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## Hydrosocial Territories in Dispute: Flows of Water and Power in an Interbasin Transfer Project in Bolivia

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**ABSTRACT:** This study of the historical development of the Interbasin Irrigation Water Transfer Project Yungas de Vandiola (*Proyecto de Riego Trasvase Yungas de Vandiola, PRTYV*) analyses the dynamics of hydrosocial territorialisation pursued by rural communities that aim to strategically claim and create water rights. Starting with the project's initial design proposal, this article describes the subsequent configurations of alternative hydrosocial territories at three key moments in the project's development. During this process, groups of communities that were initially not included in the project, changed their hydro-territorial imaginaries and forged multi-scalar alliances in response to wider political and cultural developments at the national level. This altered the dominant imaginary of the legitimate hydrosocial territory for the Yungas de Vandiola irrigation project. The article concludes that interbasin water transfer projects (for irrigation) are arenas of profound hydrosocial territorialisation, as they incorporate new water sources and stakeholders with divergent territorial imaginaries and changing multi-scalar alliances.

**KEYWORDS:** Irrigation project, hydrosocial territories, territorial imaginaries, water rights, interbasin water transfer, power strategies, Bolivia

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### INTRODUCTION

Irrigation projects distribute and provide access to an increasingly scarce, politically disputed resource. Their dynamics relate profoundly to the way in which power relationships provide substance to the conception and configuration of territory (Swyngedouw, 2004b; Molle et al., 2009; Budds, 2012; Hommes et al.; 2016). This article focuses on the struggle over water control in the highlands of Cochabamba, Bolivia. It explores the case of the Interbasin Irrigation Water Transfer Project Yungas de Vandiola (*Proyecto de Riego Trasvase Yungas de Vandiola, PRTYV*), which aims to fill the under-utilised Totora Khocha reservoir in the Pucara Watershed (upper Cochabamba Valley region). This study of the project's historical background analyses the dynamics of hydrosocial territorialisation pursued by

peasant communities that aim to strategically claim and create water rights, while interacting with state governments and international cooperation agencies.

In the history of the Pucara watershed, water rights claims and demands were based on constructing particular territorial imaginaries and the strategic political alliances to materialise them. During the design of the interbasin transfer canal, communities located in the upper watershed region became relatively successful in demanding water rights, although they were initially not included in the project (Saravia et al., 2006). They formed political alliances with other power groups, including the state, in a sociopolitical context that was favoured by national policies put in place to recognise and support rural and indigenous communities (Perreault, 2008; Morales, 2011). The project's different stages and corresponding design proposals reflect interest groups' divergent territorial imaginaries and the corresponding disputes over legitimacy of each group's territorial claims and arguments. The article highlights how local stakeholders, when dealing with the government in the implementation of irrigation projects, try to construct different hydrosocial territories and materialise them through multiscalar alliances.

The article continues by outlining the conceptual framework orienting this study's analysis and presenting the overall context for the Totora Khocha irrigation system, before describing the research methods. We then present the results, starting by presenting the hydrosocial territory as envisioned by the initial project design, and then describing the conception and production of three alternative hydrosocial territories. The conclusions section then discusses how, during these sociotechnical water-design struggles, newly emerging stakeholders disputed the control over water and the legitimacy of territorial reconfiguration. The article concludes that interbasin water transfer projects are arenas in which hydrosocial territorialisation disputes become manifest, and where territorial transformation is profoundly impacted by the incorporation of new water sources and new stakeholders with divergent territorial imaginaries and normative, distributive, and representational interests.

This article offers a conceptual and analytical approach to understanding the sociotechnical complexity of interbasin water transfer and irrigation projects' development, especially in the Andean region. The study of the hydrosocial territorialisation affecting intervention projects in the water sector allows for a better understanding of who, how, and with what interests actors resist and force changes in water projects and the ways that water and power flows, and also offers a better understanding of the territorial imaginaries, and the juridical or moral arguments to which actors are referenced.

## **WATER, POWER, AND HYDROSOCIAL TERRITORIALISATION**

A fundamental notion underlying this article is that water is an eminently political resource, disputed through power and authority relationships (Mollinga, 2008; Bakker, 2012; Vos and Boelens, 2014). In this regard, water flows are organised and steered by means of technopolitical power relations that involve domination and subordination, access and exclusion, emancipation and repression. They simultaneously produce the physical – geographical, cultural, and symbolic landscape, and consequently the hydrosocial cycle (Swyngedouw, 2004b; Budds, 2012; Hommes et al.; 2016; Hoogesteger et al.; 2016). Construction of hydraulic infrastructure to materially control access to, and exclusion from, water flows establishes control by one group over another and reinforces or challenges established power structures (Crow-Miller, 2013; Meehan, 2013; Hommes and Boelens, 2017; Sanchis-Ibor et al.; 2017). With this understanding, irrigation projects are sites for scenarios of resistance and social struggle.

Interbasin water transfer and irrigation projects produce and transform hydrosocial territories through the construction of hydraulic infrastructure, as well as through the connection of water sources, cropland, and groups of people, and the management of water flows. Boelens et al. (2016: 2), conceptualise the notion of 'hydrosocial territory' as:

The contested imaginary and socio-environmental materialization of a spatially bound multi-scalar network in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements and cultural institutions and practices are interactively defined, aligned and mobilized through epistemological belief systems, political hierarchies and naturalizing discourses. (See also Mosse, 2008; Boelens et al.; 2017; Swyngedouw and Boelens, 2018).

The concept of hydrosocial territory is useful in the exploration of the trajectory of intervention projects, and in the related arena of constructing water governance on the ground (cf. Agnew, 1994; Brenner, 1998; Elden, 2010; Baletti, 2012; Hommes and Boelens, 2017). Hydrosocial territories are actively and historically constructed through the interrelationship between society, technology, and water (Boelens et al.; 2016). The concept enables the examination of how water projects interconnect technological designs and power relations, thereby negotiating and materialising hydrosocial configurations. At stake are disputed territorial interests, perspectives, designs, and modes of concretising them: changing water flows can disrupt the political order and can challenge until-then stable ways of imagining the hydrosocial territory – all of which affects the various stakeholders in different ways (Hommes et al.; 2016).

Hydrosocial territories are continuously reconfigured and highly contested in terms of their borders, elements, and interrelations (Seemann, 2016). Therefore, a specific hydrosocial territory, at any given time, can be imagined (but also planned or materialised) differently by different actors, depending on their respective interests, visions, and power. This article shows that the prevalence of a specific configuration depends on the support and power of an interlocked multi-scalar coalition of stakeholders that provides the discursive, moral, and material support to this configuration (Swyngedouw, 2007).

