

The Silala/Siloli watershed in Bolivia/Chile: Lessons from the most vulnerable basin in South America

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ABSTRACT

The dispute over the relatively unknown Silala, or Siloli, watershed, shared by Bolivia and Chile, demonstrates the importance of history, the role of indigenous people in the stewardship of water resources, the interplay between surface waters (naturally occurring and canalized) and groundwaters, and differences in the economic philosophies informing water resource management strategies. The waters of Silala begin as a wetland formed by groundwater springs that discharge in Bolivian territory near the Bolivian/Chilean border, approximately 300 km northeast of Antofagasta, Chile. The waters flow superficially, largely via canal, from Bolivia into Chile and are used by Chilean copper mines and to supply potable water to nearby populations. In 1908, the Prefecture of Potosí, Bolivia granted the "Antofagasta-Bolivian Railway Company" a concession to construct canals in Bolivian territory and use the waters of Silala to fill its steam engines. Geological, topographical, and historical evidence suggests that the Silala springs flowed overland from Bolivia to Chile prior to the canalization. The concession was revoked in 1997 by the Bolivian government, which observed that the waters had long been used for purposes differing from that noted in the original agreement. The two countries have since been trying to reach a new agreement over Silala, while Chile continues to use the waters. Their positions are starkly different: most of Bolivia insists that the Silala *aquifer and springs* are its national property and that Chile should pay, including a historic debt, for their use; Chile maintains that the Silala *river* is an international watercourse, subject to equitable and reasonable use by both states. Even within the individual countries, there is no consensus on the best way forward. In March, 2010, Bolivia again rejected a draft bilateral agreement on Silala despite the Chancellery and the economically impoverished community nearest the watershed pushing for its signing. How the neighbouring states reconcile their overarching differences in water policy remains to be seen.

Key words: Bolivia, Chile, international water law, international groundwater law, water dispute

INTRODUCTION

An international dispute over the rights to the waters of the Silala, or Siloli, basin has been unfolding since 1997, when the Bolivian government revoked a concession awarded to a Chilean company in 1908 to use the waters for its steam engines. A preliminary bilateral agreement drafted by the two states was rejected, and the negotiations paused, by the Bolivian government earlier this year. Resolution of the Silala dispute has been impeded by the historical context of the watershed, existing diplomatic situation between the two riparian states, and lack of agreement as to whether or not the Silala is an international watercourse (UNEP, 2007). The Silala watershed remains essentially unheard of, even among experts, outside of Bolivia and Chile despite being called the only "high risk" basin in South America and "one of the most hydrologically vulnerable basins in the world" (UNEP, 2007). The objective of this paper is to present a brief case study, including a physical description, historical review and summary of current status, of the Silala basin and shed light on this hitherto virtually unknown watershed.

PHYSICAL DESCRIPTION

The Silala basin is shared by Bolivia (upstream) and Chile (downstream) and lies in the Atacama Desert approximately 300 km northeast of Antofagasta, Chile (Fig. 1). The waters of Silala begin as high altitude (over 4,500 masl) wetlands (called "bofedales") formed by groundwater springs that discharge in Sud Lipez, Potosí, Bolivia near the Bolivian/Chilean border. More than 70 small-volume groundwater

springs have been identified in Bolivian territory, discharging from fractured ignimbrites (volcanic deposits) of Miocene age overlain by relatively impermeable andesitic lavas of Pliocene and Pleistocene age (SERGEOTECMIN, 2003). Preliminary evidence supports claims that the groundwater was principally recharged by glacial melt water, thousands of years ago (SERGEOTECMIN, 2003). The Silala Aquifer is considered a transboundary aquifer, but little is known about the underground flow component.

Most of the springs are drained by a series of small, man-made channels which direct the flow towards two central drainage channels, the north and south canals, which join to form a principal canal (Fig. 2). Each canal is clearly man-made (lined with rocks and very straight in certain stretches; Fig. 2). The south canal is nearly 3 km long and contributes about two thirds of the flow to the principal canal, whereas the north canal is less than 1 km long and contributes the remaining third of the flow. The principle canal directs the water for about 700 m before crossing the international border into the II Antofagasta Region, Chile. In Chilean territory, the principle canal flows 7 km to its confluence with the Cajón River, forming the San Pedro de Inacaliri River, a tributary of the Loa River (Fig. 1). The Loa basin is the largest in Chile and the only exorheic (allowing outflow) basin in the Antofagasta Region. Mean discharge of the principal canal near the border crossing is approximately 0.2 m³/s (SERGEOTECMIN, 2003); however, the flow rate is significant given that the Silala basin is situated in the Atacama Desert, arguably the driest place on Earth. Mean annual precipitation and potential evaporation in the basin between 1983-1995 were 59.1 mm and 914 mm, respectively (SERGEOTECMIN, 2003).

