

Rescaling water governance in La Plata hydropolitics: the cases of transboundary Apa (Brazil – Paraguay) and Quarai river basins (Brazil – Uruguay)

ABSTRACT

This paper aims to analyse how changing geographical processes occurring in La Plata river basin entail changes in the scale of water governance. The hypothesis developed is that, until the last decades of the 20th century, when the main goals of national governments – Argentina, Bolivia, Brazil, Paraguay and Uruguay - were to develop industrialization and strengthen national power in the South American context, the hydropolitics in the region were framed by La Plata basin scale – thereby termed as a transnational basin. However, with the increasing focus on environmental issues and raising discourses on water crisis, the hydropolitics in La Plata basin are rescaled to transboundary water basins. This paper takes a multi-scalar perspective to address hydropolitics, presenting the first interviews with stakeholders, taken to address the main changes in La Plata, and analyses two case studies of transboundary river basins initiatives: Apa basin, in the border between Brazil and Paraguay; and Quarai basin, between Brazil and Uruguay. In the first moment analysed, water governance was addressed as a national issue. More recently, discourses at international fora on water crisis and increasing concerns about environmental changes have changed the scale used to evaluate hydropolitics in the region; the concept of river basin is still prevailing, but the frame used now is closer to border dwellers and their uses.

INTRODUCTION

Transboundary waters are a great challenge to water governance in a context framed by the `sanctioned discourse` (Allan, 2000) of water crisis (e.g. Gleick, 1993; Camdessus, 2005) and there are predictions of increasing disputes over water resources in the future (Wolf, 1998; Giordano *et. all.* 2002). This situation is sharpened by the great importance of surface river basins shared by two or more countries, which cover almost half of earth`s land surface and provide water for around 40 per cent of the world population (Wolf, 1998; UN-Water, 2008; Earle *et. al.*, 2010). In South America, a continent with three of the largest transnational river basins in the world, in area, flow and stream length: Amazon, Orinoco and La Plata (del Castillo, 2011), water security issues do not seem so acute compared to other regions like the Middle East and North Africa, where water availability is already an urgent matter (Allan, 2000). Nevertheless, in South America processes such as agricultural frontier expansion, an increasing urban population and climate variability raises questions on water politics in the continent (Tucci, 2004).

This paper, a part of an ongoing PhD thesis, aims to analyse how the changing geographical processes occurring in La Plata basin entail changes in the scale of water governance in La Plata basin. The hypothesis is that, until the last decades of 20th century, when the main goals of national governments in La Plata basin were to develop industrialization and strengthen national power in the South America – mainly represented by the antagonism between Brazil and Argentina – hydropolitics in the region were concerned

with La Plata basin – here termed as transnational basin. However, with the increasing interest in environmental issues and the raising discourses about water crisis, the hydropolitics in La Plata basin rescaled to transboundary water basins.

The issue of transboundary waters has gained increased attention at international fora and in public debates, especially regarding conditions to access and distribute water among users situated in different countries. An extensive literature has been produced addressing how water, among other environmental issues, is becoming a security matter, in a process coined as a securitization (Dalby, 2009; Mirumachi, 2013; Mason and Zeitoun, 2013). Despite the spectrum of actors involved in the production of a waterscape, the first attempts to address water security discourses paid prominent attention to the role of the national state, and its intention to maintain the quantity and availability of water within its territory. Just in more recent accounts are taken in account considerations regarding the conservation of water to human and ecological welfare in the water security debate (Cook and Bakker, 2013; Mason and Zeitoun, 2013).

Nevertheless, even from a state-centred perspective, analysts show divergences about the effects of environmental disputes in the international politics. This difficult is harshened by the forecasts scenarios of increasing scarcity, ensuing the predictions of world's population growth and the unpredictable consequences of climate change. A diverse range from catastrophically premonitions, such as in the influential paper of Robert Kaplan (1994), affirming that a combination between population growth and resources scarcity will be the drivers of 21th century wars. Another set of studies asserts that the control and access to natural resources might become one prominent issue in the next years, due to unequal conditions for certain groups to access the resources needed to your subsistence. Controlling and accessing natural resources might create conflicts through structural scarcity (Homer-Dixon, 1999) or impacting the national economies (Klare, 2001). In an opposite analysis, on water issues, Wolf (1998) and Uitto and Wolf (2002) conclude that the prognosis of future water wars do not seem “strategically rational, hydrographically effective, nor economically viable” (Wolf, 1998: 251); instead, historical records and recent treaties made these authors affirm that the outcome of water disputes usually are cooperation initiatives.

Another set of contributions, trying to detach the political outcomes in transboundary hydropolitics from conflict/cooperation poles, argues that elements of both categories can co-exist within the political interactions. Therefore, they affirm that cooperation based on treaties and agreements that actually conceal power asymmetries are not necessarily good, neither conflicts that leads to an effective issue resolution are necessarily bad; meaning that the political interactions regarding transboundary waters are more nuanced than it might looks like (Zeitoun and Mirumachi, 2008). Moreover, the analysis of power relations within a water basin could be better addressed if it identifies the strategies and tactics employed by the most powerful players acting as hydro-hegemony to achieve their goals (Zeitoun and Warner, 2006). Finally, in Zeitoun *et al.*, (2011) the ways that hydro-hegemony actions can hide the exercise of unequal ‘soft’ power, used to achieve integrative and distributional ends are discussed. In another words, they are about achieving compliance of the weakest parts through consent or resignation.

Given this context of political interactions regarding transboundary shared waters, this paper will assess in greater depth the definition of the scale adopted to inform and act in the La Plata regional hydropolitics, which is mainly the scale of the river basin. In the first

section of the paper two different perspectives about scales are discussed: the conceptualization of scale derived from human geography and political economy, asserting the social and political production of scales, and another perspective derived from ecology and landscape ecology that operationalize scales as different levels of a structured and nested hierarchized system, connected through exchange of energy. The reason to bring this discussion to the forefront of this study is the perception that scale concept sometimes is applied in river basin governance regardless of any consideration about extension, position and types of political entities contained within a watershed. The understanding is that these attributes are fundamental to reflect on water basin hydropolitics, on how changing political goals entail the construction of different scales to water governance, and how those geographical features are used to construct distinct `river basin trajectories` (Molle and Wester, 2009) to decide upon where water must be used and for whom.