Water struggles and conflicts often originate from attempts to reorganise local forms of collective self-governance and territorial autonomy, for example around irrigation or extraction projects. Such projects try to align local people and their territories with hydro-territorial projections and external mindsets, which are presented as more rational and efficient while, in actual fact, following the interests of powerful groups (Boelens, 2014; Hommes et al.; 2016). In response, as we describe in the case study, groups of affected stakeholders promote changes in technological proposals, negotiate agreements, and build political alliances to configure and strengthen alternative hydro-territorial designs: they dispute control over decision-making about developing and tapping water sources. These disputes over hydrosocial territorialisation lead stakeholders to incorporate and strategically position arguments and narratives that legitimise their particular arguments and proposals, while recognising so-far excluded stakeholder groups.

Therefore, the analytical focus does not reside in a particular hydrosocial configuration, but rather in the process through which particular hydrosocial territories become constituted, transformed, dominant, and materialised (Swyngedouw, 2004a). Following the guidelines proposed by Brightenti (2010) to describe the social production of territories, in this study we analyse hydrosocial territorialisation dynamics through the following four aspects (see also Roa-García, 2014; Rodríguez-de-Francisco and Boelens, 2016; Seemann, 2016):

- i. *Who produces the territory?* – which individual or collective stakeholders produce the territory?
- ii. *How is the territory produced?* – which concrete actions produce the territory?
- iii. *What type of territory does this produce?* – what specifically characterises the organisation of the hydrosocial territory and its associated ownership, distribution, and access to natural resources?
- iv. *Why produce the territory?* – what is the purpose of producing the territory?

An analysis of these four elements together – that is, the historical production of hydrosocial territories through irrigation-project development – highlights the social and material power relationships underlying these projects and enables a more in-depth understanding of their political dimensions.

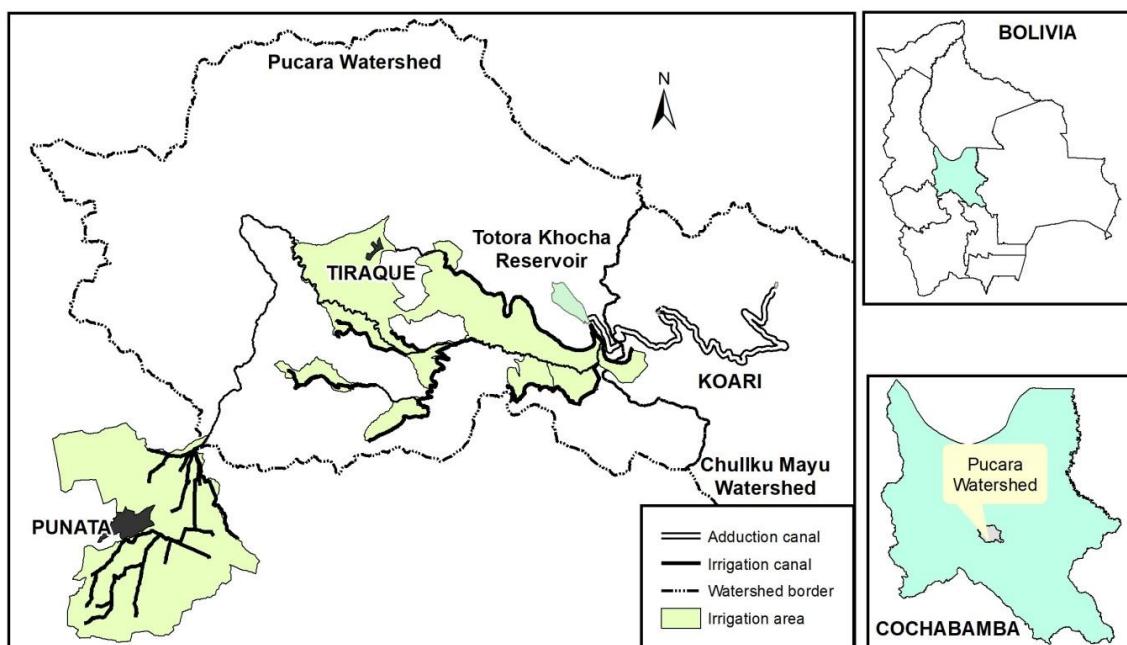
The conceptual framework combines the sociopolitical production of territory with notions about shifting legitimacy of water right claims. Rather than seeing communities' claims to irrigation water as based on established common property rights or national legislation (see, for example, Meinzen-Dick, 2014), this case examines water claims as part of the struggle over legitimacy of territorial imagination.

### THE TOTORA KHOCHA IRRIGATION SYSTEM

The Totora Khocha irrigation system (Figure 1) is located in the upper Cochabamba Valley region of Bolivia. The case study was selected because of its long trajectory of struggles over water and the many modifications of the project design that it underwent. The case shows a clear shift in the moral basis of the water right claims by different stakeholders, based on shifts away from the accepted hydrosocial territorial imaginations, dominant policy discourses, and evolving stakeholder alliances.

The irrigation system extends the length of the Pucara watershed: from the high mountains of Tiraque, where water is collected and stored in the Totora Khocha reservoir (at an elevation of 3700 metres above mean sea level, MAMSL), and which then irrigates the mountainous region of Tiraque (at 2900-3650 MAMSL) and the Punata Valley (at 2650-2800 MAMSL). The high availability of water resources and the limited aptitude for irrigated agriculture in Tiraque (due to the rugged mountainous terrain and freezing climate) contrasts with the low availability of water and the high aptitude for irrigated agriculture in Punata (because of its flat terrain and temperate climate).

Figure 1. The Totora Khocha irrigation system.



The Totora Khocha reservoir was built between 1989 and 1991, under the Tiraque-Punata Irrigation Project, with the support of the Bolivian Government and the German International Development Cooperation (Gerbrandy and Hoogendam, 2001; Rocha et al.; 2015). It has a maximum storage capacity of 22 million cubic metres ( $Mm^3$ ), and receives water that has been transferred from three micro-watersheds in the neighbouring Chullku Mayu watershed. The reservoir's water is distributed through a

complex network of rivers and canals, irrigating a total gross surface area of 7000 hectares (ha): 2800 ha in Tiraque; and 4200 ha in Punata. The system is jointly managed by the Tiraque Association of Irrigation and Services (*Asociación de Riegos y Servicios Tiraque*, ARST), and the Punata Association of Irrigation and Services (ARSP), who share water, operation, and maintenance tasks proportionately. The water that collects in the reservoir is allocated annually to three user groups: old users in Tiraque (a fixed allocation of 0.8 Mm<sup>3</sup>/year); new users in Tiraque (40 percent of the remaining water); and users from Punata (60 percent of the remaining water) (PRIV, 1992).

