

Southern Space Studies
Series Editor: Annette Froehlich

Annette Froehlich *Editor*

Space Fostering Latin American Societies

Developing the Latin American
Continent Through Space, Part 2

 Springer

Southern Space Studies

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Peruvian Government Spending on Satellite Communications. Foundations for a Communications Satellite Project for Peru

Carlos Caballero León and Wilfredo Fanola Merino

Abstract

Peruvian Government contracts satellite communication services to private foreign companies. Public entities contract independently, depending on their resources and priorities. This way of contracting turns out to be inefficient; it prevents achieving economies of scale and indicates a lack of communications policy for public institutions. The study shows that currently, satellite communication services are contracted by 45 public organizations, with an estimated capacity consumption of 511 MHz and with an effective spending per year that amounts to US\$21,7 million. Over fifteen years, this level of aggregate yearly expenditure raises to US\$325,25 million, enough for Peru to acquire a communications satellite. With the acquisition, Peru could stop its dependency on foreign providers, significantly improve the quality of spending, reduce the monthly MHz cost of satellite capacity, meet the government's demand, and reduce the country's connectivity gap. This study presents a strong argument to initiate activities leading towards the acquisition of a communications satellite for Peru and establishes guidelines for this project.

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1 Introduction

The main facilities of long-distance communication are radio-relay systems, fiber optic cables, and communication satellites.¹ All these means are necessary, complementary, and not exclusive.

For a long time, Peru has public and private radio and fiber optic networks. It is pertinent to highlight the effort made by the government to implement broadband, within the framework of Law No. 29904 for Broadband Promotion and National Optical Fiber Backbone Network Construction² (RDNFO), as well as the 21 regional projects that will be connected to the RDNFO.

The planned investment, amounting to US\$2.136 million³, will allow broadband internet access to more rural localities. It should be noted that there are no fiber optic network projects for the provinces located in the Amazon rainforest: Loreto, Madre de Dios and Ucayali.⁴

Peru registers a total of 25,009 villages with at least one public entity. As seen in Fig. 1, by 2018, 95% of these localities had at least one public entity without fixed internet access. This is expected to decline to 77% in 2020 and 65% by 2022, as current regional broadband projects get completed. For this reason, it is expected that within two years, the Internet access gap for public entities will be reduced to 16,180 villages.⁵

The connectivity gap in Peru is explained by the dispersion and distance among the localities of the territory. It is aggravated by the complexity of the country's geography, which makes access to them difficult. Also, since their populations live in poverty or extreme poverty, they are not served by private fiber optic networks and radio links, as they are not commercially profitable. However, one of the main factors that contributing to this situation is that Peru does not have the third means of long-distance communication: the communications satellite.

¹John Lewis, "Space Procedures", *International Telecommunication Union*, 2009, www.itu.int/itunews/manager/display.asp?lang=es&year=2009&issue=02&ipage=26&ext=html (all websites cited in this publication were last accessed and verified on 30 July 2020).

²Act for Broadband Promotion and National Optical Fiber Backbone Network (RDNFO) Construction, Official Journal "El Peruano", Lima, Peru, 28 July 2012.

³Nadia Villegas, "Peru Connected Through Broadband: Connected to the Bicentennial", 29 April 2020, Cycle of Videoconferences on Telecommunications Matters of the Ministry of Transport and Communications, Lima, Peru.

⁴Carlos Lozada, "Internet Access to Rural Areas to Guarantee Education Through the Aprendo en Casa Program", 19 July 2020, presentation at the Eighth Virtual Ordinary Session of the Transports and Communications Commission of the Congress of the Republic, Lima, Peru.

⁵Office of Multiannual Investment Programming, "Gap Indicators: Percentage of Localities with at least one Public Entity without Fixed Internet Access Service Coverage", *Ministry of Transport and Communications*, 17 January 2019, <http://portal.mtc.gob.pe/estadisticas/inversiones/Indicadores-de-Brechas-2019.pdf>.

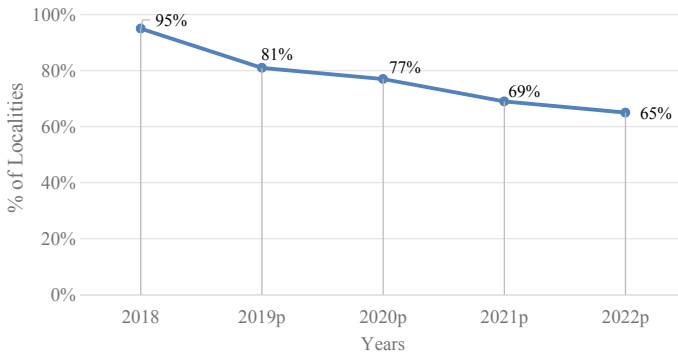


Fig. 1 Percentage of localities having at least one public entity without access to fixed internet
Source Own research based on gap indicators data obtained from Ministry of Transports and Communications MTC

In the face of this problem, a communications satellite is essential in order to connect the population in the vast national territory. A system of this type can be strategic for commercial development, national defense, and progress across all sectors.