The second section presents the hydropolitical trajectory within the La Plata river basin. It argues that along the South American political history the scale of La Plata basin was adopted as a frame to address not just water related matters, but was also a frame mobilized in the geopolitical disputes between Brazil and Argentina in their attempt to exert a regional hegemony. Hence, La Plata can be seen as a scale to address the transnational South American hydro/geopolitics. Regarding the water related disputes within the watershed, three main themes mobilized the political interactions: 1) conflicts to define the boundaries in the region, which adopted La Plata`s rivers as the national natural boundaries; 2) the control of waterways navigation, which was a sensitive matter since it was a condition to access the continental inland and drain the commodity production; and 3) the use of La Plata`s hydroelectricity capacity to foster the competing national development projects, bringing the advent of a `hydraulic mission` (Molle *et al.*, 2009) all over La Plata.

Finally, the third section explores the changing perspectives in transboundary water governance in La Plata. Some reasons appointed to these changes are: 1) the raising concerns regarding environmental issues, like water scarcity and climate change, that have been spanning worldwide through international fora and national governments, and 2) the search for more decentralized and democratically based arenas to cope with the governance of water resources, bringing new actors, ideally local, to grasp those issues. In La Plata this attempt has been tried through the adoption of La Plata river basin subunits to rescale water governance, assuming that those subunits would allow a more suitable frame to address those emergent issues. This paper aims to discuss the process of the construction of a transboundary hydropolitics presenting the preliminary data collected in two cases-studies, on Brazil-Uruguay border (Quarai river basin) and Brazil-Paraguay border (Apa river basin).

1. SCALING HYDROPOLITICS – SCALAR ANALYSES WITHIN INTERDISCIPLINARY PERSPECTIVES

This section addresses the issue of the scale adopted in hydropolitical studies and practice. Usually, the river basin is issued as the most suitable scale to assess water politics and the agreements over shared waters. It's considered that despite your unequivocal definition and application as a geomorphological and hydrological unit - bounded by their watershed which funnels the water towards a common water body -, the usage of the river basin to address water governance and hydropolitics demands some qualification, since its complexity is connected with the disparately social, geographical and institutional features

that they comprise, which entail interactions between different social actors in unequal power situations. Hence, it must reflect upon the construction of a river basin as a geographical scale not just regarding your position within a nested hydrological hierarchy, but as well as a product of social and political interactions and interests.

This spatial unit was assumed as the most fitting for water issues because of its natural origin; therefore the adoption of the water basin would allow a more technical and rational decision making upon water resources, pretentiously without political interference. The choice of this spatial scale had a widespread acceptance around the world, in the French water management policy, for instance (Meublat and Le Lourde, 2001; Vieillard-Coffre, 2001); in the United States, through Tennessee Valley Administration (TVA) (Molle, 2006); and, in Brazil, through the 1997 Water Law, which takes the river basins as the basis to manage water resources. In South American continental level, the two main river basins, La Plata and Amazon, were taken as the frame to develop initiatives of cooperation and joint management, in 1969 and 1978, respectively.

The distinction between a river basin and other spatial frames for natural resources management is its physical and natural justification. This geomorphological unit had taken place as a conceptual tool to assess the processes in landscape evolution, at the beginning of the 20th century, developed by the works of Robert Horton and Arthur Strahler. The second author defined a river basin as a limited, convenient area, usually delimited by an unambiguous topographical unity, available in a nested hierarchy of scales on the basis of stream ordering (Strahler *apud* Chorley, 1984). Besides that origin in physical sciences, the river basin has turned into an object of differing political interests and multiple territorialization possibilities, depending on the political objectives at each moment, like the sustainable development at local, regional or sectorial basis. Therefore, water basin can be conceivable also as a hybrid territory (Ghiotti, 2006) or hybrid siconatures (Swyngedouw, 1999; 2007)

Willing to address such hybridity of approaches regarding the scalar uses of the river basin concept, it needs to be made some considerations about the use of the concept of scale in human geography/political economy and ecology/landscape ecology. This presentation intends to unravel the implications of adopting the river basin as spatial scale for hydropolitics and develop a clearer understanding whilst analysing the La Plata river basin study case.

1.1. Scale as size and level in ecology and landscape ecology

In ecology, particularly in landscape ecology, scale had been used very often to define the size of observable phenomena. Within this perspective, landscapes can be assessed through their mosaic composition, whether composed by corridors, patches or matrices. Each one of these spatial forms has their own process and internal structures, therefore they can be isolated and studied as a specific unit, and can be defined as a study scale (Forman, 1995; Wiens, 1989). Following this approach, scale is defined as the size of a discrete phenomenon over the terrestrial surface. Hence, Forman (1995) states that ecological studies could be made at several scales: a region, a landscape patch, a local ecosystem or in a water basin. This definition, perhaps the most usual in the common sense, is strictly connected with the cartographical view about scales, that correspond to a relation between an area in the terrestrial surface with a representation in a map. Sayre (2005; 2009) asserts that a corollary

of this definition is an epistemological moment at any study, due to limited aspects that can be observed given a specific scalar grain (e.g. spatial and/or temporal resolution available within a given data set) and extent (e.g. the size of the study area or the duration of study).

However, an attribute to the landscapes or ecological systems is to be an open system e.g. that entails energy exchanges with other systems, by inputs and outputs. This character is responsible for some features of an ecosystem, such as its diversity and your population:

“In open systems, transfer rates among elements are relatively high, and the dynamics of patterns at a given scale are influenced by factor at broader scales. However, ‘openness’ is a matter of scale and of the phenomena considered. At the scale of individual habitat patches in a landscape mosaic, for example, population dynamics may be influenced by between-patch dispersal, but at the broader scale of an island containing that landscape, emigration may be nil and the populations closed. The same island, however, may be open with regard to atmospheric flows or broad-scale climatic influences.” (Wiens, 1989: 387)

To deal with this scalar diversity interacting with each other hierarchical theory were formulated. In this theory, each scale interact with another as levels and specific units called *holons* (which in Greek means whole), so each *holon* is a discrete sub system. The interactions among *holons* could be horizontal, between *holons* of the same hierarchical level, or vertical, between *holons* situated upwards or downwards. This conceptual organization enabled ecological analysis to focus on at least three levels in order to realize a multi scalar analysis: the analysis level, one upper and one lower level (McMaster and Sheppard, 2004).