Geological, topographical, and historical evidence suggests that the Silala springs flowed overland from Bolivia to Chile prior to the canalization. The principal canal clearly follows a natural drainage course featuring significant, natural alluvial erosion, including a relatively deep (tens of metres) canyon incised in the desert floor (SERGEOTECMIN, 2003). The general manager of the Bolivian company hired (in 2009) to evaluate Silala's hydroelectric potential concluded, based on detailed topographic studies, that the canals were constructed to make more efficient, but not to alter, the natural course of the waters, which naturally and inexorably flow to Chile (Alvarez, 2010). In the 1908 application for the concession to use the waters of Silala, a Bolivian citizen acting on behalf of the Antofagasta (Chili) & Bolivia Railway Co. Ltd. (FCAB, following the Spanish acronym), stated that "In the Province of Sud Lípez near the border, there exist springs which form the Siloli River, which flows in Chilean territory" (Martínez, 2004).

The only Bolivian users of the waters of Silala are the soldiers (numbered seven in January 2010) stationed at the Silala advanced military post. The Silala basin is strategically important to Chile because it is a significant source of process water for the Chuquicamata copper mine and potable water for nearby populations including the city of Calama. Chuquicamata, run by state-owned CODELCO, is the largest open pit in the world. CODELCO is the world's largest copper producing company and generator of about a third of the Chilean government's income (Government of Chile, 2010). Chilean copper miners consume approximately 11.5 m³/s of water per tonne of copper produced (Reuters, 2009). The city of Calama has a population of 143,000 and receives an average annual precipitation of 5.7 mm, making it one of the driest cities in the world (DGAC, 2010).

HISTORY

To many Bolivians, Silala is symbolic of their country's loss of access to the Pacific Ocean to Chile in the War of the Pacific (1879-1883). Bolivia lost its *Departamento Litoral* (coastal region), including significant mineral deposits, to Chile as a result of the war. An additional consequence of the clash was the division of the Silala basin, which, prior to 1883, was situated entirely within Bolivian territory. The conflict is also referred to as The Saltpeter War after the nitrate-bearing mineral over which the two countries and Peru were fighting. Following the war, saltpeter, gold, silver, and, chiefly, copper mines were excavated on the newly Chilean territory.

Rail was the only reliable way to get the minerals to market and steam engines required a constant supply of water, a scarce commodity in the Atacama Desert. The then English (now part of the Chilean Antofagasta PLC investment group) FCAB identified the Silala springs as a potential source of water and requested the Prefecture of Potosí, Bolivia for permission to use the springs to power their locomotives (Martínez, 2004). In its letter of request, FCAB offered to leave a third of the volume of the Silala for "public use" but Bolivia never exploited the waters, except for possibly the occasional local llama herder and, more recently, the soldiers stationed at the nearby military base (Martínez, 2004; Berna, 2010). In 1908, the Prefecture of Potosí, Bolivia granted the company a concession, in exchange for nothing, to construct canals in Bolivian territory and use the waters of Silala (Prefecture of Potosí, 1908). This concession was revoked in 1997 by the Bolivian government, which noted that the waters had long been used for purposes differing from that noted in the original agreement (Toromoreno, 2000).

Since annulling the 1908 concession, Bolivia has taken a number of potentially provocative actions with respect to Silala. In 2000, the government of Gonzalo Sánchez de Lozada awarded the rights to Silala for 40 years to the Bolivian firm DUCTEC SRL for \$46.8 million (Toromoreno, 2000). DUCTEC SRL attempted to charge CODELCO and FCAB for their use of the waters of Silala but no payments were made (Martínez, 2004). In 2006, the government of Evo Morales inaugurated a military base on the banks of Silala (Fig. 2) and publicly discussed a plan to bottle the water and sell it with the slogan "Drink Silala water for sovereignty" (Bloomberg, 2006). In 2009, the Prefecture of Potosí hired a La Paz based engineering consulting company to conduct a feasibility study for a hydroelectric plant at Silala. They reported that approximately 50 kW of electricity could be generated, enough to provide only for the nearby military base and, perhaps, a future tourist installation (Alvarez, 2010). The possibility of using Silala for agricultural purposes has been dismissed by the leader of Quetena Chico, the community nearest the Silala watershed (Berna, 2010).

