Environmental history dossier

Opportunity and sustenance of the water resource in the province of Atacama (Bolivia, 1825-1879)

Oportunidad y mantenimiento del recurso agua en la provincia de Atacama. (Bolivia, 1825-1879)

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Abstract

This article exposes the conditions for obtaining fresh water in the province of Atacama (Bolivia) in its years of existence (1825-1879). It seeks to understand in the documents analyzed, how this need is addressed in the desert, how initiatives arise and advance to obtain it, and how relationships for the common good are presented in the mentioned period. This situation is described in a synchronic and diachronic way (*descriptio* means referring to something in detail and with all its circumstances and by its parts and properties). The sources used come from the Historical Archive of Potosí (AHP), the National Historical Archive of Bolivia (AHNB) and official correspondence.

Keywords: water, desert, Atacama province, Cobija, Lamar port, Bolivia.

Resumen

Este artículo expone las condiciones de la obtención de agua dulce en la provincia de Atacama (Bolivia) en sus años de existencia (1825-1879). Desde los documentos analizados busca comprender cómo se aborda la necesidad del agua en el desierto, cómo surgen y se adelantan iniciativas para su obtención y cómo se presentan las relaciones por el bien común en el periodo mencionado. Se describe esa situación de manera sincrónica y diacrónica (*descriptio* significa referir alguna cosa menudamente y con todas sus circunstancias y por sus partes y propiedades). Las fuentes empleadas provienen del Archivo Histórico de Potosí (AHP), del Archivo Histórico Nacional de Bolivia (AHNB) y de correspondencia oficial.

Palabras clave: agua, desierto, provincia de Atacama, Cobija, puerto Lamar, Bolivia

Introduction

The extreme southwest of Bolivia included until 1879 the province of Atacama, where Cobija, Puerto Lamar was founded as the capital and first major port of the Republic; this port disappeared during the War of the Pacific. The province was located between the Pacific coast and the Andes mountain range, in an arid region with extreme temperatures with an approximate area of 120,000 square kilometers and 400 kilometers of coastline on the Pacific Ocean. Two rivers defined the limits of the region with Peru and Chile. To the east it was adjacent to the department of Potosi and the Republic of Argentina and to the west with the Pacific Ocean.

In the desert there was a particular climate, topography and history that are all exposed in this work. The sands and lack of vegetation contributed to the dry climate, although this was decreased by the proximity of the ocean and the vicinity of the Andes; it was also positively influenced by the abundance of dew that spread at night. The water systems of this region included watering holes, oases and subterranean fresh water wells, among other water resources. Although these were not always near the villages or in good condition for use and consumption as many lacked maintenance and therefore were dry. In general, it can be noted that it was a scarce resource and difficult to obtain according to needs, actions and the

various ways of living. Hence the interest in understanding, in the documents analyzed, how the basic needs for water were addressed, how initiatives arose and were carried out to obtain it, that is to say; how the relationships for the common good were produced considering how the geographical conditions were integrated? Figure 1 presents the limits of Bolivia with Peru and Chile (Loa River and Paposo River) and identifies places such as Calama, Caracoles and Chiu Chiu, Tocona, where some of the desert oases that comprised the province of Atacama (Bolivia) are distributed.

Figure 1. Map of the Littoral of Bolivia in 1876

Source: Von H. Wagner. *Mapa El Litoral de Bolivia*, *1876*, en Ministerio de Relaciones Exteriores de Bolivia, *El libro del mar* (La Paz: Dirección Estratégica de Reivindicación Marítima – DIREMAR, 2014), 28.

From a theoretical perspective, Yury Lotman relates the "poetics of everyday behavior" in the use of things[1], and Norman Pounds associates everyday life[2] with the practices, social life and uses of things; the social life revealed in the use of things, or the social life of groups revealed by their use of things.[3] This logic includes roads, water supplies, sanitation and cleaning facilities, streets, fires, food, street layout, wages, prices and the monetary system,[4] distance and transportation.[5] Marc Bloch writes: "It is revealed even in the form of the fields, the social structure".[6]

A conceptual and theoretical pillar is the territorial unit locality/region. It is the framework for understanding the space that communicates the subject with the time of culture and the determinations of nature.

The data integrates the needs and the search for solutions among which are the location of water, the conditions of obtaining and assurance, the need for maintenance, scarcity and regulation, supply, distilleries, artesian wells, purification machines and financing.

Materials and methods

The analysis of the documents is aimed at understanding the relationships that were established around freshwater needs. Various perspectives are described including the diachronic and synchronic dimensions, the scarcity of water experienced by the inhabitants, merchants, businessmen and the population in general is reviewed, and the situation in which regular access to fresh water was found in the towns of the province of Atacama are outlined. For this purpose, data was incorporated that enabled the recognition of the procedures for procurement, regulation and regularity of water procurement. Some processes of exploration and location of the sources such as waterholes are also recorded as well as the types of maintenance of freshwater sources, and additionally the forms developed for the assurance of water security are identified.

It also describes the forms used for the organization, improvement and refurbishment of supply sites, distilleries, artesian wells, the brackish water purification machine and financing. Events related to this object of analysis are covered and that are in the period of existence of the province of Atacama (1825-1879).

