reach them, rather than the developing countries having to pay for all their international traffic.

Rwanda case study

Rwanda is a good example of an LLDC that 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 pre-paid wireless broadband is relatively expensive for most inhabitants.

Nevertheless, Rwanda has been proactive in securing access to closer submarine landing stations and is connected to two submarine cables on the east coast. The first, Eastern Africa Submarine Cable System (EASSy) is accessed through Uganda to the landing station in Kenya, a 10 Tbit/s, two fibre-pair configuration that was upgraded in 2010 to 40 Gbit/s wavelengths, and in 2014 to 100 Gbit/s wave-lengths. 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) that, with backing from the African Development Bank (AfDB), has been supporting a number of initiatives that promote an integrated regional approach to a broadband infrastructure. Under its Connect Africa framework, the AfDB helped finance the EASSy through a terrestrial cable that helped Rwanda to have a more robust Internet access with high speeds. AfDB also supports the East Africa Broadband ICT Infrastructure Network (EAC-BIN) to integrate the broadband networks of EAC Member States to promote cross-border broadband traffic and trade, linking the landlocked countries to coastal landing stations and encouraging the harmonization of broadband regulations across the region

This report recommends the creation of a close collaboration between Bolivia and Paraguay for the planning and deployment of interconnectivity, which should seek consensus among all South America countries to create a regional broadband network that allows them to respond to current needs and to enable them to cope successfully with change. As a complement to this initiative, it is also recommended to promote and enhance Internet traffic exchange points in Bolivia and Paraguay.

6 Project proposal

The project proposed for Paraguay is aligned with two of the five recommendations above: "*Open fixed access network* (and backbone sharing)", and "*Telecentres"*.

The project proposed would be designed to enhance the availability of a fixed open access FTTH (fibre-to-the-home) network, to be used by operators and service providers. This would help optimize the investments required to deploy fixed broadband networks, lower service costs for users and expand coverage. In addition, it is proposed to carry out a study of converting a telecentre, in a populated area, into a digital services distribution centre for the population it serves, ensuring its sustainability.

The main objective of the proposed project is to improve national availability and use of ICTs, which could represent a competitive advantage. Paraguay will continue to face challenges linked to its landlocked geography. The good news is that this initiative will help address these challenges by accelerating the creation and use of ICTs in Paraguay, and by creating more regional content and applications quickly and efficiently. This would also help to empower national companies and create more jobs.

This proposal is aligned with BDT's mandate and should enable the two landlocked Americas region countries to reduce the disadvantage they may have with their neighbouring countries through national growth of ICTs.

6.1 Project proposed

6.1.1 Open access FTTH network

Fixed broadband access networks in Paraguay are very scarce, largely lower than the average in the rest of South America countries. While there is some fibre optic access network, the dominant technology in fixed networks in Paraguay is hybrid fibre-coaxial (HFC) technology, followed by ADSL. Deploying a fixed network requires high investments and having a shared open FTTH access network would reduce the cost per operator, accelerate and ensure availability and greater coverage.

This initiative will allow operators to focus their efforts on improving services, both fixed and mobile, since to ensure the expected evolution of mobile broadband services, it is necessary to ensure a strong backhaul portion of the network. In addition, costs for end users should be lower as a result of investments and operational savings.

Telecommunication operators prefer to remain in control of the infrastructure, both passive and active, to offer their services to customers. The proposed solution must be designed in a way that guarantees quality of service.

Facilitating coordination among potential stakeholders, and defining and supporting activities, will give the necessary impetus to this initiative to make it a reality, including:

- Strategy definition
- Support to regulatory aspects
- Business model definition
- Depending on integration level:
    - Passive infrastructure
    - Active infrastructure
    - Mixed model
- Depending on stakeholders:
    - Public only
    - Public-private partnership (co-participation, concession,…)
    - Technology and topology aspects
    - Deployment model
    - Services definition
    - Operational model
    - Interested parties coordination.