Over the years, efforts have been made to put the communications satellite’s issue on the national agenda, without success. Proof of these efforts are the legislative initiatives presented since 2009, in the form of five bills to declare the formulation of a satellite development plan of public necessity and national interest that contemplated having a sovereign communications satellite as the key component.

The contradiction between the need for a Peruvian communications satellite and the absence of concrete actions to achieve its implementation raises a series of questions: What is the real magnitude of demand in Peru in the field of satellite communications? How much money is spent on satellite communications? Which public entities use this type of service? What are the modalities of the contracted services? Is it more convenient to continue contracting services to third parties or to execute a sovereign communications satellite project for Peru? If developing a sovereign satellite is more convenient, what general criteria should guide this project?

These issues gave rise to the present investigation on the spending of satellite communications services for public entities in Peru. It should be specified that the study is oriented exclusively to contracts made by the public institutions, excluding arrangements made by private users.

2 Methodology

Public procurement in the Peruvian government is regulated by the State Contracting Law⁶. This law establishes that the Electronic System of State Procurement (SEACE) is the official system for exchanging, dissemination, and registration of all documents related to the contracting processes. For this reason, this electronic system became the primary source of information for the present investigation.

The first step was a search in SEACE⁷ of the satellite communications contracting processes that public entities have carried out between 2015 and 2020. The official documents registered in the system, as technical requirements and contracts, have been reviewed. The level of detail of the investigation exposed issues related to the discrepancy between the reference values of the listings in the first search and the contracted amounts, hence the importance of reviewing this data in the contracts.

Despite the legal requirement to register all the contracting processes' documents in SEACE, some are not accounted in the system. For this reason, and, based on the Law of Transparency and Access to Public Information⁸ a second source was used to request the information. This law promotes transparency in the actions of public administration entities and establishes the principle of publicity. Given the gaps in the information available in SEACE, this legal right was used to request technical requirements information from the Ministry of Education, the Ministry of the Interior, and the National Registry of Identification and Civil Status (RENIEC).

With the information obtained from technical documents and selected contracts, a record of the satellite communications services effectively contracted was compiled. This new record included the following elements: the name of the public entity, date and nomenclature of the procurement process, contract objective, period of the contract, amount in soles or dollars, bandwidth contracted in MHz⁹, satellite and band of operation, mode of service, number of Very Small Aperture Terminal (VSAT) fixed, mobile or telephone stations, contracting company, number of pages of technical requirements and contracts and technical data of the contracted links.

⁶Law No. 30225, State Contracting Law, Official Journal "El Peruano", Lima, Peru, 12 March 2019.

⁷Supervisory Agency of State Procurement, "Electronic System of State Procurement", <https://prodapp2.seace.gob.pe/seacebus-uiwd-pub/buscadorPublico/buscadorPublico.xhtml#>.

⁸Law No. 27806, Law of Transparency and Access to Public Information, Official Journal "El Peruano", Lima, Peru, 10 December 2019.

⁹International Telecommunication Union, *Nomenclature of the Frequency and Wavelength Bands Used in Telecommunications*, (Geneva: International Telecommunication Union, 2015), 4.

3 Results

The studied procurement processes corresponded to 45 public entities using satellite communications services in any of its modalities. The record of satellite communications services contracted collects the information from 121 technical requirements and 119 contracts from public entities throughout Peru, coming to a total of 5.897 reviewed pages.

3.1 Contracted Modalities

The satellite communications contracted by the aforementioned public institutions correspond to the following modalities

3.1.1 Satellite Segment

Satellite Segment consists of contracting a specific bandwidth in MHz to satisfy the needs of the user entities. Through a certain bandwidth, users can establish their own communication networks and transmit internet, telephone, television (TV) or data services. It is the basic modality of satellite communications service.

3.1.2 Satellite Telephony

Satellite Telephony is the provision of telephony services for users who operate in environments not served by the commercial telephone network. It can be fixed or mobile satellite telephony. The service provider uses a certain bandwidth to transmit the public telephony signal or an IP extension of a customer's private network through a communications satellite. If it is fixed satellite telephony, the receiving station can be a VSAT or Broadband Global Area Network (BGAN). If it is mobile, the service can come from global providers, who supply the telephone equipment, a package of minutes or seconds for calls, transmission of messages and Internet access.