The diachronic and synchronic dimensions of the description are used to understand the needs and the search for solutions in the moment and at the time that it occurred. The

1 Peter Burke, *Formas de hacer historia* (Madrid: Alianza Editorial, 2000), 244.
2 Norman Pounds, «El modo de vida urbano», *La vida cotidiana: Historia de la cultura material*. (Barcelona: Crítica. 1992), 428.
3 Burke. *Formas de…,* 29.
4 The same issue is addressed by historians Witold Kula y Pierre Vilar in *Oro y moneda en la historia 1450-1920* (Barcelona: Ariel, 1969).
5 Pounds. *La vida cotidiana…,*428.
6 Marc Bloch, *La Historia rural francesa.* Suplemento a la introducción (Barcelona: Crítica, 1978), 50-51.

body is organized with official correspondence (official letters), written testimonies (André Bresson, 1871), articles from local and foreign press (*El Eco de Cobija, El Caracolino, La Voz del Litoral, La Reforma de la Serena*), Historical sources were obtained in the Historical Archive of Potosi (AHP) and in the National Historical Archive of Bolivia (AHNB).

Results and findings

From the Loa River to the Paposo River, the coast of the province, whose capital was Cobija, Puerto Lamar, had an approximate extension of 482 kilometers. Its geographical location was between 21 and 30 degrees latitude south, between deep ravines that separated the Pacific coast and the Andes mountain range, in a non-flat quadrilateral area of about 120 kilometers of irregular width. In its topography it had low parts and parts of medium height, it also had a closed appearance, without gulfs or inlets (Figure 1). There was no vegetation other than in the vicinity of some streams. The waterholes that came from the ravines of the Andes, especially from La Puntilla, provided water for the ships, mostly foreigners, that carried commerce at the trade port.[7] The Loa River defined the border with Peru, and to the south the Paposo did so with Chile. To the east were Potosi and Argentina. The desert had clear boundaries between the Pacific coast and the Andes mountain range and shaped a climate, a topography and a history. In 1860 it had 34,000 inhabitants, according to Montes de Oca. [8] Of these, 4,000 were in the capital.

At a distance ships distinguished the coast thanks to the immense shadow of the Altos de Cobija hill that marked the deep horizon. José Baldomero Menéndez[9] notes that the mass was distinguishable by its solitude and contrast with the desert plain, which enabled ships to find their location. Between the sea and the hill, there emerged the two white turrets of the Church of El Carmen, also known as Santa Maria Magdalena de Cobija (with that name Cobija was already known in 1587), which gave account of the beliefs of the inhabitants. The nearby promontories descended from the Andes and to the south side and extended to the coastal mountain range and formed ravines at the bottom of which the scarce water runoff so essential was presented.

The water system provided the province with a periodic source of mountain water, although the eastern and western descents were different. In the eastern descent of the mountain range was located the plateau of Lake Titicaca, which was opposite to the desert environment, it had páramo agricultural production and fauna that was favored by that condition that was present or disappeared from the area depending on the time. While, on the descent in the direction of the desert, the more you descended the more contrasting the situation was. At the beginning, the mountain range formed ravines, streams and waterholes and the sum-

7 José Menéndez, *Manual de Geografía y Estadística del Alto Perú o Bolivia* (Paris: Rosa y Bouret, 1860), 120.

8 Ismael Montes de Oca, *Enciclopedia geográfica de Bolivia*, (La Paz: Universidad Mayor de San Andrés, 2005), acceso el 10 de agosto de 2014, http://www.bolivia.com/geografiadebolivia/cap10.htm.

9 Menéndez, Manual de…, 60.

mits were home to herds of guanaco and vicunas, flocks of turtle doves, the Andean condor and the puma or American leopard.[10] Despite the character of the desert, its vicinity with the mountain range of perpetual snow conditions were favorable to the vegetation and the humid surface of the mountains was covered with a rich vegetation of cactus and Barbados nut (Jatropha curcas).[11] Bravo identified the prairies, the paddocks and a swamp.[12] They were places that were used for the breeding of chinchilla and vicuna, in addition to being a stopover for travelers.

Certainly, the capital port was not close to this area but rather on its edge. The capital of the province of Atacama and first major port of the Republic was on the seashore and after the crossing of the desert. The surface had rough ravines that came from the summits and ran perpendicular from the mountain range to the sea, with distances of 13 to 40 kilometers between main ravines.

> [The plains] suggest the idea that the conformation of this whole region is contemporary with the universal flood, for that geological area is known to have been materially swept away, furrowed and torn in all directions by the combined action of interior fire, earthquakes and floodwaters.[13]

The streams were abundant, but at the same time they were meager sources in the immense space that was constrained by the Loa River at one end and the Paposo at the other. This is how Bravo describes the rivers that delimited Peru and Chile:

> The Loa River carried its waters without discontinuity from the mountain range to the Pacific. [...] From Santa Bárbara the river loses that name to take the Loa or Chiu Chiu to the town of this denomination. Up to there its waters, whose flow occupies a width of 20 meters by half a meter deep, are sweet and pleasant; Its course is from north to south; receives the filtrations of the swamps of Aiquina [...] The course then becomes very tortuous as it continues to describe an arch from south to west in the direction of Calama. From this place, the Loa runs restricted by Guacate and Miscanti heading west, and then deviats northwest to Chance, here it receives the waters of the San Salvador River, runs south to north by the Toco and Quillagua to the parallel 21 1/2, then veers perpendicularly to the coast until it flows into its shores.[14]

In the desert, after the descent of the mountains, writes José Torres,[15] on the western side, there was neither a hut nor a tree nor a bush, and the scorching rays of the sun fell into the sand with nothing to mitigate the heat. He compared the desert to a barren plain, covered with quicksand that was ever changing its appearance as the winds moved it about, although the feet of horses were solid and did not sink below the surface. The exception to that condition was in the port of Mejillones 241 kilometers from the Caracoles mining center.