Arthur Koestler (1970) coined the term *holon* as an attempt to bring a word to express a situation of a wholeness in social and natural hierarchies. Every hierarchical level is an assemblage of entities playing an ambiguous and relative role, at the same time a part of a more general structure and a whole in itself; in his words a level is an ‘intermediary structure’ of a hierarchy (Koestler, 1970: 65). Thus, ‘dissect’ hierarchies within its components can be a step towards analyse social or natural organizations. The *holons* has also the attribute to assert its particular characteristics, to differentiate from other parts, but at the same time an integrative tendency, to make clear its attachment with broader structures. Sayre (2005; 2009) argues that the definition of scales as levels entail a scalar ontological moment. In that sense, the ontological moment is the assumptions made to justify the interactions among levels and your boundaries as an objective reality.

The spatial scale extension also brings consequences to its temporal scales. Theoretically, phenomena occurring in an immediately upper scale from the level upon analysis occurs, simultaneously, in a slower temporal scale, therefore, their characteristics are constraints; the phenomenon occurring in an immediately lower scale, inversely, happens at a faster pace, hence they bring diversity and stability to scale analysis (Wiens, 1989; McMaster e Sheppard, 2004; Forman, 1995).

“[...] when analysing any particular level the processes operating at the next higher scale can be regarded as constraints. They are so much slower, and show so little spatial variation at the scale of analysis, that they can be treated as constants. Processes operating at the next lower scale are conceptualized as driving change at

the scale of interest, but run so much more quickly that they can be regarded as having reached an equilibrium state. This means that they can be approximated as fixed initial conditions for the purposes of modelling change at the scale being studied". (McMaster and Sheppard, 2004: 11)

Gibson *et al.* (2000) shed light over some flaws of hierarchical theory. The factors they identify as misleading derive from the fact that the theory does not address the emergence of constitutive hierarchies (e.g. hierarchies that have their structures marked not only by the union of different levels). In constitutive hierarchies, raised in complex systems, the aggregation of lower levels does not mean the union of their functions and processes, but creates emergent proprieties. "In complex, constitutive hierarchies, characteristics of larger units are not simple combinations of attributes of smaller units, but can show new, collective behaviours." (Gibson *et al.* 2000: 221)

Within environmental sciences the concerns about the distinctiveness of every scale and level within a hierarchy became a prominent issue when regarding how environmental processes have been managed and how political structures built to deal with human-environmental systems have been misleading in taking account of the problems they have to tackle, such problems are treated as issues of multilevel governance (Cash *et al.*, 2005; Lebel *et al.*, 2006) or of scale fitness (Moss and Newig, 2010).

Therefore, conceptually, the works that intend to explore the challenges to implement an effective governance in multilevel environmental systems try to cope with the definitions of scale and level. Scales are generally defined as the spatial, temporal, quantitative or analytical dimensions to study any phenomenon, and levels as units of analysis that are located at different positions on a scale (Gibson *et al.* 2000; Cash *et al.* 2005; Moss and Newig, 2010).

Finally, the character of a constitutive hierarchy brings serious consequences to the conceptualization of scale, especially within hierarchy theory, because the processes and structures of any level upon analysis does not reflect their upper or lower related levels. Human geography, through different ways and debates, came to similar theoretical conclusions: that a scale is not only the aggregation of lower levels, instead each scale presents a distinct character built on social and political processes. Moreover, it undertook severe critique to the hierarchical thinking within scalar organizations, proposing more networked or flat spatial arrangements of scales.

1.2. Scale as relation in human geography

Human geography knowledge, during the last thirty years, has been seeing a great debate over the concept of scale and its limits. Some critiques have been made to the conceived idea of scales structured as nested hierarchies in social sciences - some metaphorical tools used to clarify the organization of scales as nested levels are the `Russian dolls`, the `Chinese boxes` or `(scales as a) ladder` (Herod, 2011). The most well diffused thinking about how the scales were structured, in political economy and political geography, was proposed by Peter Taylor (1982) and stated that the political economical organization of

contemporary world was made by an urban to global structure, going through the national level.

The comprehension of scales as nested hierarchies generated another dissensus whilst it conflated the notions of scales and levels, which became more evident in the work of Yves Lacoste (1988). This author identifies scale issues within geography as the matter of choosing an adequate level of analysis, a level of generalization, appropriate to the phenomenon being tasked, and further on, the dimension that you can address the `reality` of the world. Therefore, the choice of an appropriate level of study would be one of the most important roles of geographical endeavours, depending on the conceptualization of space made by geographers and the objective of their works (i.e. public policies or scientific analysis). However, it worth note that, at that moment, Lacoste was dealing with the challenge to question and complexity the traditional object of French geography, the region, heir of the regional monographs developed during the beginning of the 20th century.

The notion of scale as a nested hierarchy was discussed also in another period of geographical thought, when geographers attempted to identify and delimit patterns in space. This was attempted through the use of mathematical and statistical methods that could show which process would be more relevant at each scale (for instance, tidal currents, frost action and soil creep at the local scale; tectonic activity at the regional; and solar radiation activity at the world-wide scale) (Harvey, 1968).

Those general assumptions made about scales in human geography were questioned by those geographers concerned with the political economic changes raised within globalization processes, and questions as such the internationalization of production and the restructuring of the nation-state's role. The theoretical achievements of these studies were the comprehension of the limits in assessing any particular scale with an ontological character, and that there aren't any inherent conditions that make a scale more suitable for a social study (Sheppard and McMaster, 2004; Brown and Purcell, 2005).

In such a perspective, one of the propositions states that scales are socially constructed and built through social interactions. They aren't given by itself, instead they are the consequence of agent actions searching a specific political agenda. Moreover, geographical investigation contemplating the scales of social or ecological phenomena must scrutinize the strategies and motivations that gave rise to a scalar arrangement (Brown and Purcell, 2005; Swyngedouw, 2007).