3.1.3 Satellite Internet

Satellite Internet is the provision of Internet signal through a certain communications satellite bandwidth. The receiving station can be a VSAT or BGAN.

3.1.4 Data Transmission

Data Transmission is the interconnection service of equipment with data acquisition capacity (Supervisory Control And Data Acquisition—SCADA type) or networked computers, located in remote locations, with a satellite link, which requires a certain bandwidth.

3.1.5 Satellite TV

Satellite TV is the transmission of domestic and international channels through a satellite link. It corresponds to direct to home or Direct To Home (DTH) services.

Table 1 Modality and quantity of contracted services. *Source* Prepared by the authors

N°	Modality	Quantity of contracts
1	Satellite segment	22
2	Satellite telephony	31
3	Satellite internet	38
4	Data transmission	11
5	Satellite TV	10
6	Combined modalities	9
Total		121

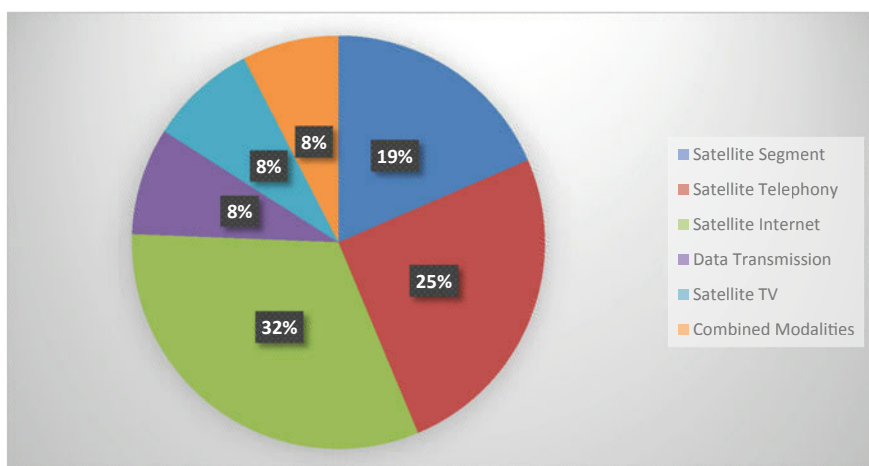


Fig. 2 Modality of contracted satellite communications services *Source*: Own research

The public contracts studied include at least one or a combination of the aforementioned modalities. Table 1, outlines the number of services contracted by modality for the study period:

The three most frequent modalities are satellite Internet (32% of cases), satellite telephony (25%) and satellite segment (19%) (Fig. 2).

3.2 Contracted Amounts

Regarding the contracted amounts, the 121 studied processes amount to US \$68.930.755,00 after adjusting for inflation.

The processes studied correspond to the period from October 2015 to July 2020 (four years and ten months). It has been verified that public entities contract in periods ranging from less than one year up to a total of five years. Entities contract

in any of the twelve months of the year and contracts are made both in national currency (sol) or in foreign currency (US\$).

Likewise, it has been verified that each sector or institution makes these contracts independently, depending on the available resources and their own priorities. While outside the scope of this analysis, it should be noted that this form of contracting turns out to be very inefficient since it prevents access to economies of scale, to which the government should strive for through a policy of integration of contracting in general and of the services of satellite communications, in particular.

At this point, the collected information needed to be standardized to facilitate analysis. Firstly, the amount of each contract was divided by the contracted period in years. This allowed to understand the amount that the public entity pays for the contracted service each year. The sum of all contracts in force each year amounted to US\$25.290.624,35 as total annualized spending.

However, it was determined that several processes were repeated for the same item when they were hired every year. In the same way, it was necessary to identify those processes that, despite being contracted for periods of less than a year, are permanent services in order to include them in the calculation, unlike those that were temporary services.

By analyzing case by case and applying the corrections, the so-called effective spending per year was obtained. This item adds the amounts of the contracts in force every year, regardless of the contract period or date. In this case, the effective spending per year amounts to the sum of US\$21.683.142,51.

The effective spending per year for satellite communications services is considered a fundamental result of this study since it represents the effective outflow of funds from the public treasury that is carried out each year, for all the institutions included, on a permanent basis, and allows a projection of the expenditure that the government will carry out in a given number of years.

3.3 Contracted Bandwidth

Another important piece of data to consider in this study is the bandwidth contracted by public entities, since it allows for calculating the cost per MHz per month effectively paid. To do this, the bandwidth contracted in the satellite segment modality is added to the estimated bandwidth used in the other contracted satellite communications services.