6.1.2 Sustainable telecentres in underserved populated areas

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

It is necessary to ensure a broadband connection to the telecentre, expanding the services it offers, and turning it into the point of distribution of all digital services, including all public and social services, such as e-learning, e-health, e-government, disaster prevention, and the services related to the economy of the underserved populated area and others, for example, entertainment. These services would contribute to ensuring the sustainability of the telecentres. It will be necessary to provide continuous capacity building that is creative and adapted to the needs of the telecentre-user communities.

It will also be necessary to study a business plan model for a telecentre in an underserved populated area taking into account the inclusion of digital services and adapting the telecentre to the economy of the population dependent on it.

Annex 1 – Paraguay mission and workshops

An important part of the work for the preparation of this study was carried out during the mission to Asunción from 29 to 30 June 2017 through meetings with the main institutions and companies of the Paraguay ICT sector, with the objective of exchanging information and documents relevant to the study.

Meetings were held with CONATEL, SENATICs, the National Computing Center of the National University of Asunción and the main telecommunication operators, including the COPACO, Telecel, Núcleo, Hola Paraguay and AMX Paraguay.

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

Paraguay

Evolución de las TIC: desafíos y oportunidades

Junio 2017

ÍNDICE

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

- Ley de Telecomunicaciones 1995:
  - Servicios
  - Conatel
  - Fondo de Servicios Universales
- Ley 4989 (2013):
  - Marco de aplicación de las tecnologías de la información y Comunicación en el sector público
  - Creación de SENATICs
- Plan Nacional de Telecomunicaciones 2016 – 2020
- Otros decretos:
  - Plan Nacional de Ciberseguridad
  - Declaración de interés nacional la aplicación y uso de las ICTs en la gestión pública

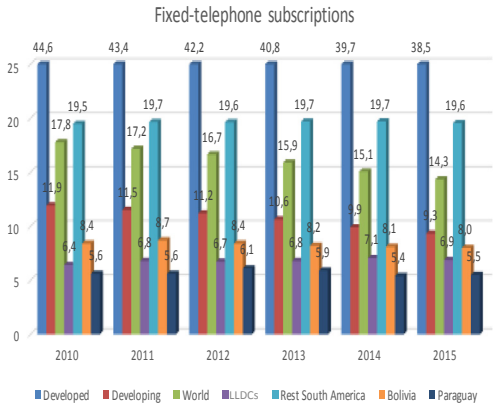
2. Situación actual

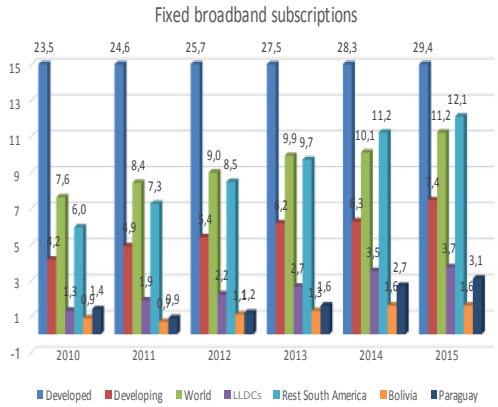
Conectividad

- Red fija escasa. Fuerte evolución penetración de los servicios móviles.
- Incremento hogares con ordenadores y acceso a Internet, a distancia del resto de Sudamérica.
- Bajo ancho de banda internacional por usuario de Internet.