10 José A. Torres, *Solución de la cuestión de límites entre Chile y Bolivia* (Santiago: Ferrocarril, 1863), 8.
11 Menéndez, Manual de …, 57.
12 Carlos Bravo, *La patria boliviana. Estado geográfico* (La Paz: La Paz -Yungas, 1894), 59.
13 Torres, *Solución de…*, 10.
14 Bravo, *La patria…*, 62.
15 Torres. *Solución…*, 9.

The mountain range parallel to the coast had a distance of approximately 96,000 kilometers on average. This geographical barrier accentuated the existence of the water system through which almost no fresh water drained down the side that descended into the desert. The rivers were meager and followed a trajectory that did not coincide with the port or its needs, although the creeks appeared on the surface, that is, there was the physical conformation through which the waters should flow from the mountains in which the waters were formed.

The waterholes supplied the residents thanks to an arduous task that in some cases was frequent and habitual.

Another source of water in this desert water system, in that descent, were the oases: Calama, Chiu-Chiu, Atacama, Tocona and Caracoles (Figure 1). They were characterized by not having enough flow to reach all areas.

Carlos Bravo[16] also notes other water sources that passed over the veins of salt and were useful for the fodder grown there that was important to fatten the cattle in less than 60 days. Another source was the fog that moistened the rare vegetation during the night.

Finally, there was the immense sea, on whose shore had incrementally grown the Bolivian ports in the Pacific coast up until 1879; Cobija, Tocopilla, Mejillones and Antofagasta. Regarding the water conditions noted, and despite the fact that the combined systems formed the whole, there was a permanent need to obtain and secure minimum quantities vital for subsistence.

The traveler had to bring food, water and fuel for the journey as the desert was arid during the transit of carriages. The surface was crossed by valleys and gorges that resulted from some ravines without water that descended from the Andes.

> ... in the waters of the southern ocean several capes and points belonging in their entirety to the coastal province of Lamar and some of which have hydrographic importance and would have had greater significance if they were not located in the extremity of this territory that was so arid and depopulated.[17]

In the few geographical features of the coast were located the ports that had sufficiently deep water for all kinds of ships to enter. The south wind buffeted strongly and raised sea swells because of the rocks that obstructed the beach and there was no more than a brackish spring, two kilometers from the city.[18]

According to the administrative organization of the State, a prefect was established in the departments, a governor in the provinces and in the cantons a mayor. The constitutions of 1831 and 1834 dictated that the territory of the Bolivian nation included the departments of Potosí, Chuquisaca, La Paz, Santa Cruz, Cochabamba, Oruro and the provinces of Litoral

16 Bravo, *La patria…,* 188.
17 Torres. *Solución de…*, 9.
18 Torres, *Solución de*…, 120.

and Tarija.

The Litoral District was the only coastal district in Bolivia. It had been configured with the bases of an earlier original population. Carlos Toranzo refers to this phenomenon[19]: "The original is very different, when it coexists with the Creole and the Spanish, different at the time of the creation of the Republic in the nineteenth century; and its concept and reality are very modified." So "nations and the phenomena associated with them must be analyzed in terms of political, technical, administrative, economic and other conditions and requirements."[20]

When Bresson toured the desert in 1870 and made stopovers in the ports, he noted copper mineral treatment plants, mining huts, seawater distilleries and saw the Changos Indians on rafts.[21] They were fishermen and their utensils were made from seal and sea lion leather. In these villages Bresson encountered other customs as well, such as the chewing of coca leaves. He was interested in writing down about the soldiers that he met there, about the muleteers and their mules and it struck him that the inhabitants could make long journeys and that they did not seem to feel tired and that they did it without food.

The desert at whose maritime end Cobija was, Puerto Lamar, was shared. There were Changos, Atacameños, Aymaras, and from that diverse group officials were incorporated through the medium of work. Between 1825 and 1879 not only officials arrived, but also businessmen, workers, miners, political exiles from Argentina who installed commercial houses; consuls arrived from neighboring countries as well as from countries that were not neighboring;[22] additionally adventurers, mineral seekers, soldiers, criminals and neighbors arrived attracted by the advantages that the government granted in order to populate the province. The ships anchored in the port whose import and export goods connected with both nearby and overseas ports.

Undoubtedly, in those daily logics that motivated the organizational, cultural, economic and political forms of the port, the availability of fresh water was essential.

Migrants, traders, businessmen and others who inhabited the port adjusted in part to this situation. The activity of English and Chilean businessmen with concessions for the exploitation of huanífera, nitrate and other metals was subject to the schema of Bolivian law. In this conformation, "the little inhabited and little known territories must then exist, for the great majority, far away in geography and far away in memory. But even more, unimaginable to the vast majority."[23]

19 Carlos Toranzo, *Repensando el mestizaje en Bolivia. Nación o naciones bolivianas. Institucionalidad para nosotros mismos* (La Paz: CIDES-UMSA, 2009), 48.

20 Eric Hobsbawm, *Naciones y nacionalismo desde 1780*, 2ª ed. (Barcelona: Grijalbo Mondadori, 1992), 50.

21 André Bresson, *Bolivia. Sept anneés d'explorations, des voyages et des séjours dans L'Amérique Australe* (Paris : Challamel Ainé. 1886), 11. Acceso el 12 de enero de 2010. http://www.unz.org/Pub/BressonAndre-1886.