Hydraulic design deficiencies (overestimating available water because of poor climatic and hydrometric data) and external impacts on the supply system (disputes over water sources and supply canals in catchment zones) resulted in less available water than had been projected, and consequently the construction of the Totora Khocha on an overly large scale. Between 1991 and 2010, the reservoir contained, on average, no more than 30 percent of its maximum storage capacity. In response, a new project was proposed to fill the Totora Khocha reservoir: The Interbasin Transfer Project Yungas de Vandiola. The aim of this project was to expand the catchment zone by constructing a new supply canal to collect water from the Yungas de Vandiola region (another basin). Our article studies the design and negotiation process of this new interbasin water transfer project.

The current Totora Khocha irrigation system is the result of thorny, conflict-ridden struggles and negotiations to control water from the Pucara watershed (shared between Punata and Tiraque), since its construction began in 1964 (cf. Rocha et al.; 2015). Peasants in Punata, taking advantage of their better biophysical conditions for irrigated agriculture, and of political and socio-economic relations, were for long time favoured by government irrigation investment, which privileged Punata over Tiraque in terms of irrigation water. The dynamics of designing and constructing the Totora Khocha irrigation system and the negotiations around the Yungas de Vandiola Irrigation Project, make this a relevant case to study the complexity of irrigation development: it involved complex negotiations followed by redesign (Rocha et al.; 2015), and provided key lessons to irrigation professionals in Bolivia about interactive design, co-construction, and joint management (Gandarillas et al., 1994; Gerbrandy and Hoogendam, 2001).

## METHODS

Most empirical data for this article was gathered in 2009 and 2010, and several additional field visits were made between 2011 and 2017. Three data-collection methods were used to reconstruct the different phases of territorialisation: semi-structured interviews with key informants (six interviews with leaders of irrigators' associations, six interviews with irrigators, two interviews with engineers of the departmental government, and two interviews with project directors); participant observation of assemblies discussing project developments; and a documentary review of project reports, press releases, and archival research.

## THE YUNGAS DE VANDIOLA IRRIGATION PROJECT AND THE PRODUCTION OF HYDROSOCIAL TERRITORIES

The PRTYV, conceived and managed by the regional government (the Prefecture, or *Prefectura*<sup>1</sup>) of the Department of Cochabamba, proposed to expand the catchment zone for the Totora Khocha reservoir by constructing a new supply canal to increase the availability of water and fill the Totora Khocha reservoir. The project's historical trajectory is analysed below to show the dynamics of hydrosocial territorialisation by rural communities opposing the project. Starting by describing the hydrosocial

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<sup>1</sup> The Prefecture is the regional government of a Department in Bolivia. In 2010, the Prefecture was converted into the Departmental Autonomous Government.

territory proposed by the project, we analyse proposals for alternative hydrosocial territories produced at three key moments in the project's development, which largely determined how the project unfolded.

### The hydrosocial territory proposed by the project designers

In 1993, two years after the Totora Khocha reservoir began operating, the idea arose of expanding the catchment zone by building a new supply canal. The preliminary study proposed to tap water from the Yungas de Vandiola region (CES-GFA, 1993) – with a mean annual rainfall of about 1500 mm/year – by building a transfer canal 28.1 km long at an elevation of 3800 MAMSL. The new supply system would contribute a total of 27.6 Mm<sup>3</sup>/year to the Totora Khocha reservoir, to finally fill its storage capacity. During those years, Bolivia was undergoing a period of difficult economic structural adjustments (Kohl, 2002), and the project proposal was not supported by the government, notwithstanding the claims of irrigators' organisations. In 1994, through the Popular Participation Law, the state's role in irrigation development shifted from a top-down model to a more flexible demand-driven one. Through participatory planning, this law increased opportunities for peasant communities to participate in municipal decision-making, particularly in the irrigation sector, empowering new groups of under-represented peasant communities (Kohl, 2003; Perreault, 2005). Over seven years, Punata and Tiraque's irrigators increased the pressure, and in 2000 the Cochabamba Prefecture decided to finance the 'final project design study' for the PRTYV.<sup>2</sup> After the so-called 'Cochabamba's Water War' in April of 2000, water became a central political issue in Bolivia and a priority for national and regional governments. The project was always understood by the users of Totora Khocha as a complementary project, or as a continuation of the previous Tiraque-Punata Project, by which "the engineers who had designed and constructed the reservoir would fix the previous project's failure".<sup>3</sup>

From the outset, the shared Totora Khocha reservoir was built on the basis of agreements negotiated between the irrigators' associations in Tiraque (ARST) and Punata (ARSP). These agreements resulted from complex water control disputes and struggles, marked by the two user groups' clashing positions and interests in the Pucara Watershed. The first steps toward the PRTYV provided the opportunity to reopen discussion of the reservoir's shared-use agreement. In this context, ARST proposed to take control of the new project and change the future water allocation from Totora Khocha: 60 percent for Tiraque and 40 percent for Punata. The upstream ARST based their demand on their socio-territorial rights<sup>4</sup> to water sources and the reservoir, and the need to include new users who had not been taken into account in the Tiraque-Punata Irrigation Project. The proposal was resoundingly rejected by the downstream ARSP, who asserted their rights to the hydraulic property that had been obtained by building the dam (cf. Gerbrandy and Hoogendam, 2001; Boelens and Vos, 2014; Meinzen-Dick, 2014). In this conflict situation, the Prefecture demanded that both parties had to reach an agreement prior to beginning the final design study. Between March and July of 2001, ARST and ARSP negotiated intensely, and finally signed an agreement to adjust the future water allocation from Totora Khocha (Saravia et al., 2006). The agreement established that once the water from Yungas de Vandiola arrived, the water from Totora Khocha would be divided into equal parts (while respecting the existing use rights): 50 percent for Tiraque and 50 percent for Punata. Both user sectors had to adjust their positions, understanding that they were mutually dependant on the project's success. Although Punata needed Tiraque because the water sources are located in what they consider their hydrosocial

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<sup>2</sup> This 'final project design study' never really became final and continued to be adapted.