2. Situación actual

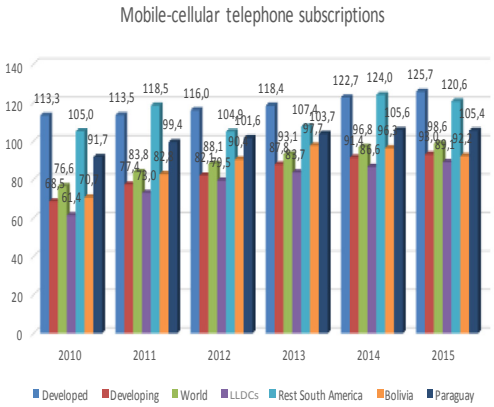
Conectividad – Red Fija

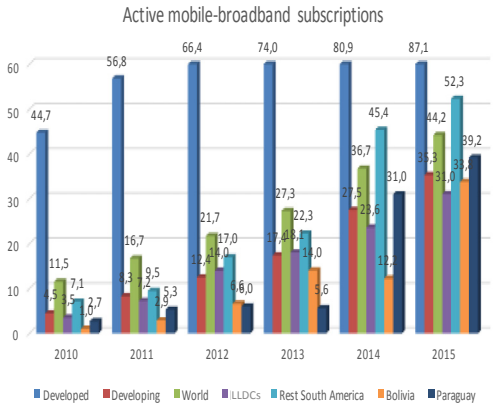




2. Situación actual

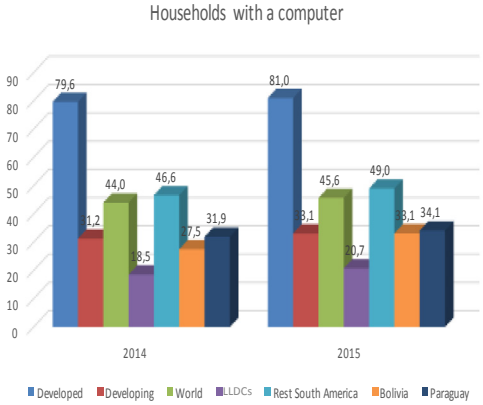
Conectividad – Red Móvil

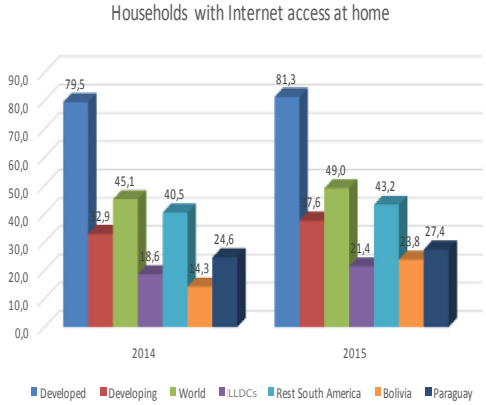




2. Situación actual

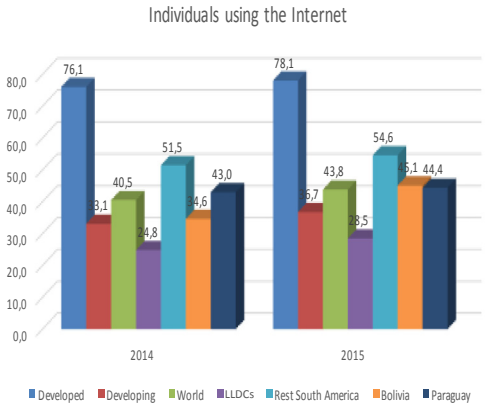
Conectividad – Hogares con ordenador y acceso a Internet