On the other hand, despite a lack of official diplomatic relations, the two countries have demonstrated efforts to cooperate on the issue. In 2004, the Bolivian and Chilean Ministries of Foreign Affairs struck a working group on Silala, which would meet several times in the ensuing years. In 2008, the topic of Silala was included in the 13 point bilateral agenda adopted by Evo Morales and Michelle Bachelet on behalf of their respective states. Most notably, in July, 2009 the Chancellery of the Republic of Bolivia provided to the media a draft preliminary bilateral agreement on the use of the waters of Silala (La Razón, 2009a). The agreement establishes that Bolivia would be compensated by Chilean users of the waters of Silala and that "Bolivia is entitled, initially, to fifty percent of the total volume of water of which flows across the border... and that this percentage may be increased in Bolivia's favour, based on the results of joint studies to be carried out under the agreement" (translated from La Razón, 2009a).

CURRENT STATUS

The draft agreement remains unsigned and the Silala negotiations have yet to resolve the two states' distinct positions. The Chilean government claims simply that Silala is an international river (Toromoreno, 2000). Chile asserts its right to equitable and reasonable utilization, as described in the United Nation's 1997 *Convention on the Law of the Non-navigational Uses of International Watercourses* (1997 Watercourses Convention) (for which Chile voted in favour, Bolivia abstained, and neither country has ratified; UN-ILC, 1997). Bolivia, for the most part, denies that there exists a Silala river, asserting that the Silala springs would not flow to Chile if not for the construction of the canals over a hundred years ago (Bazoberry, 2003).

Thus Bolivia claims ownership of the waters and demand payment (estimated at \$15,000 per day) from Chile for their use (La Razón, 2010a). Many Bolivians believe that the payment should include a historic debt for use of the waters not stipulated in the original concession (La Razón, 2009b). The draft agreement

reflects Chile's willingness to pay, but not a historic debt and only, initially, for fifty percent of the total volume of water that flows across the border (La Razón, 2009a). Parliamentary representatives from Potosí and community activist groups alike rejected the articles implying that Chile would initially have to pay for only half of the transboundary flow, believing that Bolivia is the rightful owner to the waters of Silala in their entirety (La Razón, 2009c; 2009d).

Bolivia rejected the draft bilateral agreement despite the economically impoverished, indigenous community of Quetena Chico and the Bolivian Chancellery pushing for its signing. Quetena Chico would stand to benefit from the Chilean compensation for their use of the waters of Silala. The leader of the community previously warned that "if the pre-agreement isn't signed, those who opposed it should pay us one hundred percent of what the Chileans were prepared to compensate" (Berna, 2010). He and a representative of the Chancellery were booed at the "International forum in defence of the waters of Silala", held in December 2009 in La Paz. The forum declared Bolivia's sovereign right to one hundred percent of the flow of the Silala, calculated that Chile owes more than a billion dollars for historic use of the waters, and concluded that any negotiation with Chile should guarantee Bolivia access to the Pacific Ocean (Hora 25, 2009). The Bolivian government declared a pause in the dialogue over the 13 point bilateral agenda, including the Silala negotiations, following the election of Sebastián Piñera in Chile in March 2010 (La Razón, 2010b).

DISCUSSION

The Río Lauca is shared by Bolivia and Chile in the region north of Silala. Though there are enough differences between the Silala and Lauca watersheds to warrant cautious comparison, there are revealing similarities. Perhaps the most important of these is the Bolivian desire to link a local watershed with the War of the Pacific, in which Chile left Bolivia without access to the Pacific Ocean. Glassner (1970) noted that "the Lauca had become essentially a tool with which the Bolivian government could unite its people on the less dramatic, but much more basic, question of an outlet to the sea". Forty years later, one can substitute "Silala" for "Lauca" in Glassner's writing and have no less a fitting observation. The Río Lauca dispute prompted Bolivia to propose "Preliminary studies on the legal problems relating to the utilization and use of international rivers" to the United Nations General Assembly (UNGA) in 1959, setting in motion a process that would eventually yield the 1997 Watercourses Convention. Three years later, the dispute would provoke a break in Bolivian/Chilean diplomatic relations that continues to this day.