22 Viviana E. Conti, «Familia, redes y negocios en Sudamérica (1790-1850)», *Nuevo Mundo Mundos Nuevos*, Coloquios, (2008), acceso el 7 de julio de 2008, http://nuevomundo.revues.org//index17323.html.

23 Rossana Barragán, «Las fronteras del dominio estatal: espíritu legal y territorialidad en Bolivia, 1825-1880», *Umbrales. Revista del Postgrado en Ciencias del Desarrollo*, n.º 7 (2000), 15.

The sands and the lack of vegetation and water contributed to the warm and dry climate. The temperature varied between 18 and 34 degrees Celsius. Sometimes due to the excessive stillness of the atmosphere it amounted to 38 and rarely to 40. This helped, for example, to make the nights cool to travel along the coast. The temperature at 8pm was pleasant, although the fog descending was uncomfortable.[24] The atmosphere acquired a certain freshness during the hot season when a cold current arrived off the Strait of Magellan that lowered the water temperature of the ocean by five or six degrees, in the same way the temperature was lowered by the proximity of the snow-covered mountains.

Protection from the sun's rays in shade was scarce in the region.

> [Bolivia was] "between 9º 30' and 25º 40' of southern latitude and, located by the same to the N. and S. of the Tropic of Capricorn, which, in the first fourteen degrees corresponds to the torrid zone, in its section of S., and in the remaining two degrees to the southern temperate zone.[25]

As is the case of the inter-tropical countries, two seasons predominated: Spring that lasted from March to September and summer from September to March.[26] The twilights were brief and there was not much difference between the length of days and nights. The strong midday winds frequently and forcefully moved and dragged the sands about.

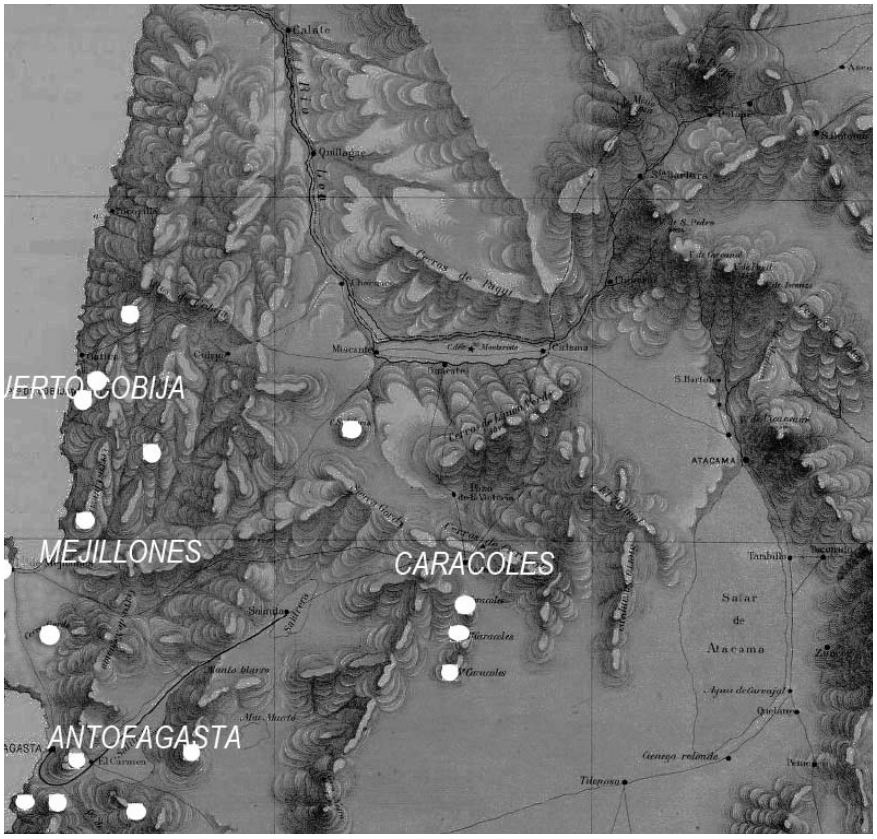
Puerto Cobija, Lamar, capital, was supported by the regulation of this shortage and each time a possible solution was sought. This was the case in 1866, when Quintin Quevedo (1866-1867), one of the prefects during the government of General Mariano Melgarejo, supported the project for the construction of an artesian well and for the care of the waterholes. The dream was born, spread and matured in this desert. It was believed that the problem had been eliminated through regulation. It was distributed in an egalitarian way, over use was avoided preventing the consequent lack for others. This improved the distribution; however, the shortage did not diminish and the central problem continued: the lack of fresh water for consumption.

As mentioned in previous paragraphs, the existing sources bore a great need, for although the physical condition existed they often did not contain enough water, and when new waterholes identified many lacked the water that was needed, sometimes they were useless as a result of lack of maintenance and repair. Justo L. Moreno, editor of *El Eco de Cobija*, wrote that the beasts that made the journeys along the roads transporting passengers and cargo, could not satisfy their needs of the day when they arrived at the watering holes in order to unload or lift loads of commerce, this "being the least bad thing that can happen to them to have to buy part of the water for consumption, of the machine distilled water, which costs four to five reales to load six arrobas".[27]

24 Menéndez, *Manual de* …,104.
25 Menéndez, *Manual de* …,99.
26 Menéndez, Manual de …, 100.
27 Justo Moreno, «Aguadas», *El Eco de Cobija*, Lamar, 12 de julio de 1860. Archivo Histórico Nacional de Bolivia, AHNB, Bolivia, 2.