Howitt (1993, 1998) argues that one of the most common misleading elements of the scale as nested hierarchy conception was to assume that a large scale would be made with the sum of small-scales components. Moreover, he evaluates that there is no causality or necessary relationship among the characteristics derived from the lower levels and the constraints from an upper level, even though the features of any level are derived from horizontal and vertical relations. Finally, the acceptance of uncritically `conceptual givens` levels (Howitt, 1993: 37) – i.e. urban, regional, national and global – are not practical, politically and scientifically, and tends to encapsulate processes in *a priori* labels, or frames (Howitt, *op. cit.*). Indeed, what can be assessed from this critique made by Richard Howitt over the conceptualization of nested scales in human geography is an attachment with the

still present concept of scale derived from cartography, as a representation of the proportion between a spatial extension in reality and that within a map, and with its corollary in simplification and generalization. Therefore, what have been stressed within this conceptualization are the extension and the boundary making of an area on the surface.

In further works Howitt (1998, 2002), after identifying the main uses of the scale concept (as size and as level), proposes the adoption of the understanding of scales as relations. In that sense, scale can be assessed as a geographical totality, given by the interactions among its features, with each totality having some autonomy. Depending on the perspective adopted to address the totality some features can be emphasized, but they don't disappear if you change scale, they just move to the background. For instance, the national scale is defined by features, such as territorial sovereignty, national market, cultural identity, etc.; regardless the size of the country, which could be Russia or Singapore; and the national scale does not depend on the features existing in another scale, such as subnational entities or supranational organizations. Hence, justifying what makes the national a relevant scale requires us to address the relations between those features (Howitt, 1998).

However, attempts to develop new theoretical alternatives to supplant the traditional understanding of scale, understood as a nested hierarchy with vertical connections among different levels, had one of its most vigorous critiques made by Marston *et al.* (2005). Their critique was harsher when they defended that for human geography knowledge would be more practical to eliminate scale from their conceptual range, since the attempts to find a solution to define it through adding network theory, like scale as a relation definition, were not enough to overcome the limits of scale definitions as size or level.

The critique over scale concept in human geography made by Marston *et al.* (2005) can be summarized in three points:

- (1) After more than 20 years of theoretical debate and empirical research there is still confusion between the two main ways to define scale, either the horizontal definition, as size or scope; or the vertical, as level. Therefore, the authors argue that the unique difference between these two categories rests upon 'points of view' from which space is demarcated: horizontally, space seems in extension; vertically, space seems upwards and downwards. Then, if scales are just a matter of vantage point of view geographical knowledge should be able to merge the two definitions in one more operational.
- (2) Scalar hierarchies are hardly disentangled from the binary distinctions in social sciences, such as global – local, micro – macro, agency – structure, and so on. The example of the global economy's effects in localities is given to demonstrate how in a scalar hierarchy analysis one level takes the prerogative to influence and induce changes in other levels, structuring causal arrangements in different places indistinctively.
- (3) The third point, also presented by Howitt (1993) and Swyngedouw (1997), states that hierarchical levels usually constitute pre-given arrangements, just creating a structure where the social facts fit inside a structure already prepared, usually at levels such as the body, neighbourhood, urban, regional, etc.

To supplant scale in geographical theory they propose a flat ontology of spatial relations. This suggestion is grounded in neo-realist epistemology and complexity theory (Escobar, 2007) that addresses the geographical units as `sites`, where human and non-human entities are assembled in particular and individual ways, and define different interactions between them. The model of these assemblage relationships would be horizontal, rather than vertical connections that mean that networking processes are the main drivers of the emergence of new properties in social sites (Marston *et. al.* 2005).

The critique and propositions of Marston *et. al.* (2005) were followed by a set of commentaries which explored different perspectives in their work to agree with some points or challenge new perspectives to the development of the scale concept (Hoefle, 2006; Collinge, 2006; Jonas, 2006; Escobar, 2007; Leitner and Miller, 2007). One of the most common critique were that within the scale literature evaluated by Marston *et. al.* (2005) they weren't attentive to the empowering role of interactions between scales, and at different scales at same time; in another words, the social production and politics of scales invested social agents with capacity to circulate among different levels, which had been demonstrated as an useful tool to social movements within engaged politics. Therefore, what was suggested as an impressive development in the scale conceptual debate would be a more detailed empirical analysis of types of production of scales and which power relations are used in this process, instead of throwing away the conceptual arsenal built to assess scalar politics (Collinge, 2006; Jonas, 2006; Leitner and Miller, 2007).

In a more specific critique, Leitner and Miller (2007) argue that the conflation between hierarchy and verticality implies a strict top-down power relationship, which is not the case within the scale literature. Otherwise, the evidence in the literature shows that connections within hierarchies could be top-down and/or bottom-up. Moreover, if scales are not fixed, but an arena of struggle between social agents, then there isn't an opposition between one level that constitutes the structure, as the global, and another that constitutes the agency, as the local.

Other accounts about the scale concept do not intend to desert the endeavour of defining the uses and benefits of scalar thinking. The article of Neil Brenner (2001) tries to bring a more accurate perspective over the developments within the overall use of the term politics of scale and the whole lexicon derived from this geographical concept. The main worry of the author was to elucidate how the political, economic and urban geography debates, in the 1990s, have turned the scale concept to a buzzword, loosely distinguished from other concepts within geographical jargon, like territory, place or space. Therefore, the question if a sociospatial phenomenon is indeed a scale problem, or whether the best way to address these phenomenon would be with some of the other concepts cited above is a sensitive subject.

Furthermore, Brenner (2001) differentiated two main ways that the empirical analysis about the politics of scale had been made. Firstly, he identifies a singular meaning of politics of scale, stated as "the production, reconfiguration or contestation of some aspect of sociospatial organization *within* a relatively bounded geographical arena – usually labelled the local, the urban, the regional and so forth" (Brenner, 2001: 599). By contrast, in the second, or plural meaning, "politics of scale refers to the production, reconfiguration or

contestation of particular differentiations, orderings and hierarchies *among* geographical scales". (Brenner, 2001: 600). The important point of differentiation between those two definitions is that for the plural politics of scale the most important aspect of scale analysis is the embeddedness and positionalities of spatial units interacting with each other. Hence, the geographical scale is "understood primarily as a modality of *hierarchization and rehierarchization* through which processes of sociospatial differentiation unfold both materially and discursively" (Brenner, 2001: 600).