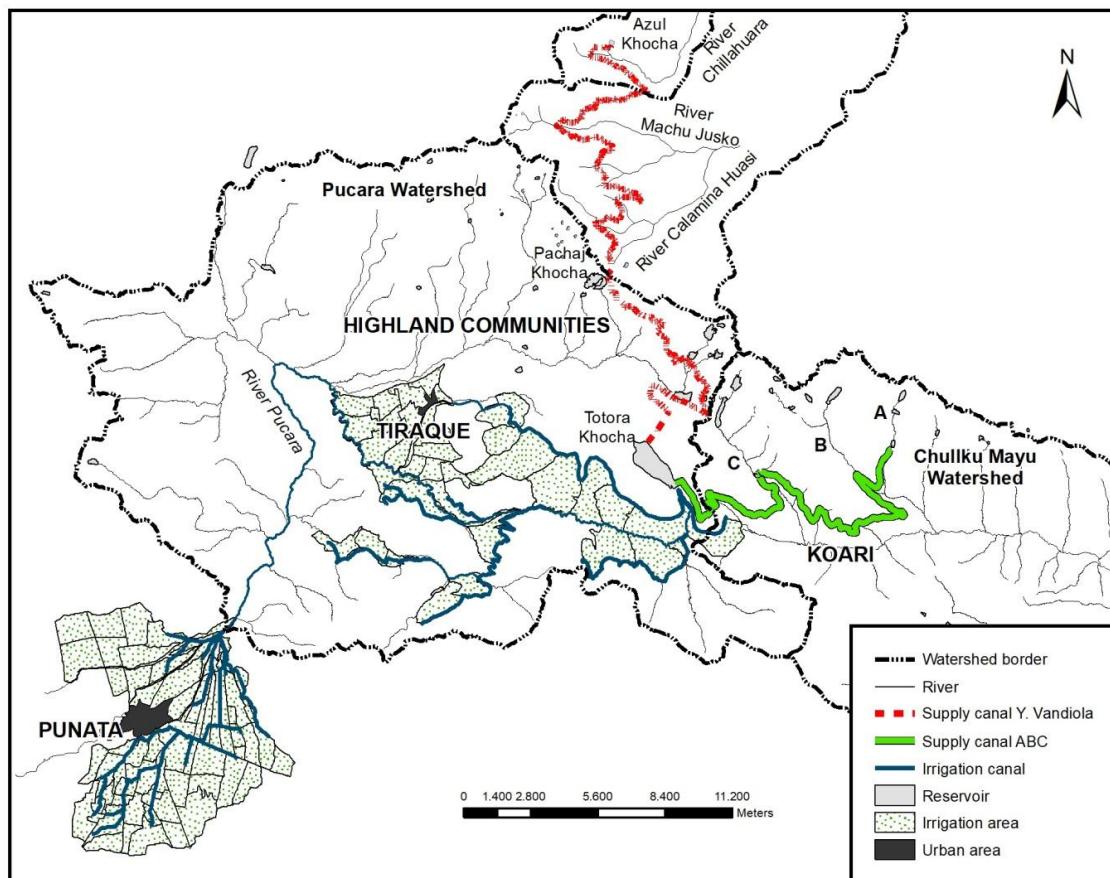
<sup>3</sup> Quoted from an interview with ARSP's leader, Punata, May 2009.

<sup>4</sup> Socio-territorial rights to water are authorised claims over water sources that originate in, or flow through, a territory (Boelens, 2015).

territory, Tiraque also needed Punata in order to justify the investment to funders. The new agreement meant that ARSP gave ground in their control of the new project and reservoir, which reinforced ARST's leadership.

Once the new water allocation agreement was reached in 2001-2002, the final design study for the PRTYV was executed by the CPM-CONAM<sup>5</sup> consulting consortium. Aware of the previous conflicts about the project, the study avoided socio-political matters; it focused totally on the project's technical and agronomical design, and ignored water division and distribution issues (CPM-CONAM, 2002). The final design study proposed a 39.22 kilometre-long supply canal built at an elevation of 4040 MAMSL,<sup>6</sup> to collect runoff water from seven micro-watersheds, contributing an additional 15.1 Mm<sup>3</sup>/year<sup>7</sup> to Totora Khocha at a cost of approximately US\$11 million. Figure 2 shows the overall project diagram, with two supply systems: the existing supply system built in 1989-1991 (the green line) and the newly proposed supply system (the dotted red line). The indicated irrigation area is the area irrigated as of 2018 by the Totora Khocha irrigation system in Tiraque and Punata.

Figure 2. Overall diagram of the PRTYV final project design study.



<sup>5</sup> Multidisciplinary Professional Center S.R.L. (CPM) and Multidisciplinary Associated Consultants S.R.L. (CONAM).

<sup>6</sup> The final design study analysed five alternative routes for the supply canal (at 3840 MAMSL, at 3940 MAMSL, at 4040 MAMSL, and two combinations), and the 4040 MAMSL alternative was found to be the most technically and economically viable.

<sup>7</sup> Compared to data from the General Irrigation Plan for the Upper Valley, the final design study calculated a lower effective volume to fill Totora Khocha reservoir (13 Mm<sup>3</sup>/year less) by conducting a more detailed hydrological study and including local precipitation data.

Considering that the project's main purpose was to catch water to fill the Totora Khocha reservoir, the hydrosocial territory projected by designers (consultants and technical staff of the Cochabamba Prefecture) focused on capturing new water sources, thereby expanding the system's catchment zone. With this understanding, the designers had no great problems, at least on paper, in aligning all the user communities of the Totora Khocha reservoir with the project, assuming that the new territories incorporated into the catchment zone were controlled and represented by ARST. Although designers avoided introducing changes into the existing irrigation system management, ARST took advantage of the juncture to renegotiate the future water allocation of Totora Khocha according to their own vision of the projected hydrosocial territory, adding water from Yungas de Vandiola. This negotiation and the new water distribution agreement earned ARST new decision-making power over the project, using their discourse about socio-territorial rights to claim water.

### **Hydrosocial territory proposed by communities in Upper Tiraque**

Shortly after the final design study was publicly presented (in 2002), highland communities in Tiraque which had been excluded from this process expressed their opposition to the project. They questioned the legitimacy of ARST's authority and representation to control water resources belonging to the entire Tiraque Municipality. Alleging that "Tiraque's water must be for Tiraque's people",<sup>8</sup> they demanded that the Yungas de Vandiola water be used exclusively to irrigate land in Tiraque, leaving Punata out of the project. This gave rise to a movement led by the highland communities which did not belong to ARST and which had been excluded from previous irrigation projects. These highland communities in Tiraque are located in the north-eastern part of the watershed, at elevations of from 3500 to 4000 MAMSL (Figure 2). Initial discussions around the PRTYV coincided with a conflicted period of struggle against neoliberal water reforms in Bolivia, which resulted in the re-institutionalisation of water governance at the national level (Perreault, 2005, 2008), and the promulgation in 2005 of the Law of Promotion and Assistance to the Irrigation Sector for Agriculture and Forestry (Law 2878). Through this law, Bolivian irrigators achieved, first, the legal protection of customary water uses through collective water rights and, second, the institutionalisation of irrigators' control over the irrigation sector (Perreault, 2008).