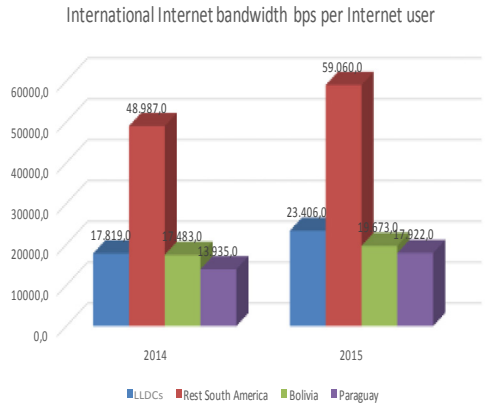




2. Situación actual

Conectividad – Uso y ancho de banda internacional





2. Situación actual

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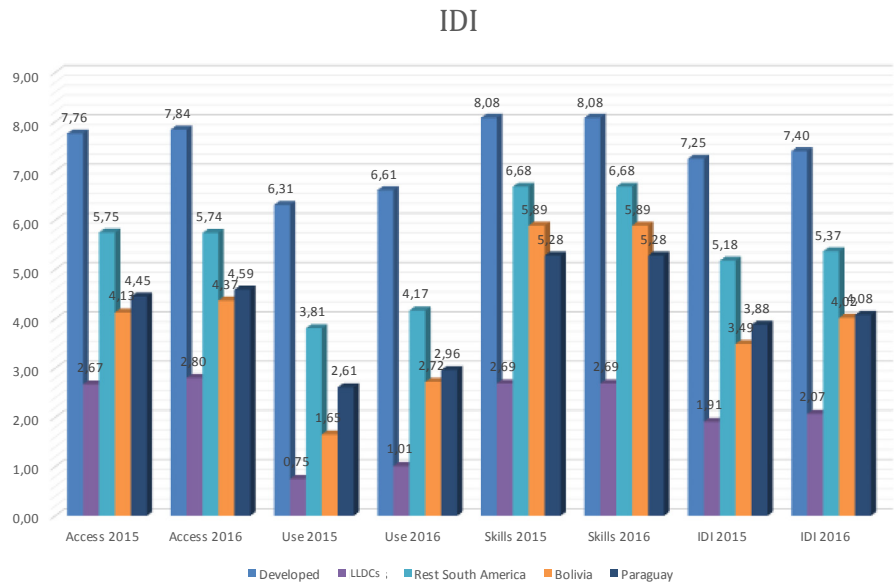
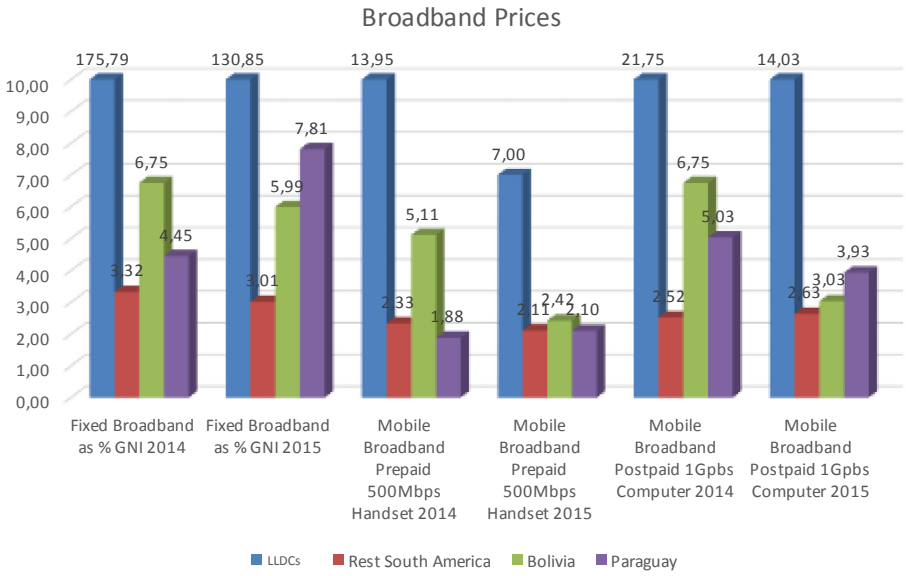