Consequently, the singular approach of scale, which prioritizes a self-enclosed spatial unit and its content that is well delimited by demarcated boundaries, would be better addressed through the employment of alternative geographical lexicon, such as place, territory or network. Nonetheless, the sociospatial phenomenon that would benefit by the deployment of scale and rescaling processes can't be understood as a final and static structure. Therefore, Brenner (2001) proposes eleven hypotheses to assess the processes of production and reproduction of spatial scale, but this paper presents just those more relevant to the subject here discussed.

- There are multiple forms and patterns of scalar structuration: Any scalar structure must be evaluated, in terms of how, why and when the sociospatial processes are divided into a vertical hierarchy; which spatial units are relevant to that hierarchy; what are their role within the structure; and what are their historical evolving relations with the other spatial units.
- Scales evolve relationally within tangled hierarchies and dispersed interscalar networks: Metaphors such as the `Russian dolls` are misleading, because they assess the levels of a hierarchical structure as containers defined by absolute geographical size. Nevertheless, each geographical scale must be addressed regarding its positionality within the context of other scales.
- There are multiple spatialities of scale. The areal terms in which scales are generally described are just one, among several, spatialities that scale can represent.
- Scalar hierarchies constitute mosaics not pyramids. The geometries of scalar structures would not be understood as nested superposed levels, but as unevenly superimposed layers. (Brenner, 2001: 605-607).

This short evaluation in human geography literature about scales shows that whilst the geographical scientific field still far away from a conceptual general definition and operational consensus, some approximation between different perspectives are possible, and perhaps desirable. The following sub section intends to explore further possibilities considering hydropolitical studies and the hybridity of the usual scale adopted in such analysis, the river basin.

1.3. Levels in relation: perspectives of scalar thought to hydropolitics.

Trying to develop a theoretical perspective about scales closer to the paper's case it is used the schema below, published in Lebel *et. al.* (2005). It illustrates how hydropolitics can be assessed within a river basin framework, like La Plata, and relating with its sub-catchments. Although nested levels are not the only possibility to address hydropolitics within a river basin, like illustrated by the figures of politics of positions and place, they can be very informative about the possibilities of political range within a river basin. For instance, those actor situated in a sub-catchment river basin would be mobilized to address issues related with water uses within that their level, but not with the overall schema of water allocation and the development policies in the upper levels.

Furthermore, thinking about those representations of politics of scale in light of the hypotheses constructed by Brenner (2001), scale construction and their relations are open to render different organizations, such as politics between scales, positions and places simultaneously. Insofar the representation of politics of scale might remember the metaphor of 'Russian dolls', wherein each level constitute precise and discrete bounded areas, each level just makes sense in accordance with the overall context of other levels. Finally, thinking as scalar structuration as spatial mosaics, instead of pyramids, means that the boundaries of watersheds are selectively appropriated or changed accordingly to the issues addressed by political goals at stake (Davidson and Loe, 2014).

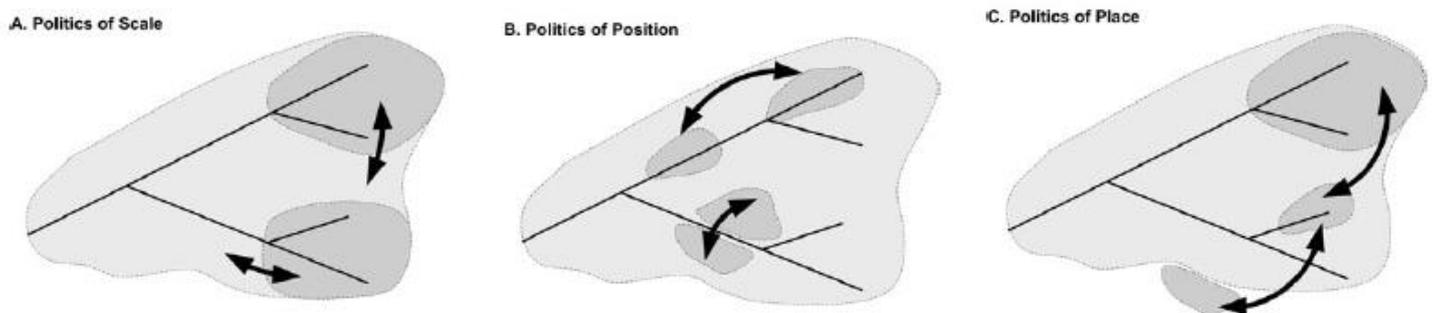


Figure 1: A schematic representation of the politics of scale, position, and place around regional water sources. Source: Lebel *et. al.* 2005.

How those different spatialities are converted in water politics and management are analysed by Lankford and Hepworth (2010) that using the metaphors of the cathedral and the bazaar try to compare different perspectives on water management. The cathedral model defines a basin-wide authority deploying a monocentric governance, usually ruled by command-and-control national laws and dependent on scientific data to produce enforceable decision-making processes. The cathedral model is normally identified with the principles of the Integrated Water Resources Management (IWRM) and are diffused through financial bodies and water workshop training in several developing countries. Nevertheless IWRM's principles states the importance of community participation and adaptive models for water management and allocation, empirical evidences asserts that most of times decision implementation are made without public participation. Most of times just a shorty

consultation is held, and technical and normative procedures often are replications of humid/temperate river basins, usually from developed countries.