To balance forces and dispute the power of ARST and ARSP, the groups opposing the project formed strategic coalitions that played a leading role at different stages of project development. In 2004, the Chillawara – Azul Khocha Irrigation and Service Association was founded, demanding that the Cochabamba Prefecture radically change the PRTYV in favour of its exclusive use by Tiraque communities (Saravia et al., 2006). ARST and ARSP responded that the PRTYV was not a new project, but rather was complementary to Totora Khocha. In November 2005, to show their strength and unity, ARST and ARSP signed a new agreement with three components: (a) the implementation of the Yungas de Vandiola Project for equal use by Tiraque and Punata; (b) the project's respect of possible third parties' water rights, opening the possibility for water from the supply zone to be utilised by other users during the dry season; and (c) an agreement to sue the Cochabamba Prefecture for the supply canal to be constructed not at an elevation of 4040 MAMSL but rather at 3800 MAMSL (as originally proposed in the preliminary study), mainly with the purpose of increasing the water catchment and reducing the possibility of new demands for utilisation of water from the supply canal. Although the Chillawara – Azul Khocha Irrigation and Service Association appeared newly on the scene and made their demands, this new organisation did not receive support, and their demands were watered down as their appeal to their constituency dwindled. This loss of support was mainly because, in practice, the association did not control any water source or any specific territorial area, so they lacked a solid mobilising foundation.

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<sup>8</sup> Quoted from an interview with the highland communities' leader, Tiraque, August 2009.

In 2006, a new organisation called the Highlands Association was formed by three communities that did control various small water sources at the higher elevations. Taking advantage of these communities' strategic location in the supply zones, the Highlands Association demanded inclusion in the project and to be granted rights to use water from the conveyance canal, according to the canal route outlined in the final project design (at 4040 MAMSL).<sup>9</sup> Agricultural production in this zone was mainly limited by the availability of irrigation water in the dry season, therefore access to this new water source would allow these communities to extend their cultivated area. Considering the low number of users in the Highlands Association (as compared to ARST and ARSP), the Highlands Association decided to include the Koari Irrigation and Service Association (ARSK) in their demand. ARSK grouped communities from the Chullku Mayu watershed (the catchment zone of the Totora Khocha reservoir, see Figure 2). It had initially been formed to defend their water sources from Totora Khocha (ARST and ARSP) users. In exchange for not claiming water-use rights from the PRTYV's supply canal, ARSK claimed increased rights in the existing Totora Khocha's catchment zone: the right to draw water from the supply canal ABC (see the green line in Figure 2). They now combined their claims to be included in the project.

The Cochabamba Prefecture asked the conflicting parties to negotiate an agreement to make the project viable, since they were already discussing project funding with the German International Development Cooperation. In these negotiations, the Highlands Association made it clear that if they were not included in this project they would not let more water ("not even a single drop"<sup>10</sup>) through their territorial area, which would affect the existing Totora Khocha irrigation system. After deliberation and heated meetings, and pressured by the arrival of a mission of the project's funders, in October 2006 ARST and ARSP had no alternative but to finally agree to include the Highlands Association in the project (CES-GFA, 2008). At the express request of the new groups of communities joining the project, a combined commission was formed involving all four organisations equally in decision-making and project management.

A new power balance in decision-making arose out of the alternative hydrosocial territory (Figure 3) reconfigured in response to demands for inclusion and claims of socio-territorial rights to water by communities grouped under the Highlands Association and ARSK. By forming a strong coalition which united the communities with territorial areas in the two supply zones of Totora Khocha, these communities forced their way into the project. The new reconfiguration of the hydrosocial territory included these new groups in the water allocation from the Yungas de Vandiola project, implying a reduced water allocation for Totora Khocha and therefore for Tiraque and Punata. Under the new agreement all four organisations had the same decision-making power as project beneficiaries.

### **The new hydrosocial territory proposed by the project designers**

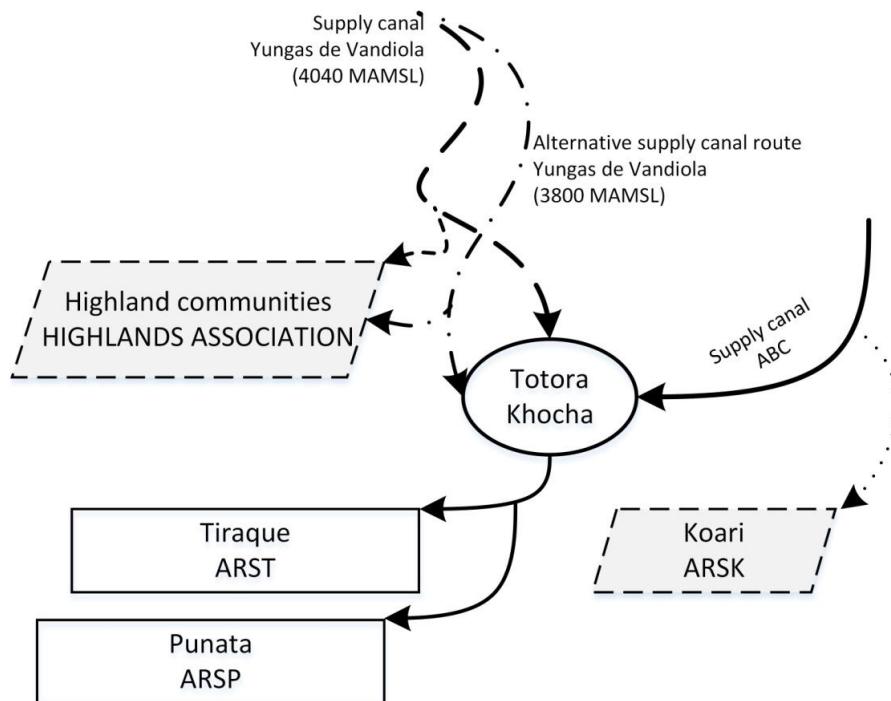
In June 2006, the Governments of Bolivia and the Federal Republic of Germany agreed to finance (via the KfW Development Bank) the implementation of the PRTYV, at a cost of €6 million. In view of the Totora Khocha experience (see Rocha et al.; 2015), funders required a study to evaluate technical, social, and financial aspects of the project's final design, as a prerequisite to beginning construction. The technical staff of the Cochabamba Prefecture and the Sustainable Agricultural Development Program (PROAGRO-GTZ) conducted this evaluation study (Saravia et al., 2006). It concluded that, although the project had favourable conditions for implementation, complementary studies and

<sup>9</sup> The elevation of the supply canal had implications for the project. The construction of the supply canal at a higher elevation (4040 MAMSL as proposed by the final design study, instead of 3800 MAMSL as proposed by the preliminary study) could allow highland communities to irrigate more land, increasing their water demand and reducing the water available for Totora Khocha (see Figure 3).

<sup>10</sup> Expression of a highland community's leader in a meeting of Highlands Association, Tiraque, May 2009.

adjustments were required to ensure feasibility. Specifically, the study observed three problematic aspects: insufficient knowledge about catchment watersheds' hydrological behaviour, lack of topographical measurements and geological field analyses to define the final elevation of the interbasin supply canal (at 4040 or at 3800 MAMSL), and conflicts over the inclusion of, and future water allocation to, highland communities.