Further hampering the Silala negotiations is the stark contrast of philosophies influencing the management of water resources in Bolivia and Chile. On one extreme is Chile, an often cited model of privatization for its 1981 Water Code (reformed in 2005), which created water markets and established transferable water use rights (Bauer, 2004). On the other is Bolivia, whose support for water as a human right is enshrined in its new constitution, and whose "water wars" in Cochabamba and El Alto put it at the forefront of the anti-privatization movement (Olivera, 2008; Shultz, 2009). Bolivia championed the *Resolution on the Human Right to Water and Sanitation*, recently adopted by the UNGA (UNGA, 2010). Yet Bolivians, to whom water is not for sale, seem to agree that Chile should pay for its use of Silala.

It is also interesting to note the two countries' levels of inclusivity and media coverage surrounding the Silala negotiations. The Chilean position on Silala has been established by experts and has had relatively little media coverage in Chile. Bolivia's position is defined by multiple actors (Bolivia's president and vice president have even hinted at the possibility of a national referendum on the issue; La Razón 2009e, La Razón, 2009f) and national media coverage is rampant—one newspaper (La Razón) alone published nearly two articles per week on the subject in 2009.

CONCLUSIONS

The dispute over the Silala basin illustrates the importance of history and the effects of differences in national socio-economic philosophies informing water resource management in international negotiations concerning transboundary watercourses, regardless of their size. The Silala is about one million times smaller the Amazon (in terms of mean discharge) and far lesser known, yet it has been labelled the only "high risk" basin in South America, largely because of the lack of official diplomatic relations between Bolivia and Chile and the fundamental disagreement as to whether or not the Silala is an international watercourse (UNEP, 2007). Nevertheless, the two countries have made important strides towards an agreement concerning the use of the basin.

The Silala case provides an illuminating example of the overlap between surface and groundwater regimes and the range of interpretations states can uphold regarding this complex interaction. The next step in this study will be to test the applicability of, and attempt to reconcile, the 1997 Watercourses Convention and the Draft *articles on the Law of Transboundary Aquifers* in the context of the Silala basin.

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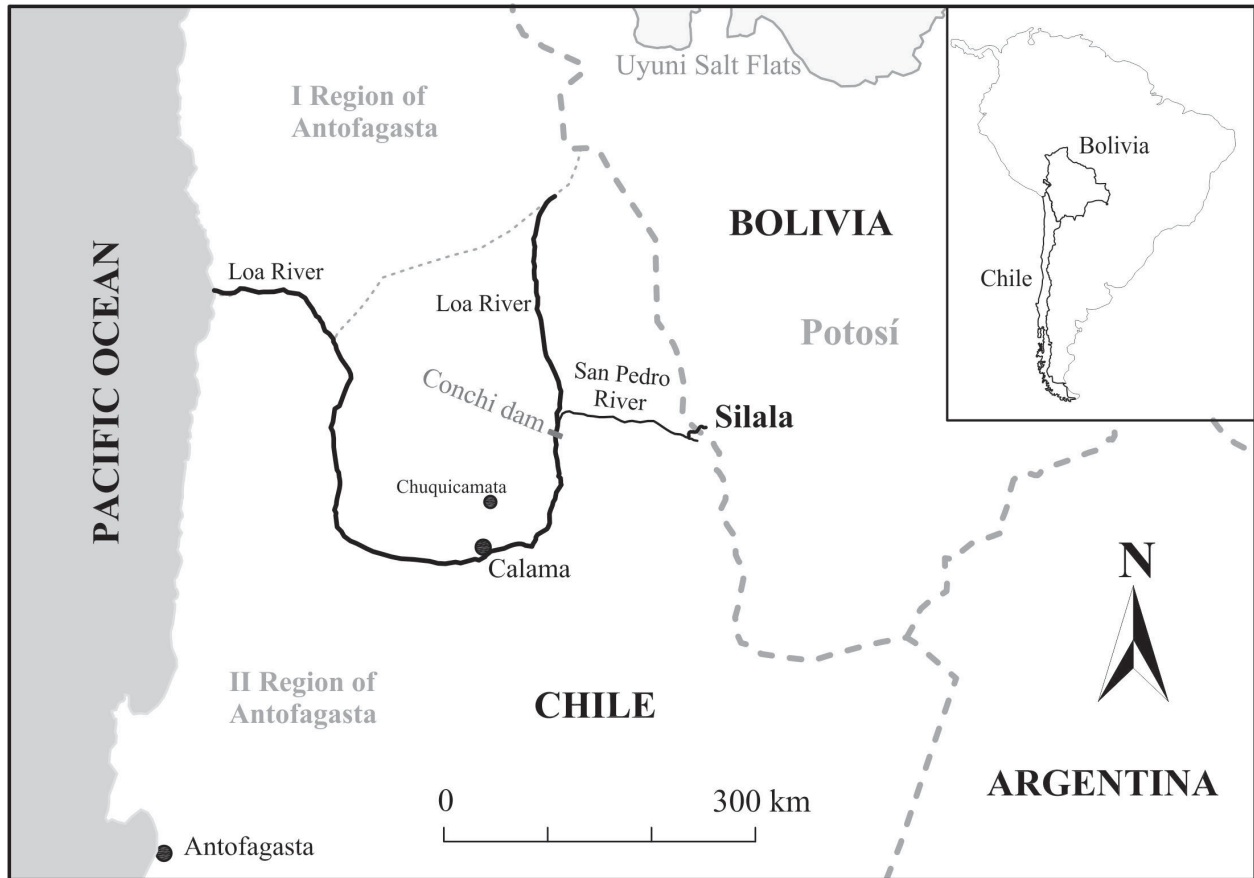