The scarce water holes, Torres notes,[28] were formed like springs and water holes. Some such as Tuina, Aguas Dulces Providencia and Pozo de la Victoria were in declining catchment areas.[29] In general they were not abundant and some were brackish; nevertheless, they gave life to the desert and were vital for the excursions of the prospector, the explorer and the traveler. In 1829 ten new ones had been detected in the Litoral. Prefect Gaspar Aramayo located one of them in the capital port. That revelation gave rise to the President of the Republic, Andrés de Santa Cruz authorizing the purchase of two artesian drills to drill the earth to locate them for the benefit of the population and a decree being issued for the maintenance of the existing ones, especially Las Cañas, establishing the large water deposits and ponds that contributed to the comfort of the population.[30] The decree bore fruit and work was also done on the maintenance of La Algarrobo and Las Cañas watering (Figure 2).

Figure 2. Map in which some water holes or sources of water collection in the Province of Atacama are indicated.



Source: Amado Pissis, *Geografía física de la República de Chile* (Instituto Geográfico de Paris: Delagrave, 1875).
Note: White markings are not from the original document.

28 Torres, *Solución de*…,11.
29 Bravo, *La patria*…, 188.
30 «Historia del agua en el desierto más árido del mundo/Las aguadas de Cobija», Luis Pomar, acceso el 11 de febrero de 2019, http://historiadelagua.wordpress.com.

The maintenance covered a process in which they were provided with a wooden container lined with lead. They had a larger deposit and a smaller deposit.

> Both the fountain and the tank were enclosed in a kind of drawer with solid walls, to prevent the water from getting dirty with dust carried away by the wind. They were constructed of wood, but lined with lead inside to prevent water leakage. [31]

The Algarrobo did not have a constant flow. Some months during 1833 it produced between 5 to 7 barrels of water a day. In June 1833 it produced 12 to 13 barrels per day and in August 1833 it produced 15 per day. The cost of maintenance was 4,000 pesos. At a lower cost, the Aguada Las Canas produced more. In July it produced 100 barrels per day in its largest tank and 50 barrels per day in the smallest. The rain in the heights increased its capacity to 500 barrels per day. The contribution was such that it was compared with Las Cañas.

Among those who had contributed to the insurance was José Miguel Velasco. In his second term in the presidency of the Republic, between 1839 and 1841, he continued with repairs for conservation, storage and distribution. The watering hole of Cerro Moreno was of great importance. Francisco Vidal Gormaz comments that it was located in a cavern and was formed by the leaks that caused the condensation of mists that covered the Morro of 1290 meters high.[32] This is how Pomar describes it:

> The watering hole [de Moreno] is located on the coast and within a cavern on the hill that has a mouth of 6 to 7 meters and a depth of 10 meters; It is somewhat brackish and produces in 24 hours 3,500 liters of water that is collected through an iron tube; during the months of May and June it dries up almost completely, according to the use of the fishermen and miners who exploit it. The place of water is accessible by land, but by sea it is only occasionally accessible. As he passed in front of the water hole of Mount Moreno, the great opening of this cave was clearly seen, and there was a significant number of fishermen who came in and out of its interior, and at the distance that we saw them from, they seemed to sprout from a dark and deep den.[33]

The residents of Antofagasta and Mejillones were more favored by the proximity (Figure 3), while other users had to arrive with drums or have it from the slope of La Chimba (Antofagasta), which arrived on the back of mules.[34]

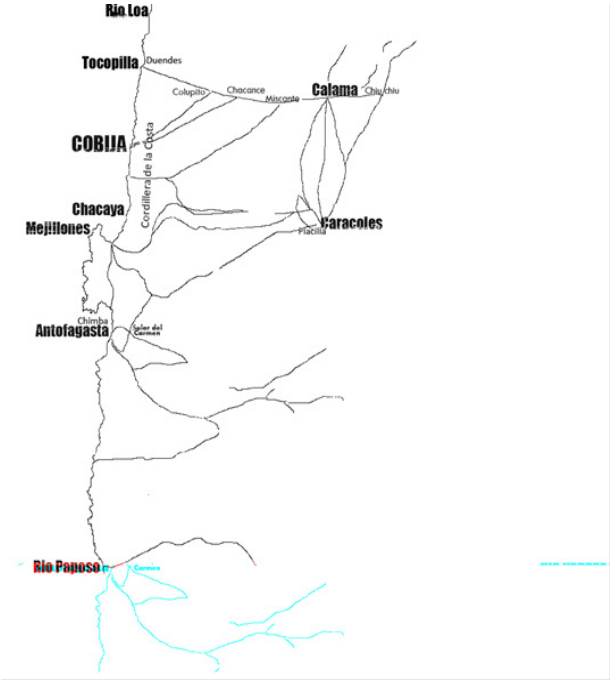
31 Pomar, «Historia del agua en el desierto más árido del mundo/Las aguadas de Cobija», 8.

32 Francisco Vidal Gormaz, «El Desierto de Atacama», en *Boletín de la Sociedad Geográfica de Madrid*. Barcelona: Real Academia de las Artes de Barcelona, 1879.

33 Pomar, «Historia del agua en el desierto más árido del mundo/Las aguadas de Cobija», 8.

34 Isaac Arce, *Narraciones históricas de Antofagasta* (Chile: s. e., 1930).

Figure 3. Borders with Chile and Peru (Paposo River and Loa River)



Source: Own elaboration.