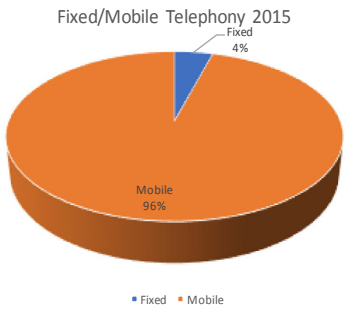
2. Situación actual

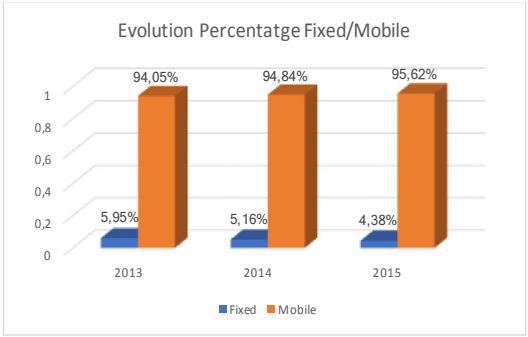
Precios



2. Situación actual

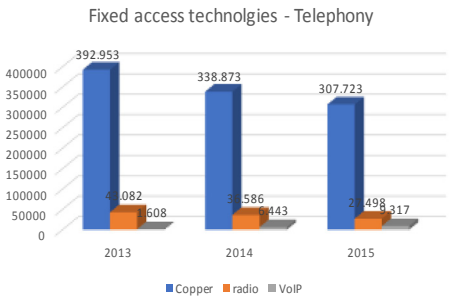
Paraguay: tecnologías de acceso

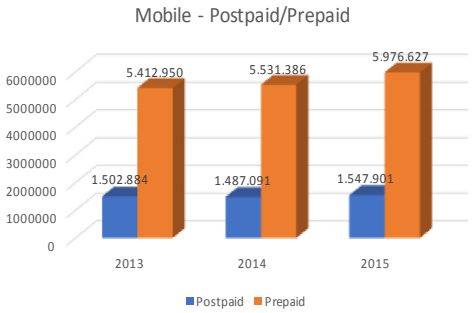




2. Situación actual

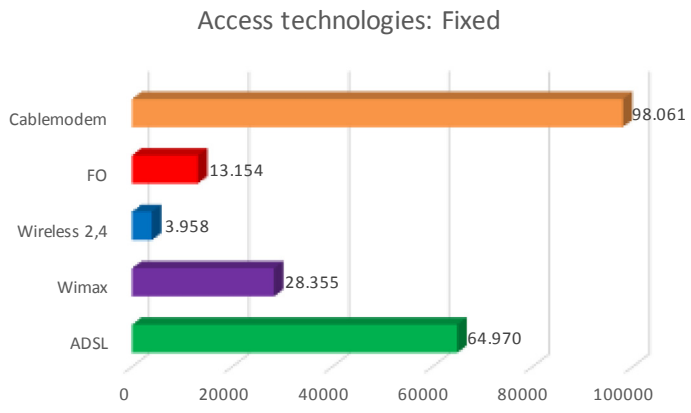
Paraguay: telefonía





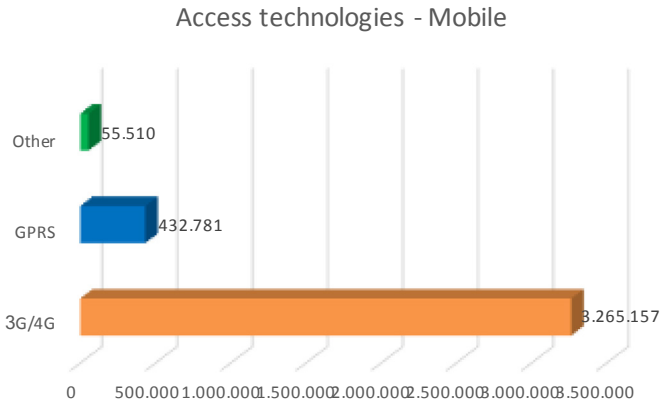
2. Situación actual

Paraguay: acceso red fija



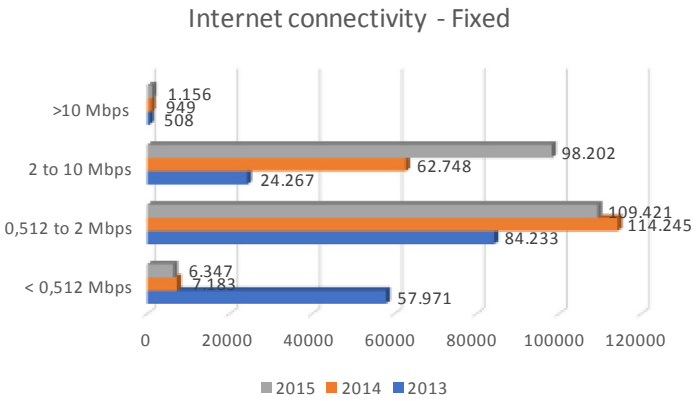
2. Situación actual

Paraguay: acceso red móvil



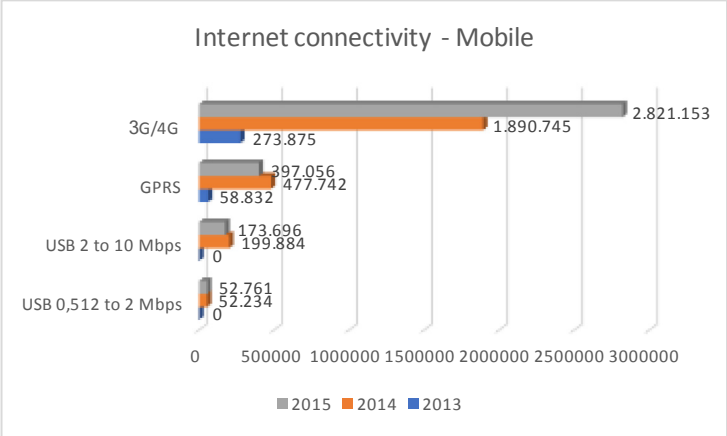
2. Situación actual

Paraguay: acceso Internet fijo



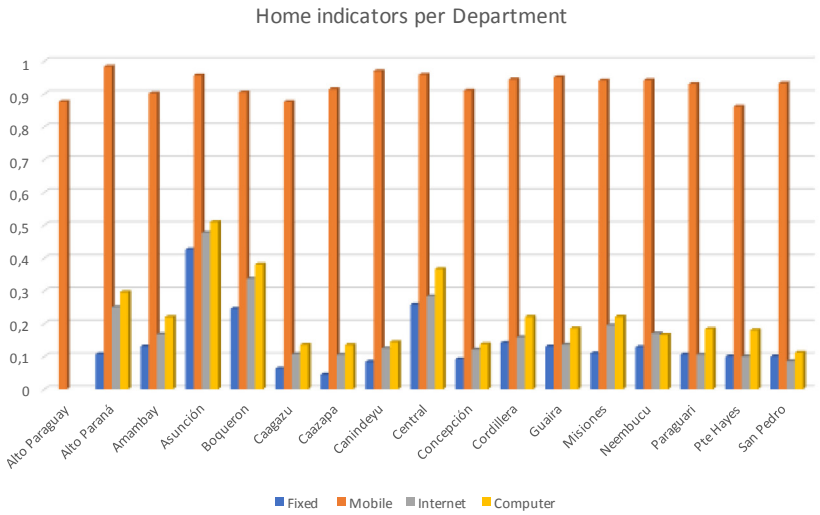
2. Situación actual

Paraguay: acceso Internet móvil



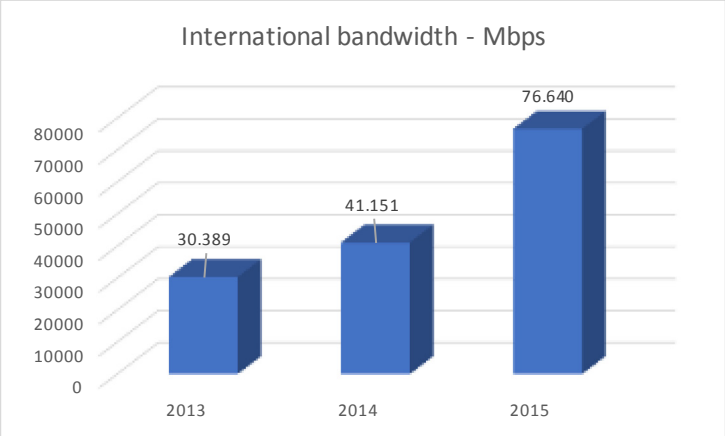
2. Situación actual

Paraguay: visión por Departamento: indicadores hogar



2. Situación actual

Paraguay: conectividad internacional



3. Uso de las TIC

3. Uso de las TIC

Actores

- Ministerio de Obras Públicas y Comunicaciones.
- Conatel
- Senatics
- Operadores: Copaco, Núcleo, Telecel, Hola, AMX, ...

3. Uso de las TIC

Proyectos especiales

- Hacia una sociedad conectada.
- Inclusión digital.
- Mejorar eficiencia regulatoria.
- Plan nacional de Ciberseguridad.
- Proyectos Sinetics.