Figure 1: Location map showing Silala as a tributary of the San Pedro de Inacaliri and Loa Rivers in Chile.

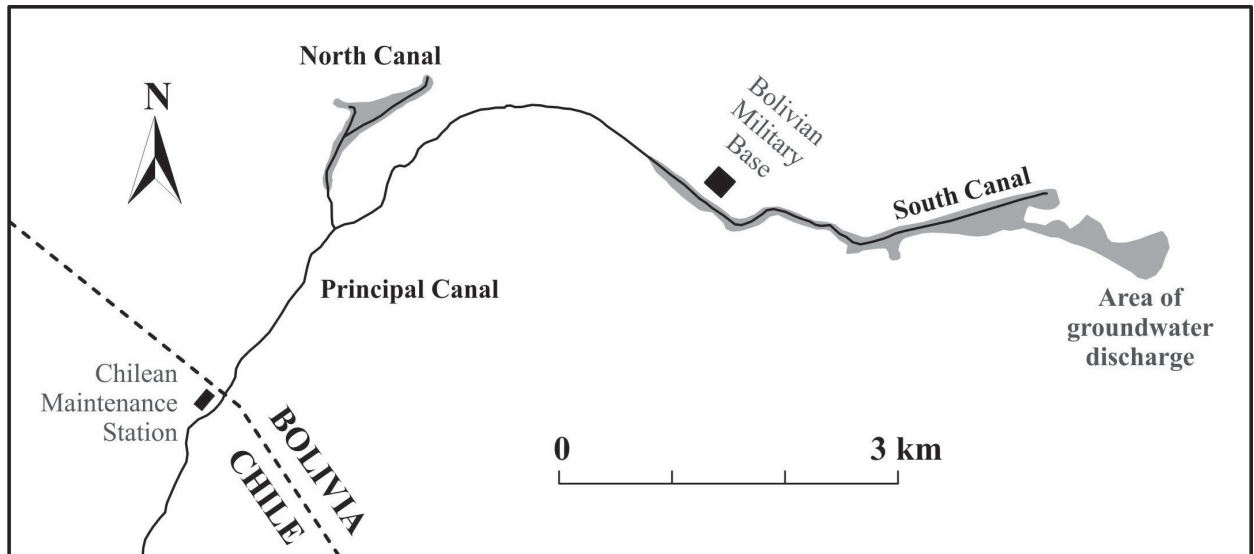


Figure 2: Detail of the source area of the Silala watercourse. Gray shading indicates the general geographic area of wetlands ("bofedales") produced by groundwater discharge, present along both the North and South Canals.