Note: the distances between Cobija and other towns, ports and neighboring cities of the province are: Cobija-Caracoles, 136 km approx., Cobija-Calama: 188 km approx., Cobija-Tocopilla: 45 km., Cobija-Potosí: 188 miles (303 km approx.), Cobija-La Paz: 667 km (3 weeks of travel), Caracoles-Calama: 18 leagues, Caracoles-Mejillones: 241 km and Antofagasta-Tocopilla: 120 km.

In 1868 the first seawater condensing machine was brought to the coast. It delivered 270,000 liters a day to a population of about 400 people, plus cattle and mules. As the population grew, so did the demand for desalination machines. In those days André Bresson was able to appreciate some aspects of the place, for example, the residences of the authorities, which had a clean and relatively elegant appearance.[35] On the beach he found the distilleries that removed salt from seawater. Overseas trade boosted the arid spectrum. The trades of muleteers, prospectors, skilled guides, innkeepers and miners gave life to the roads and activity to the carriages and the service of mules. In 1872 and 1874 the distillery of Don Eusebio Moreno were installed, that provided 21,600 liters per day, that of Don Teófilo Reska, that of Juan de Dios Varas, that of Cesar O'Feliux (13,000 liters per day), the best quality belonged to Don Eduardo Orchard (13,000 liters per day), there were also installed those that worked with fantasy names such as "The Four Amigos", "The Sun" and "His Star".[36]

35 Bresson, *Bolivie. Sept annees*…,11.
36 Arce, *Narraciones históricas*…

The conditions in the shadow of the mountains were very different. Water quality improved and increased when ascending from the coast inland. These are described by Torres.[37] Some were at 57 kilometers and 72, others at 33 and 43, then at 25 and so on in sufficient frequency until the sources, which kept the scarce crystalline currents flowing in the streams.

The water sources were found within the mountain ranges and not in the flat expanses of the desert, where currents were scarce and spaced out at great distances. Around the thin waterways confined within the deep channels of the ravines grew thickets and on the surface of the slopes reeds and grasses. The flora was scarce and the oases were deep in the ravines. There grew salt grass (chépica). Over these waterholes the turtledoves fluttered and vicunas and guanacos lived. "Even the lion and the desert fox looked for prey there, as did the condors of the mountain ranges, and there they sowed the ravines with the spoils of their victims."[38]

In 1860 the prefect Francisco Buitrago advanced the idea of making a loan that had taken shape with the calculations of the editor of *El Eco de Cobija*, who proposed to raise a capital of 10,000 pesos[39] with the sale of shares of 50 and 100 pesos. Everything corresponded to the interest of subsidizing the flow of the Algarrobo as well as cleaning, improving and repairing some new leaks. As stated, one of the processes was to rebuild them, and what was carried out in the port was insufficient or was undertaken as a result of immediate need, with no long-range planning. In other cases the work was entrusted to people without knowledge.

After preparing the budget, the project had to be published then proposals had to be evaluated seeking to "contract the work to whoever proposes the greatest advantages".[40] For the amortization of 1,000 pesos each year, the publisher proposed to sell at a price that would allow paying the annual interest of 12 percent to shareholders and meet the salary of a trusted person to provide service and cover costs for unforeseen expenses and spare parts. These amounts, in addition, were going to compensate for the daytime inconveniences by having no cost at night.

The budget contemplated charging half a real each time for a beast of burden and one real for each load of 6 arrobas sold. This meant that, with the daily consumption of 100 beasts and the sale of 40 loads of water, it would generate an income of 11 pesos. Of course, consumption could vary from month to month, so it took a standard base of 10 pesos a day to add an annual entry of 3650 pesos. 1200 pesos would be allocated to capital interest at one percent per year, 1000 would amortize the capital in 10 annuities, 600 would be used for salaries of the manager, 850 for spare and unforeseen expenses.

The logic of the project was essential because it dealt with a basic need and the solution to its scarcity, lack of regularity and adequate distribution. It was stated that for 10 years the same fund would be allocated for interest on the shares. The surplus for the payment of less interest in the second year could be raffled off; in the third, following the logic of reducing

37 Torres, *Solución de*…, 11.
38 Torres, *Solución de*…, 11.
39 The currency had the approximate exchange rate of five bolivianos for each pound sterling.
40 Justo Moreno, «Aguadas», *El Eco de Cobija*…, 2.

interest, the premium would rise to 240 pesos, and this would increase resulting in a safe and beneficial placement of small capitals. The probability of a considerable profit to those who will keep their shares until the last year in which, corresponding to the 1000 pesos to amortize 120 pesos of interest, should also be distributed to the owners of those shares 1080 pesos by this system of payments.[41]

The consignee representatives of the province, the mining entrepreneur Artola, the miners, the well-to-do muleteers and everyone interested in progress were invited, with the aim of not allowing these plans to fall on deaf ears. With this background, between 1866 and 1867, the prefect Quintín Quevedo put into action his knowledge about the navigable rivers that he had acquired in his years of political exile in the Bolivian jungle and revived the project of having water on a regular basis. He led from the Prefecture and Superintendence of Finance and Mines of Lamar the construction of the artesian well and wrote to the prefect of Potosí the background related to the company that was organized.