- Proyectos relacionados con el Fondo del Servicio Universal.

4. Retos

4. Retos

General

- Actualización Ley de Telecomunicaciones.
- Servicio Universal y forma de financiación.
- Asegurar Gobernanza de todas las iniciativas.
- Programas de fomento de las TIC en todos los sectores productivos del país.
- Participación activa del sector privado.
- Aplicaciones y contenidos locales.
- Asegurar compartición de infraestructuras.
- El foco deberían ser los servicios, no tan solo la conectividad.
- Mejorar equilibrio territorial.

4. Retos

Conectividad

- Despliegue de redes de banda ancha fijas.
- Reducir las barreras para el despliegue de redes.
- Incremento continuo de la velocidad de acceso a Internet.
- Incremento de los servicios en los Telecentros.
- Potenciar el 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 paraguaya.
- 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. Impacto en el servicio y tarifas usuarios.
- Orientación TICs a mejorar calidad vida ciudadanos, la eficiencia y productividad de las empresas y los servicios públicos y sociales.
- Desarrollar el uso de las TIC en todos los sectores: ventaja competitiva para Paraguay.

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

Annex 2 – References

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International Telecommunication Union (ITU)
Telecommunication Development Bureau (BDT)
Office of the Director
Place des Nations
CH-1211 Geneva 20 – Switzerland
Email: bdtdirector@itu.int
Tel.: +41 22 730 5035/5435
Fax: +41 22 730 5484

Deputy to the Director and Chief, Administration and Operations Coordination Department (DDR)
Email: bdtdeputydir@itu.int
Tel.: +41 22 730 5784
Fax: +41 22 730 5484

Infrastructure Enabling Environment and e-Applications Department (IEE)
Email: bdtiee@itu.int
Tel.: +41 22 730 5421
Fax: +41 22 730 5484

Innovation and Partnership Department (IP)
Email: bdtip@itu.int
Tel.: +41 22 730 5900
Fax: +41 22 730 5484

Projects and Knowledge Management Department (PKM)
Email: bdtpkm@itu.int
Tel.: +41 22 730 5447
Fax: +41 22 730 5484

Africa

Ethiopia
International Telecommunication Union (ITU)
Regional Office
P.O. Box 60 005
Gambia Rd., Leghar ETC Building
3rd floor
Addis Ababa – Ethiopia

Email: ituaddis@itu.int
Tel.: +251 11 551 4977
Tel.: +251 11 551 4855
Tel.: +251 11 551 8328
Fax: +251 11 551 7299

Cameroon
Union internationale des télécommunications (UIT)
Bureau de zone
Immeuble CAMPOST, 3e étage
Boulevard du 20 mai
Boîte postale 11017
Yaoundé – Cameroun

Email: itu-yaounde@itu.int
Tel.: + 237 22 22 9292
Tel.: + 237 22 22 9291
Fax: + 237 22 22 9297