Another perspective, coined as bazaar model, intends to promote a decentralized approach to water management and governance. Instead of a central regulatory rule, it proposes a model that enforces a polycentric management, focused in a nested set of sub catchments within the biggest frame of the cathedral management. Each subunit are seen as a *holon*, as an autonomous totality in itself, ruled through by-law norms, that don't need to be a river basin necessarily, but an irrigation system, for instance. Finally, the authors conclude that the probable river basin operation would be a balance between the two models:

“In some river basins, there will be a clear case for a well-financed regulatory authority deploying centrally planned infrastructure, water quality and quantity measurement, and legal safeguards against powerful sectorial interests. In other basins, a basin-centred office might be omitted or be comparatively small, providing essential water resources assessment and monitoring functions, while greater support is provided for the management of localised modular subunits/holons each determining priorities to meet particular and external objectives.” (Lankford and Hepworth, 2010: 96)

Those considerations about scalar thinking intends to argue that although the `natural` boundaries of watersheds must be criticized because of their masked political implications on hydropolitics, analysis could take advantage from a perspective that addresses relations among different levels, over which water is managed, appropriated and framed. Even though hierarchical analysis in social sciences are usually seen as a fixed and overly structured framework, it intends to acknowledge how each level within the hybrid structure of a river basin can be autonomous. In another words, as it can be addressed as a *holon*. The next section assesses the La Plata river basin hydropolitical trajectory through a transnational lens; i.e. how the countries within the river basin have been interacting regarding the use of water.

2. TRANSNATIONAL LA PLATA HYDRO/GEOPOLITICS AND THE `HYDRAULIC MISSION`

La Plata river basin, which encompasses Brazil, Argentina, Paraguay, Uruguay and Bolivia has a total area of 3.1 million km², therefore it is the second biggest river basin in South America. The river flux within your mouth is the third largest in the continent, surpassed by Amazon and Orinoco River streams (del Castillo 2011). In fact, what is commonly known as La Plata is the ensemble of three main river basins that drains South-American inland: the Parana River basin, with 1,5 million km²; Paraguay River basin, with 1,09 million km²; and Uruguay River basin, with 365 thousand km². These three river basins converge to the Plata river estuary, located at the boundary between Uruguay and Argentina, which drains an area of 130 thousand km², altogether these river basins outline the most known La Plata basin (Elhance, 1999; Pochat, 2011; Queiroz, 2012).

Brazil owns the biggest area of the river basin, 46%, and the sources of the main rivers within the basins are in Brazilian territory. Following, Argentina has 28% of the basin area,

Paraguay 13%, and the last 13% are shared between Uruguay and Bolivia (Elhance, 1999). Although Brazil has the control of the biggest area and the main water springs, it does not have the control of the river mouth, which was first with Spain and after Latin-American independence with Argentina rule. The outcome of this spatial arrangement was that throughout the colonial period and state independence process, the disputes concerning the river streams were related with boundary demarcation issues and the control of the ports in the river mouth, in La Plata estuary.

2.1. Navigation and boundary demarcation – the aftermath of colonial period

The fluvial navigation was one of the main diplomatic affairs involving not just the countries within the basin, but also the industrial foreign powers, i.e. Great Britain, France and United States. Controlling the waterways and the port activities were strategic to access and exploit South American inland resources, especially the mining in the Mato Grosso and Goias provinces, in Portuguese America, and the livestock hordes – cattle, horses and mules – which were created extensively in the continental inland. The La Plata Rivers were the main, if not the only, way to drain the products and to communicate with those areas, since the terrestrial pathways entailed huge dangers and long travels. Economical and geopolitical demands to open the waterways to free navigation, more than once, were the driven reasons to Portuguese and Brazilian endeavours to control the river margins, especially on the river mouth. For such end distinct strategies were used, like taking the leadership over the trade of silver, of slaves and of basic goods – through legal ways or smuggling – within the Buenos Aires port. As well as the invasion, building and dominance of Colonia del Sacramento, and the attempt to annex Cisplatina province, both on the north margin of La Plata estuary (Puiggrós, 2006; Bandeira, 2012).

The free navigation of La Plata Rivers was just accomplished after several conflicts during 19th century which involved the city of Buenos Aires, the Argentinian mediterranean provinces (Entre Rios, Corrientes and Misiones provinces), Uruguay, Brazil, Paraguay, and also France and United Kingdom. Buenos Aires port had the monopoly over the custom taxation on La Plata River and your tributaries, what dissent the interest of the other riparian states, of foreign powers and the other provinces within Argentinian confederation. Those players were willing to extract a bigger income from the beef jerky and meat trade. Therefore, the first free navigation treaties were signed by default of Buenos Aires city during Juan Manuel Rosas government (1835-1852). At that time, Brazil signed bilateral treaties with all the other riparian governments to assure it accesses to the La Plata main waterways – Parana and Paraguay rivers. With Uruguay in 1851, with Paraguay in 1856 and, finally, with Argentinian Confederation (without Buenos Aires) in 1856. Afterwards the free navigation principle were reaffirmed within different deals and agreements among the countries, then the principle was `solemnly consecrated in the Triple Alliance treaty, in 1865, which united Brazil, Argentina and Uruguay in an offensive and defensive alliance against Paraguay (Puiggrós, 2006; Zugaib, 2007; Bandeira, 2012).

Although Brazil has not settled your domain over La Plata River mouth, since both Colonia del Sacramento and Cisplatina province do not stand within Brazilian state, the arrange of the international boundaries within the river basin guarantee to Brazil access to the three main waterways (Paraguay, Parana and Uruguay Rivers) and that Brazil has

demarcated boundaries with every country in the basin. Furthermore, the rivers are, most times, the boundaries among the riparian states (Table 1). Hence, as a consequence of this territorial arrangement, Brazil interact with any country within the basin, even in bilateral and multilateral ambit.

Table 1: Brazil's boundary extension with riparian states in La Plata basin. Source: Second Commission on Boundary Demarcation (SCDL, acronym in Portuguese)

Boundary extension (Km)	Total	Rivers and channels	Lakes	Geometrical lines	Watersheds
Bolivia	3.423,2 (100 %)	2.609,3 (76.2 %)	63 (1.8 %)	750,9 (21.9 %)	
Paraguay	1.365,4 (100 %)	928,5 (68 %)			436,9 (32 %)
Argentina	1.261,3 (100 %)	1.236,20 (98 %)			25,1 (2 %)
Uruguay	1.068,10 (100 %)	608,4 (56.9 %)	140,1 (13.1 %)	57,6 (5.4 %)	262 (24.5 %)

2.2. Setting up the La Plata treaty to initiate the hydraulic mission within Brazil-Argentina geopolitical disputes

Following the demarcation process and the settlement of the international boundaries among La Plata countries, the waterways continued to be used as the main routes for national and international trade. Especially for Paraguay, because of its mediterranean position, and Bolivia which, as aftermath of the wars against Chile and Peru, has the only autonomous way out to the sea through the Paraguay River. Otherwise, Brazil and Argentina, the two role players in regional politics, used their control to access the waterways and other transport networks to gain more influence on other South American countries. The regional waterways were employed as a bargain asset with the smaller countries and the dispute zone between the two regional powers.