> Persuaded of his patriotism, I hope that V. G. will concur with some actions and that he will procure to the company some other particulars of that neighborhood. Mr Clovis, the director of it, has been examined very carefully to avoid the possibility of being deceived. The exam has resulted in a satisfactory approval that allows the happiest results.[42]

The prefecture of Potosí followed up on the statement and requested that it be passed to the prior of the Commerce Consulate to gather the merchants of the city and make them participate. A week later he reported that the government had approved the artesian wells project and that it was committed to 200 partnership actions.[43] The next day it was intended to extend the deed of society and would begin to run the term at half the value of each share. Potosí concurred with some of the hundred and odd shares.

By mid-1866, the joint-stock company had been organized and work had begun. Quintin Quevedo was interested in obtaining information on the actions in the artesian wells company and in establishing a mail service for parcels.[44] On June 28 of that year, the construction had been completed and Francisco Gutiérrez's reply arrived from Potosi with the list of 21 merchants who acquired shares.[45] The subscription list had been passed to the company's Commission for consideration of payroll. With this news of the development of the project in the aspect of financing, and while it was convenient that partners from other places constituted a proxy of actions and deliberations, with a part of the investment of the resident shareholders, the engineer M. Clovis advanced a trip to Chile with three thousand pesos for the purchase of the drill and other tools.

41 Justo Moreno, «Aguadas», *El Eco de Cobija*…, 2.

42 «Correspondencia del prefecto de Cobija con destino a Potosí», Cobija, 4 de junio de 1866, Archivo Histórico de Potosí-Casa Nacional de la Moneda, AHP.

43 «Correspondencia del prefecto de Cobija con destino a Potosí», Cobija, 4 de junio de 1866, AHP.

44 «Correspondencia del prefecto de Cobija con destino a Potosí», Cobija, 12 de junio de 1866, AHP.

45 «Correspondencia del prefecto de Cobija con destino a Potosí», Cobija, 28 de junio de 1866, AHP.

Pessimistic views around the water system seemed to be forgotten. In 1863, that is, no less than three years prior to the limited company, those who knew and had traveled the place argued that these natural waters, so necessary for the consolidation of industry and commerce in the department, were disappearing. "There is not a single stream coming down from the mountain ranges to the sea, nor any of the streams bathed in vesicular vapors and accidental rain."[46]

The following references of the documents reviewed pertain to the water projects in the province are during the governorship of José Taborga in 1869 and then the dates are extended during the years of 1970.

On May 10, 1869, José Taborga reported on the initiative and mentioned that the company was conducting explorations with the aim of finding new waterholes emanating from the bottom of the rough ravines and descending from the mountain peaks.[47] In 1871 it was reorganized and adaptations were made to the ones. The service of the Algarrobo and the Canas was overseen by three inspectors, who had the task of maintaining their usefulness.[48] If the water advantages of these were compared, in Lamar, with those of Mejillones, Antofagasta and Tocopilla, it turned out that it possessed an abundance, which could be extracted in inexhaustible quantities. The capital had had them since the time of colonialism and with little cost they could be enabled. In addition, given the case that neither the wells nor the old ones would be used, there was the source of La Chacrita, about eight kilometers away (published *La Voz del Litoral*[49]), offering an inexhaustible supply of that great element of life for the human organism and of prodigious vitality for all industries.

Elsewhere in the desert, the situation was different. *El Caracolino* published, with dramatic tones, the situation that was presented by the shortage of water.[50] In its headline it cried "Water for God's sake. That our throats are already drying," they wrote: "The watery Cañas held some trees in the ravine of that name, and supplied a part of the population, it has also fallen asleep in the bowels of the earth, without the Municipality promoting the repair of the pipe."

Another newspaper that circulated on the site was *La Voz del Litoral* and questioned as follows:

> Why so much scarcity? Have they taken it somewhere else? Since there are neither in the wells nor in the machines, why do they not send to ask for the vapors that pass or without going very far, to the one that are more on hand? The municipality, meanwhile, sleeps the sleep of the just. Why don't you clean the wells? Why don´t we stop the delivery man's conduct? Why not prevent water from being lost before the public receives the water they need (sic) for their

46 Torres, *Solución de*…, 10.

47 «Correspondencia del prefecto de Cobija con destino a Chuquisaca», Cobija, 10 de mayo de 1869, AHP.

48 Decreto Supremo n.º 24-10-1871, 24 de octubre de 1871, Organización administrativa de Cobija, edición: GOB-24.

49 «La Reforma de la Serena», *La Voz del Litoral*, en Lamar, 12 de octubre de 1874, AHNB, 1.

50 «Agua por cañería», *El Caracolino*, en Antofagasta, 6 de enero de 1873, AHNB, 3.

first needs?[51]

Even the location of the resource and its use were questioned, and it was required that the police prevent the traffic of the mules passing through the main streets because when they were unloaded and all trotting the dust they raised was unbearable. This traffic had to be moved outside the walls or to the unpopulated parts of the cities. "The corrals are not, or at least should not be inside the town: to drink the beasts of burden do not have to go through the main streets. Why, then, tolerate the abuse we are talking about?"[52]

Some events in 1872,[53] articulated to the economic growth of the Salar de El Carmen, the discovery of mining wealth in Caracoles a year earlier and the direct use of the road from Antofagasta, modified the conditions of both ports, of both mining towns. While years before it was understood that the development was around the Lamar port in Cobija, it was not proven in the 1870s. Contrary to what was expected, the populations that migrated to other places and ports increased, without going through the capital, which was further north. Added to this was the government's interest in this growth, supporting the provision to Caracoles and El Carmen's Salar. With this, it authorized on April 26 the establishment of a brackish water purification machine. So the water source and the collection and insurance could reconfigure the social, economic and other conditions of different parts of the region.