Senegal
Union internationale des télécommunications (UIT)
Bureau de zone
8, Route du Méridien
Immeuble Rokhaya
B.P. 29471 Dakar-Yoff
Dakar – Sénégal

Email: itu-dakar@itu.int
Tel.: +221 33 859 7010
Tel.: +221 33 859 7021
Fax: +221 33 868 6386

Zimbabwe
International Telecommunication Union (ITU)
Area Office
TelOne Centre for Learning
Corner Samora Machel and
Hampton Road
P.O. Box BE 792 Belvedere
Harare – Zimbabwe

Email: itu-harare@itu.int
Tel.: +263 4 77 5939
Tel.: +263 4 77 5941
Fax: +263 4 77 1257

Americas

Brazil
União Internacional de Telecomunicações (UIT)
Regional Office
SAUS Quadra 06, Bloco "E"
10º andar, Ala Sul
Ed. Luis Eduardo Magalhães (Anatel)
70070-940 Brasilia, DF – Brazil

Email: itubrasilia@itu.int
Tel.: +55 61 2312 2730-1
Tel.: +55 61 2312 2733-5
Fax: +55 61 2312 2738

Barbados
International Telecommunication Union (ITU)
Area Office
United Nations House
Marine Gardens
Hastings, Christ Church
P.O. Box 1047
Bridgetown – Barbados

Email: itubridgetown@itu.int
Tel.: +1 246 431 0343/4
Fax: +1 246 437 7403

Chile
Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Merced 753, Piso 4
Casilla 50484, Plaza de Armas
Santiago de Chile – Chile

Email: itusantiago@itu.int
Tel.: +56 2 632 6134/6147
Fax: +56 2 632 6154

Honduras
Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Colonia Palmira, Avenida Brasil
Ed. COMTELCA/UIT, 4.º piso
P.O. Box 976
Tegucigalpa – Honduras

Email: itutegucigalpa@itu.int
Tel.: +504 22 201 074
Fax: +504 22 201 075

Arab States

Egypt
International Telecommunication Union (ITU)
Regional Office
Smart Village, Building B 147, 3rd floor
Km 28 Cairo – Alexandria Desert Road
Giza Governorate
Cairo – Egypt

Email: itu-ro-arabstates@itu.int
Tel.: +202 3537 1777
Fax: +202 3537 1888

Asia and the Pacific

Thailand
International Telecommunication Union (ITU)
Regional Office
Thailand Post Training Center, 5th floor,
111 Chaengwattana Road, Laksi
Bangkok 10210 – Thailand

Mailing address
P.O. Box 178, Laksi Post Office
Laksi, Bangkok 10210 – Thailand

Email: itubangkok@itu.int
Tel.: +66 2 575 0055
Fax: +66 2 575 3507

Indonesia
International Telecommunication Union (ITU)
Area Office
Sapta Pesona Building, 13th floor
Jl. Merdan Merdeka Barat No. 17
Jakarta 10110 – Indonesia

Mailing address:
c/o UNDP – P.O. Box 2338
Jakarta 10110 – Indonesia

Email: itujakarta@itu.int
Tel.: +62 21 381 3572
Tel.: +62 21 380 2322/2324
Fax: +62 21 389 05521

CIS countries

Russian Federation
International Telecommunication Union (ITU)
Area Office
4, Building 1
Sergiy Radonezhsky Str.
Moscow 105120
Russian Federation

Mailing address:
P.O. Box 47 – Moscow 105120
Russian Federation

Email: itumoskow@itu.int
Tel.: +7 495 926 6070
Fax: +7 495 926 6073

Europe

Switzerland
International Telecommunication Union (ITU)
Telecommunication Development Bureau (BDT)
Area Office
Place des Nations
CH-1211 Geneva 20 – Switzerland
Switzerland
Email: eurregion@itu.int
Tel.: +41 22 730 6065

International Telecommunication Union
Telecommunication Development Bureau
Place des Nations
CH-1211 Geneva 20
Switzerland
www.itu.int

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