Figure 3. The alternative hydrosocial territory proposed by the highland communities of Tiraque, showing two alternative routes for the supply canal (at 4040 vs. 3800 MAMSL), and the claim of ARSK to water from the existing supply canal.



In response, funders made financing conditional on a further pre-investment study to resolve the flaws detected in the final design study. Initial findings from this pre-investment study (CES-GFA, 2008) set aside the discussion regarding the two alternative routes for the supply canal, and observed two main aspects. First, after adjusting the hydrological models, the amount of transferred water would total only 12.5 Mm<sup>3</sup>/year, and thus would fall short of filling Totora Khocha reservoir as planned. Hydrometric field data revealed that prior studies had overestimated the available water, which seriously handicapped the project's feasibility considering the additional reduction in water for Totora Khocha from the project's inclusion of the highland communities. Second, the study observed that most of the catchment infrastructure would be inside the Carrasco National Park (Parque Nacional Carrasco, PNC), and partially inside its strict protection zone where national norms did not allow construction of any type of infrastructure. None of the previous studies had noticed this fact, although the PNC had been created in 1991.

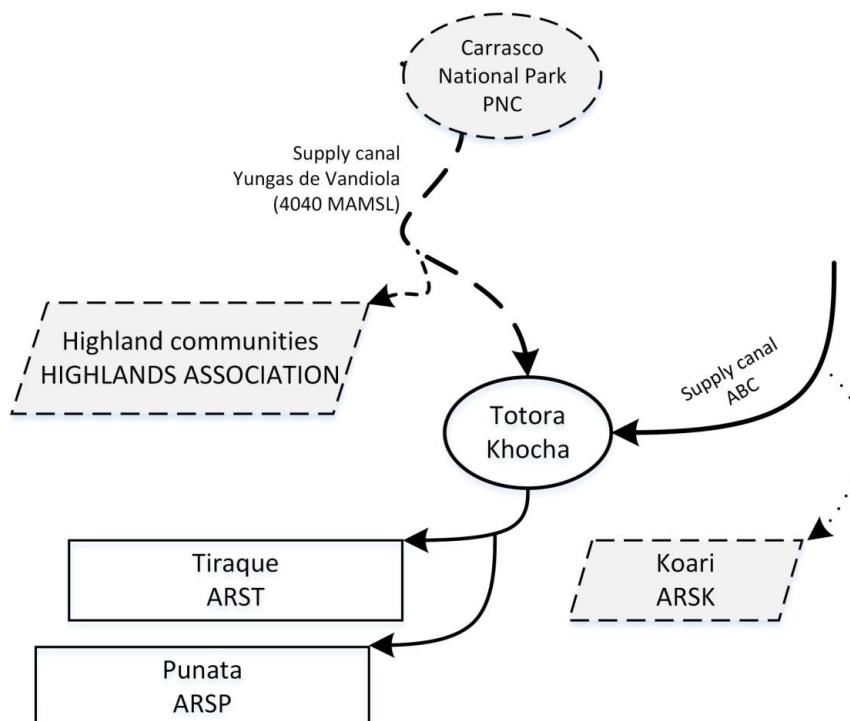
This new information made KfW uncertain about the funding they had committed to, as the project design violated their financing policies. The consulting consortium suggested, as remedial action, that an alternative way to fill Totora Khocha reservoir should be studied: improving and expanding the current supply system (canal ABC in Figure 2). In this sense, the consulting group conducted complementary studies which considered two alternatives: building the PRTYV canal (excluding the

protected PNC area), or improving and expanding the current supply canal ABC, possibly including new watershed sources (CES-GFA, 2008).

When ARST and ARSP learned of the pre-investment study's preliminary findings, they reacted against the new project direction, interfering with the pre-investment study. The ARSK (Koari) irrigators also tenaciously opposed the option of expanding and improving the current Totora Khocha supply system, prohibiting consultants from entering the canal ABC zone and demanding the renegotiation of the agreement to operate the Totora Khocha supply system.<sup>11</sup> ARSP and ARST reacted quickly. They were aware of the fatal consequences that renegotiating the supply agreement could have for them. They asked that the supply system study (the second alternative) be disregarded, and that the focus be placed on studying only the new Yungas de Vandiola (irrespective of the problem with the protected area), which the consultants eventually did.

Consequently, the pre-investment study resumed its focus on the water supply from Yungas de Vandiola as the only viable alternative. However, the inclusion of the PNC as a new element in the project's new hydrosocial territory (Figure 4) completely shattered the project's initial objectives. According to the data presented by the consultants, leaving out the watersheds located in the PNC core zone would reduce the amount of water transferred from Yungas de Vandiola from 12.5 to 3.5 Mm<sup>3</sup> (CES-GFA, 2008). This reduction in the amount of water transferred would practically defeat the project's viability, considering that Totora Khocha would also receive less water because of the highland communities' demands. ARST and ARSP therefore completely rejected the proposal to reduce the supply canal and the project's water availability. They demanded that the final design proposed in 2002 be maintained, which included the National Park watersheds in the catchment area.

Figure 4. Alternative hydrosocial territory resulting from taking the Carrasco National Park into account.



<sup>11</sup> According to this agreement, ARSP and ARST had the right to use the canal ABC, and to catch water for Totora Khocha, from December to April (rainy season); whereas Koari was entitled to use the canal ABC and tap this water from May to November (dry season).

After the National Service of Protected Areas (SERNAP) – which is the government agency for managing national parks – issued a legal ruling that the project design was not viable, irrigators pressured SERNAP to reverse what they called its "veto". Contesting SERNAP's argument about environmental protection and biodiversity conservation, irrigators insisted on the project's importance for rural families' livelihoods. Under the slogan "What matters more – wild plants and animals, or people's lives?",<sup>12</sup> irrigators demanded that SERNAP reverse its ruling and enable the project to go ahead with its full supply system.

ARSP and ARST were politically well connected to the country's ruling party. Rural sectors in Tiraque and Punata in general, and irrigators in particular, were strong supporters of the ruling party (Movement Toward Socialism – Instrument for Peoples' Sovereignty, MAS-IPSP). Unswerving participation by Punata and Tiraque irrigators in the movement that made Evo Morales President (the first indigenous president in Bolivia, from January 2006) and later the support of the communities in the impeachment of the opposing-party Prefect of Cochabamba (in 2007), had positioned the irrigation sector in close relationship to the national and departmental governments. Through the new Constitution (2009) the Morales government restructured democratic representation and governance around indigenous autonomy and communitarian values, empowering indigenous/peasant communities and giving them the right to make decisions about their territories and their resources (Morales, 2011). In this context, several irrigator leaders held key government positions (Parliament, Vice-Ministry of Irrigation, National Irrigation Service, and others). In consequence, irrigators backed by the politically influential Cochabamba Irrigators Federation (FEDECOR) brought tremendous political pressure on SERNAP to revisit its ruling, and on the Prefecture's technical staff (now under MAS-IPSP control) to declare the project viable.