Regarding the satellite segment, the aggregate bandwidth contracted annually by all public institutions is 171,128 MHz. This information is explicitly presented in the technical requirements and contracts.

Concerning satellite Internet services, telephony, data transmission and their combinations, an estimate of the bandwidth used in each contract has been made, since this information is not presented in the consulted documents. To do this, the

following formula¹⁰ has been used to convert the contracted data speeds in Mbps to MHz, considering a spectral efficiency of 2,5 Bits/Hz in data download and 2 Bits/Hz in upload.

$$\text{Bandwidth (MHz)} = \frac{\text{Download Speed (Mbps)}}{2,5 \text{ bps/Hz}} + \frac{\text{Upload Speed (Mbps)}}{2 \text{ bps/Hz}}$$

Thus, the total estimated bandwidth in the contracted satellite communication services is 340,03 MHz.

The total estimated bandwidth used in the services contracted by public entities is 511,158 MHz. This information is also a fundamental result of the study, which will allow for further analysis and comparisons to better understand the meaning of this value.

3.4 Contracting Public Entities

Since the studied satellite communications procurement processes correspond to 45 public entities, this means that only 1,53% of 2.940¹¹ public entities retain this type of service.

4 Special Case Analysis

The results of the investigation and the standardized information in the form of effective spending per year and total estimated bandwidth used by public entities, have been analyzed. However, the following special cases should also be discussed.

4.1 Most Expensive Contracts

The analysis of the most expensive contracts shows ten of the 121 studied contracts total US\$19.263.733,72, which represents 89% of the annual effective spending. The way these numbers behave follows the Pareto principle¹², as shown in Fig. 3.

This means that even if, from now on, the analysis focused only on these ten contracts (from the National Bank, National Police, Ministry of Education, National Institute of Radio and Television, Joint Command of the Armed Forces, Army,

¹⁰International Telecommunication Union, *Definition of spectrum use and efficiency of a radio system*, (Geneva: International Telecommunication Union, 2017), 33.

¹¹National Agency of Electronic Government and Information Technology, "List of Entities of the Peruvian State", *Presidency of the Council of Ministers*, 6 October 2016, www.datosabiertos.gob.pe/dataset/lista-de-entidades-del-estado-peruano.

¹²Richard Koch, *The 80/20 Principle. The Secret to Achieving More with Less*, (New York: Doubleday, 2008), 6.

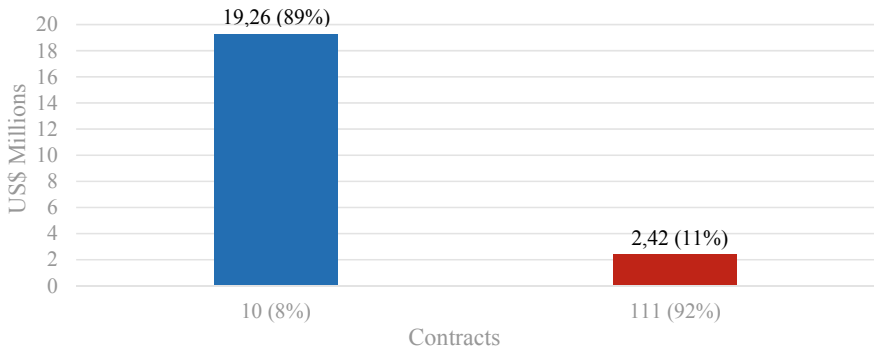


Fig. 3 Most expensive contracts *Source* Own research

Navy and Air Force), the conclusions would be effectively equal to the conclusions corresponding to the study of all the contracts. This situation will be reviewed later in the sensitivity analysis.

4.2 Entities Demanding More Bandwidth

Although the total estimated bandwidth used by public entities amounts to 511,158 MHz, the analysis shows that only seven institutions (National Police, Ministry of Education, National Institute of Radio and Television, Joint Command of the Armed Forces, Army, Navy and Air Force) employ 441,278 MHz, 86% of the total contracted bandwidth. In this case, the Pareto principle is also verified, as shown in Fig. 4.

As in the case of the most expensive contracts, if the bandwidth analysis focused solely on these seven institutions, the conclusions would be practically the same as the analysis of the total.

4.3 Public Entities Situated in the Same Locality

Several cases of different institutions using satellite communications within the same locality have been identified. For instance, in Lima, Piura, Arequipa, Iquitos and Pucallpa, there are offices of the National Bank, Joint Command of the Armed Forces, Army, Navy, Air Force, National Police and Peruvian Airports Corporation (CORPAC).

With this organization, each entity must implement dedicated infrastructure, systems for maintenance and operation, communications equipment and antennas (Satellite Hub, VSAT’s). If not, entities must contract this service along with communications service.