Brazilian and Argentinian initiatives to improve navigation conditions was a frequent diplomatic issue in the region over the mid-20th century, but it was the driver to develop the first institutional attempts regarding water issues in the continent. During the 1960s international organizations, such as the Organization of American States (OAS), the Inter-American Development Bank (IDB) and the Economic Commission for Latin America and the Caribbean (ECLAC) supported the fostering of a treaty regarding the La Plata basin watercourses. The overcome of this process were the signing of the La Plata Basin Treaty, in 1969, which established the benchmarks to the use of water resources and the development of regional infrastructure projects. Therefore, this treaty is seen as one of the first steps to create a cooperative hydropolitical scenario (Elhance, 1999; del Castillo, 2011; Biswas, 2011; Pochat, 2011).

That does not mean that the treaty ratification was the end of the tensions within La Plata countries. Ferres (2004) argues that the success to state the treaty was the result of an Argentinian diplomatic victory, which could assemble the downstream (*rio abajo*) countries to cooperate about the water resources uses for development purposes, in a move to antagonize Brazilian position. In a first moment, the Brazilian military government saw the possibility to be tied up with your downstream neighbours through a treaty as a possible restraint to enforce your upstream and economic power. Nevertheless, Brazil succeed to

interpose the inclusion of a clause that stated the obligation to inform other riparian countries of any work intention on the La Plata Rivers. Actually, Brazil agreed to sign the treaty more to prevent the loosening their hegemonic influence over the countries in the region to Argentina. The previous information clause about any work in the river was tackled further on the disputes about the Parana`s River dams.

Finally, in 1969, the La Plata river basin treaty was signed. Its biggest accomplishment is building the institutional framework to regulate the hydropolitical interactions between the countries (Pochat, 2011). The influence of the treaty over the hydropolitical initiatives is made through two institutions created to articulate and develop the policies regarding the development of the basin: the Inter-governmental Co-ordination Committee (CIC Plata) and the Financial Fund for the Plata Basin (FONPLATA). The CIC, created even before La Plata treaty formulation and signature, is responsible for the execution of projects regarding water issues. The FONPLATA, created in 1976, is responsible to finance projects of development in La Plata countries. It receives funds of the treaty signatories' countries and also gather funds in other international institutions. Until 2011, FONPLATA approved US\$ 1.04 billion dollars in development projects.

From 2001 onwards, the environmental concerns started to integrate CIC Plata policies through the elaboration of the "Sustainable management of water resources in La Plata basin program, regarding the effects arising from the climate change and variability". This regional scope research, sponsored by the Global Environment Facility (GEF), aims the elaboration of a social and environmental diagnostic over La Plata, working towards the construction of local programs to mitigate environment degradation and your preservation. Thereby, the "Framework Program", how it became to be known, intends to integrate and articulate the projects already in motion within the river basin area, as well as propose new ones. It worth noting that ideas and inspiration to this program came from the Water World Fora, especially the second, that happened in 2000 (Tucci, 2004; CIC, 2011). The Framework Program was a changing point in the trajectory of the river basin initiatives regarding the focus in the environmental preservation and the concerns with the regional effects of climate change.

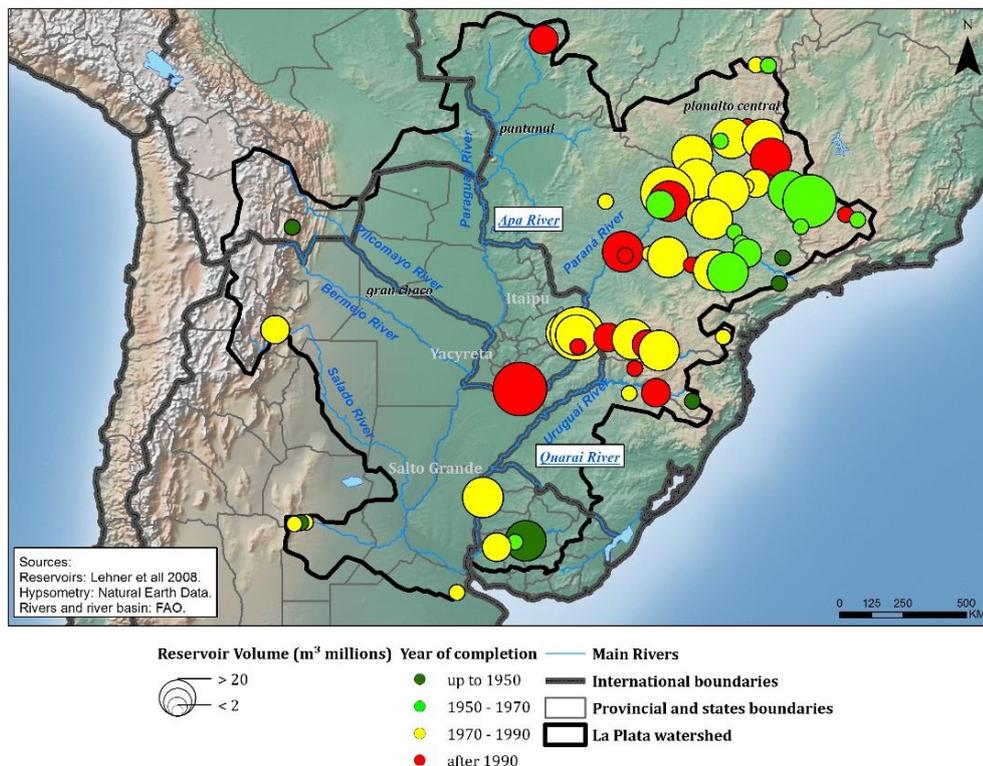
2.3. Transnational disputes over La Plata water resources – the construction of big dams