After several meetings with consultants and governmental authorities, with threats of mobilising to block roadways, finally in late 2009 SERNAP issued a new resolution, stating that the supply system located in the PNC would not affect the Park's core zone (contradicting the initial ruling). Hence, providing that remediation and protection measures were taken, it would be possible to construct infrastructure. This new resolution enabled the project to proceed, and the process continued. Notwithstanding its doubts about the SERNAP ruling reversal, KfW remained interested in funding the project and decided to wait for the final findings from the pre-investment study to make their decision.

### **Hydrosocial territory proposed by FRIAC: the project's 'death sentence'**

Although the 2006 agreement included the Highlands Association communities as beneficiaries of the PRTYV, this group of communities felt that the project limited their control over their territory and water sources, because the project's main beneficiaries were still ARST and ARSP. Although most water sources to be tapped were not included within the boundaries of their community's territory, the new supply canal would run right through it, and would thereby take away part of the water that these communities saw as potential sources for their own future irrigation systems. To ensure that they maintained full control over what they considered to be their hydrosocial territories, the Highlands Association designed alternative proposals to utilise water from Yungas de Vandiola.

In 2007, the NGO *Mano a Mano* helped the Highlands Association draft their own irrigation project to tap water from the Encañada Watershed, which was included in the catchment zone for the PRTYV within the Highlands Association community territory. That year, the project's design was completed and presented to the Tiraque Municipality for financing (CES-GFA, 2008). The designed route of the conveyance canal would closely match the canal that was designed for the PRTYV (the 2002 design, at 4040 MAMSL). Thus, building it would require changes in the later project. Because the Encañada

<sup>12</sup> This argument was expressed by a leader from Tiraque at a meeting to discuss the PRTYV, in October 2009.

Irrigation Project could make the PRTYV technically and financially inviable by reducing water for the project, ARST and ARSP initially opposed it. The Tiraque Municipality declined to finance the project, because it exceeded their financial capacity and because it would cause new conflicts.

However, the Highlands Association and Mano a Mano insisted on implementing the Encañada Project and began building the supply canal with their own resources, hoping to raise further resources later. Building this canal would also consolidate their rights to the disputed water. They threatened that if the Encañada project were not implemented, then the PRTYV would not happen either. So, in June 2008 ARST and ARSP suspended their opposition to the Encañada Irrigation Project, and signed an agreement stating that the two projects were compatible, and both should be financed. Although the Encañada project would reduce the catchment area for the PRTYV, ARST and ARSP agreed to this new project because they thought it was unlikely to be funded, and they also felt that the planned construction of the Encañada project's canal route would also support their position that the interbasin transfer canal should be built at 3800 MAMSL to avoid interfering with it.

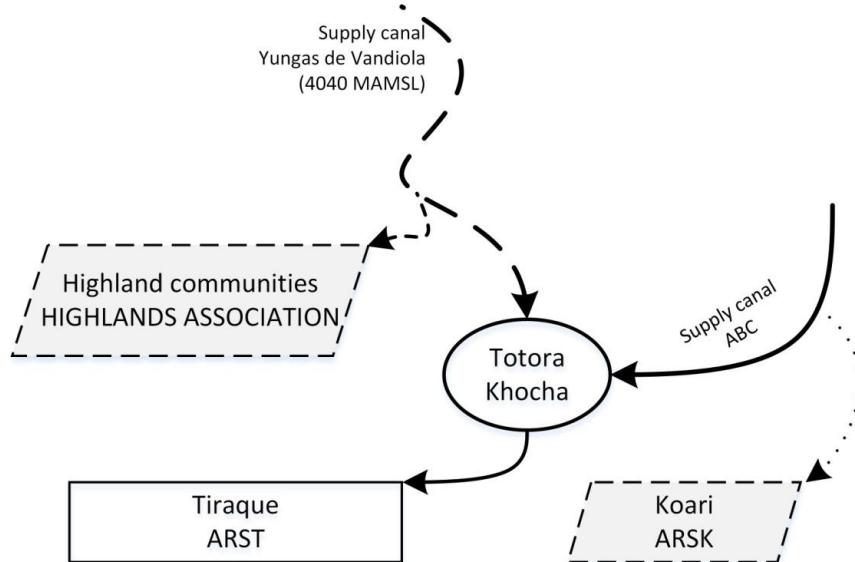
Despite gaining ground, the Highlands Association considered that it was losing the power struggle over the watershed's resources, and that they thus needed a new political ally. With the support of FEDECOR, ARST and ARSP had political influence in departmental and national government agencies, and could maintain and expand their control over territorial areas and water sources in the Pucara watershed. The leaders of the Highlands Association thus knew that they needed to consolidate their political power within the state. For this reason, the Highlands Association chose to capitalise on claims and demands by other communities in Upper Tiraque that did not belong to ARST, and who felt marginalised by the new agreements over water control in the Pucara watershed. On 16 August 2008, the Cochabamba Federation of Indigenous Agricultural Irrigators (FRIAC) was founded, bringing together a total of eight irrigation associations, including the Koari Association and the Highlands Association. FRIAC claimed to defend Tiraque water resources, which they felt ought to be used by the watershed's indigenous farmers. FRIAC's discourse was clearly influenced by the discourse of the ruling party, MAS. FRIAC's members claimed to be "the true water warriors"<sup>13</sup> and legitimate stakeholders in the Bolivian process of change, because they took part in the mobilisations backing the ruling party's rise.

Quickly asserting its position in negotiations about the PRTYV, FRIAC became the new voice of highland communities in Tiraque. From the first meetings, FRIAC firmly expressed their opposition to the PRTYV as it was originally conceived, and demanded that Yungas de Vandiola water should exclusively irrigate land in Tiraque. They called for the supply canal to be dug at 4040 MAMSL, to benefit the eight-member irrigation association and the current users of Totora Khocha in Tiraque – leaving Punata out of the project. The strength and fast strategic positioning of FRIAC in the PRTYV negotiations was mainly based on two aspects. First, FRIAC strategically used the discourse that promoted the need to defend water resources for Tiraque, which ARST leaders could not object to, resulting in the union of Tiraque communities around it. Second, FRIAC was made up mainly of communities which controlled the upper watershed where most of the water sources are located, so they threatened ARST and ARSP with blockage of access to the water sources located in their territorial areas. The alternative hydrosocial territory proposed by FRIAC (Figure 5), without Punata (previously the most powerful stakeholder in the watershed), aimed for total control over PRTYV, which would consolidate their water control in the Pucara watershed as well as political power as the main representative of its irrigators.