A novelty that was added to these changes was the discovery made by the administrator of the Las Descubridoras mines, Francisco Latrille, of fresh waters near Caracoles. Until that moment it depended on those who arrived in carts from Calama, Chiu Chiu and Antofagasta.

> [In 1873 it was expected in Antofagasta] the container that Mr. Miralles had built one block from the Plaza de Colon to sell in it, at the lowest price possible, the water that by pipe was brought from his distilling machine, located in the southern part of the town and about 10 blocks away from the main square. This is a work of general positive utility.[54]

Later, both the delay and development were great. New endowment projects would appear. The need for liquid was equated to the need for a railroad, as the residents of the Litoral read on Friday, January 10, 1873, in a third of the third column and another of the fourth of *El Caracolino*, That the progress of the mines in Caracoles was based on the economy: "Railway! Rail! Rail! Water! Water! Water!"[55]

In those years fresh water entered daily expenses like this: It was paid to 3.50 and 4

51 «Sección Crónica», *La Voz del Litoral*, en Lamar, 22 de octubre de 1871, AHNB, 4.
52 «Recua de mulas», *El Caracolino* en Antofagasta, 21 de noviembre de 1873, AHNB, 3.
53 Arce, *Narraciones históricas…*, 19.
54 «Cañas», *El Caracolino* en Antofagasta, 11 de julio de 1873, AHNB, 3.
55 «Crónica de Caracoles», *El Caracolino* en Antofagasta, 10 de enero de 1873, AHNB, 2.

pesos cargo, until 2.50.[56] The relationship with the price of other services can be compared: Daily food for a beast cost about 6 pesos, water was paid 5 and a half pesos per load, bread cost 25 cents a pound.[57]

Discussion and conclusions

In general, the influence of geographical conditions on the province of Atacama is revealed in the social and human disposition towards nature, in the various relationships that were developed in the province and of this with the central power of the Republic. In this context, and in particular, events that came from this concatenation were identified, such as the assurance of fresh water. The existence, regular use, maintenance and organization in the distribution of water that came from the waters that emerged from the streams demanded attention and maintenance for habitability.

Efforts concerning procurement and supply conditions required exploration, construction of wells and development of techniques and strategies, such as the organization of distribution, maintenance and conservation. In turn, these processes are linked to the sustained effort that ultimately translates into obtaining the water, although it should be emphasized that the starting point of this result were the processes developed from the search and the regular search, search strategies, the socialization of sector strategies, such as relations between residents and norms. As well as the participation and commitment of merchants and authorities and entrepreneurs for the use, which did not concern only the maintenance, but involved the rules and norms of use, the price of use and the types of use.

In 1829, 10 water holes were detected. The identification gave rise to drilling and then deposits were established for consumption. Some of them had existed from the colonial period and if they had not disappeared they needed to be enabled. In this regard, in the reviewed sources there is an important relationship that favors the aforementioned tasks. In 1839 the president of the Republic approved the budget and works for the repairs of some of these, which ensured their conservation and use. However, this concern extended from the technical and physical aspect of the water deposit to the concern about its distribution.

In 1860 the prefect advanced a loan to subsidize the flow, cleaning, improvement as well as the repairing of leaks. That same year, the editor of the newspaper *El Eco de Cobija*, proposed a support budget. In 1866, the prefect and a group of neighbors supported the construction of an artesian well and care. In 1866, the prefect and a group of neighbors supported the construction of an artesian well and care. The distribution, the deposits and the spare had improved and a public limited company with shares was organized to finance the work. The subscription list was passed on to the company's commission to consider payrolls, residents and other shareholders.

56 «Prórroga», *El Caracolino*, año I, nº.76 en Antofagasta, viernes 13 de junio1873, AHNB, 2, col. 4.
57 The reference to the pound sterling was one pound against five pesos.

The tasks around freshwater produced a prolonged social effort. In the case of the preparations of 1866, they did not achieve the required momentum, so much so that a year later the prefect continued with explorations. This data allows us to infer in the synchronous analysis that these efforts had a process character at the moments of their treatment, and were sustained in time by the prolonged circumstances of scarcity.

Later, in 1871 the province was reorganized and the water holes were adapted. The service was carried out by three inspectors, but the shortage was not overcome, the municipality was questioned about the cleaning of the wells and the possibility of controlling the delivery man was proposed. In 1872 some wells managed to provide up to 21,000 liters per day. However, there was also concern about the missing sources. In 1873, without the repair of the pipe by the municipality, the Aguada Canas had been left underground.[58] A further development occurred in 1873 when a container was installed from which water was transported by pipe from the distilling machine a distance of 10 blocks. A novelty was the discovery of waterholes near Caracoles that until then depended on the water that arrived in carts from Calama, Chiu Chiu and Antofagasta. In those years fresh water entered daily expenses as follows: it was paid at 3.50 and 4 pesos load, up to 2.50.[59] The relationship with the price of other services can be compared: Daily food for a beast cost about 6 pesos, water was paid 5 and a half pesos per load, bread cost 25 cents a pound.[60]

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58 «Agua por cañería», *El Caracolino*, en Antofagasta, 6 de enero de 1873, AHNB, 3.
59 «Prórroga», *El Caracolino*, año I, nº.76 en Antofagasta, viernes 13 de junio1873, AHNB, 2, col. 4.
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