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<sup>13</sup> Quoted from an interview with FRIAC's leader, Tiraque, November 2009.

Figure 5. Alternative hydrosocial territory proposed by FRIAC.



Consequently, FRIAC called for stopping the pre-investment study until the project's orientation could be redefined. This position jeopardised the project's continuation, so the KfW warned that if these conflicts were not resolved promptly, allowing the completion of the pre-investment study, they would withdraw funding from the project. FRIAC's proposal – to only irrigate Tiraque lands and leave Punata out – was a radical change that the KfW viewed as a whole new project, quite different from the initial purpose of filling Totora Khocha. During several meetings in 2009 and 2010, an attempt was made to reconcile the parties in order to continue the pre-investment study. However, positions became entrenched and resolution of the conflict became an increasingly remote prospect. Ultimately, the pre-investment project was never concluded as planned. The partial report by the consultants, CES-GFA, was not accepted by the Prefecture of Cochabamba and the KfW withdrew the funding they had committed. Consequently, by mid-2012, the development of PRTYV was halted by the Cochabamba Prefecture. Nevertheless, Totora Khocha irrigators still hope that one day the project will be reactivated, and that the engineers will finally keep their promise to fill Totora Khocha. At the time of finishing this article (2019) no new project proposals had been developed.

## CONCLUSIONS

The article concludes that interbasin water transfer projects are arenas of profound hydrosocial territorialisation, as they incorporate new water sources and stakeholders with divergent territorial imaginaries and changing multi-scalar alliances. The eventful course of PRTYV's development highlights political struggles over irrigation planning and design. Different stakeholders establish strategic alliances to cultivate, mature, and support their imaginaries of hydrosocial territories that they feel must materialise through the irrigation project, with particular water management and usage suited to their interests. The article shows how the plan to expand the Totora Khocha irrigation system through the PRTYV produced opposition from marginalised highland communities in Tiraque, which then formed strategic coalitions to claim rights to the water sources included in the project. Configuring alternative hydrosocial territories was a means of resistance that emerged in order to dispute representational arrangements and project control, and to mobilise other communities with shared interests. Table 1 describes this dynamic configuration, breaking down the four fundamental components of the production and conception of hydrosocial territories (Brighenti, 2010). The first territory is the proposed layout from the project's final design study. The second and fourth are

alternative hydrosocial territories proposed by coalitions of highland communities. The third is the alternative hydrosocial territory proposed in response to the Carrasco National Park's presence and related norms.

Table 1. Analytical description of the hydrosocial territories produced regarding the PRTYV.

Hydrosocial territory (year and figure)	Who produces the territory?	How is the territory produced?	What type of territory does this produce?	Why produce the territory?
I Hydrosocial territory proposed by the PRTYV final design study  (2002, Figure 2)	• Project designers (CPM-CONAM), with assistance from irrigators of Totora Khocha (ARST and ARSP)	• By preparing the project's final design study. • By negotiating the new Totora Khocha water allocation agreement	• A territory to use water from the Vandiola region in Punata (50 percent) and Tiraque (50 percent)	• Interbasin water transfer project to fill Totora Khocha and use irrigation water in Punata and Tiraque
II Hydrosocial territory proposed by highland communities  (2006, Figure 3)	• Highland communities from Tiraque, organised as the Highlands Association	• By a coalition of the Highlands Association and ARSK, mobilising against the project • By negotiating the agreement for inclusion in the project	• A territory to use water from the Vandiola region in the highland communities, Koari, Tiraque and Punata. All four groups with equal participation in decision-making about the project	• Demanding water-use rights, to include highland communities in the project
III Hydrosocial territory proposed by the PRTYV new pre-investment study  (2008, Figure 4)	• Consultants for the pre-investment study (CES-GFA), following resolutions by SERNAP and KfW	• By conducting the pre-investment study • By inserting the PNC and environmental norms in debate • By redesigning the project	• A territory to reduce the catchment zone in Vandiola (and reducing the amount of water) respecting the boundaries of the PNC core zone	• Redesigning the project according to environmental norms to protect the national park
IV Hydrosocial territory proposed by FRIAC  (2009, Figure 5)	• FRIAC (grouping the Highlands Association and another seven irrigators' associations from Tiraque)	• By elaborating the alternative Encañada Irrigation Project with the support of NGOs • By forming a coalition of eight irrigators' associations from highland communities as FRIAC • By mobilising and defending water rights from Yungas de Vandiola • By suspending pre-investment study	• A territory, including the communities from the eight irrigation associations comprising FRIAC in the project, and excluding Punata	• Demanding water-use rights, to build FRIAC's political power (i.e. highland communities) over water control and territories in the watershed

Coalitions formed to oppose the project's technological and normative design brought increasing pressure on project negotiation, geographically building and politically fortifying their proposed alternative hydrosocial territories. Although the main purpose of the opposition was initially to include highland communities in the project and demand water-use rights, it ultimately expanded to bolster FRIAC's political power to control water resources in the Pucara watershed. Although in the end PRTYV had not yet been implemented, the process yielded a new array of political power relations for water governance in the Pucara watershed. This strengthened highland communities in Tiraque and established their territorial control over water sources, disputing ARST's representation and water control. Further, ARST and ARSP not only lost their opportunity to access Yungas de Vandiola water, but also lost ground for future negotiations to tap the watershed's water. For the highland communities, gaining political control over the Tiraque water resources was more important than reaching a compromise over an interbasin water transfer project that would benefit mainly other communities. In the eyes of the highland communities, their increased political control over the hydrosocial territory would guarantee a better starting point for any future irrigation projects.

The application of the hydrosocial territory conceptual framework in the case of the Yungas de Vandiola irrigation project yields three insights: (1) rural communities in Bolivia change their water right claims based on their evolving visions of their hydrosocial territory, (2) stakeholders dynamically forge multi-scalar political alliances to further their interests based on their imagined hydrosocial territories, and (3) the project formed an arena where stakeholders struggled to get their imagined hydrosocial territories accepted and dominant. During the project the dominant vision of what constituted the legitimate hydrosocial territory changed constantly, based on the political struggles of the different multi-scalar stakeholder alliances articulating this vision with wider political and cultural developments at the national level.

The conceptual framework to analyse hydrosocial territories, in combination with shifts in the legitimacy of water right claims, has important potential for studying water conflicts around the world. The study of the historical processes of hydrosocial territorialisation allows an analysis of the multiple dimensions and arenas where water – and specifically interbasin water transfer and irrigation projects – are developed. This analysis could be applied in order to better understand who, how, and based on what moral grounds or regulations, groups of people claim water or resist water development projects, what conflicts and solutions they yield, and how stakeholders negotiate project design, materialise their infrastructure, and thus change flows of water and power.

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