On the second half of 20th century the construction of big hydropower projects started to characterize the disputes over the uses of La Plata water resources. Since the main urban and industrial centres in South America are within the basin, its energy potential became to be seen as the possible source to foster the national development plans. The water of La Plata was used to achieve two goals: hydroelectricity and navigation. That water governance period can be defined as the state hydraulic paradigm, as defined by Bakker (2003), which characterizes the governance of water in this moment as a mechanism to legitimize state power while pursuing a modernization project and allocate water in sectors that can foster that objective. Peter Gleick (2000) defines this water governance model as the 20th century paradigm, based on projections of population growth and, as a consequence, the need to increase the supply of water and energy. Therefore, the frontier of resources available to be exploited was in the border regions, where the hydropower projects were developed by the

initiative of riparian national governments, with financial resources from international agencies and banks, such as World Bank and IDB. If, on one side, these projects were the trigger of conflicts among the countries, on other side, the resolution process had strength the dialogs spaces and the cooperation on hydropolitical issues.

The tensest case of disputes among the countries was about the hydropower plants of Itaipu and Yacyretá, which settled in skirmishes Brazil, Argentina and Paraguay. La Plata basin hydroelectrical potential is one of the biggest in the world, because of your topographical gradient, that has an abrupt rift between the Central Brazilian plateaus with the Chaco depression (map 1). The basin's rivers provide 55.5% of the energy demanded by the countries within La Plata, producing a volume of 309.503 GWh, in 2010. Paraguay, for instance, is completely dependent on the energy generated in the Paraná River (Popescu *et. al.* 2012). Currently, around 60% of the basin potential is already explored through more than 100 hydropower plants working, or in construction (CIC *apud* Pochat 211: 499). Within Brazil, the bulk of hydropower construction happened along the mid-20th century, beginning on the main tributaries of Parana River, like Tiete River, near the biggest southeaster cities; furthermore, they expanded to the proper Paraná River, following the urban and agricultural frontier (Elhance 1999). Parana River becomes the most important contributor to energy supply in Brazil, with approximately 49% of Brazil's energy (Pochat 2011).

Map 1 La Plata River Basin: Main reservoirs, by volume and year of completion



According to map 1, reservoirs and dams distribution within La Plata river basin, considering the year of installation, follow the increasing of the urban settlement in the countryside and the economic/industrial growth in the countries. Over the 68 dams identified by *Global Reservoir and Dam Database Project (GRaND)*, 20 started to produce energy on 1970 decade, most of them in Brazil. Noteworthy that three of the biggest dams were bilateral

projects: Salto Grande (Uruguay and Argentina), Itaipu (Brazil and Paraguay) and Yacireta (Argentina and Paraguay).

Disputes about the construction of Itaipu dam between Brazil and Paraguay once more related the use of the water courses with boundary demarcation issues. Likewise the 19th century, when boundary demarcation guarantee the rights of certain countries to navigate through waterways. In 20th century the boundaries between sovereign territories gave the right to exploit the hydropower potential of the rivers. About the Itaipu negotiations, Paraguay's pleas to revise the boundaries with Brazil ensured their right, in condominium with Brazil, to use Parana River waters to produce electrical power.

On the beginning of 1960s, during Joao Goulart government (1961 – 1964), were made the first inventories of hydropower potential along the Parana River, on the region of Sete Quedas (Seven Falls), on the border between Brazilian state of Parana and Paraguay. So far, the proposal was to develop a joint energy resources exploitation project on the river. However, following the coup d'état that removed Joao Goulart government, in 1964, the negotiations were refrained and Paraguay government started to request a review of their boundaries with Brazil. The Paraguayan allegations was that in Sete Queda's region the boundary treaty was not clear about the limit position, whereby Paraguay could gain some territory over Brazil. In 1965, both Brazilian and Paraguayan army seized on the bench of Parana River, upstream the first of the seven falls, near the towns of Mundo Novo, in Brazilian Mato Grosso do Sul state, and Guaira, in Brazilian Parana state. The contest was settled in the next year, with the signing of the Itaipu record, where it was also agreed that future condominium energy projects on Parana River course, between the mouth of Iguacu River (a southern tributary of Parana River) up to the Sete Quedas, ought to share the yield between the two riparian countries. The record was enforced in 1973, with the Itaipu treaty, at the same time was created the binational company in charge to build and manage the hydropower plant. Finally, the boundary question within the reservoir area was solved by the flooding of the contentious area and the creation of an ecological reserve on the left bench of the river, upon the international boundary (Oliveira, 2012).

In the same year of the Itaipu treaty, Paraguay signed with Argentina a similar treaty, nonetheless to build another dam, the Yacireta dam, as well in Parana River, but downstream Itaipu. The proximity between the agreements of those two diplomatic treaties was not a coincidence, but was a result of the disputes between Brazil and Argentina to exert political and economic influence over Paraguay, which, otherwise did not have resources to develop the hydropower projects. Nowadays, Itaipu and Yacireta still the biggest hydropower plants within La Plata basin and turned Paraguay the larger energy exporter in the world. Both treaties are very similar: instituted binational companies to manage the undertakings and sell the energy production. Most part of the enterprises expenses were taken by Brazil and Argentina, and the treaties stated that Paraguay had to sell the energy surpluses below the market prices, therefore tying Paraguay which a big foreign debt (Elhance 1999; Pochat 2011).

Itaipu and Yacireta binational treaties negotiations were happening almost at the same period that the terms of the multilateral La Plata basin treaty were being defined. On one side, Paraguayan bilateral treaties put Brazil and Argentina in opposite sides, since Itaipu position along Parana River gave Brazil privileges to dam your waters. On another side, La Plata basin treaty was the first attempt to create a diplomatic mechanisms to negotiate the technical parameters to exploit the river resources. However, as argued by Candéas (2010),

La Plata treaty does not achieve the goal to attenuate the tensions among signatory countries, because it firstly was focused to improve, politically and technically, the navigational conditions, but do not cope specifically with hydropower issues. About the energy subject still predominating a strong Argentinian mistrust over Brazilian intentions to dam Parana River and jeopardize their downstream projects.

It was just after the 1976 Argentinian coup d'état that the governments of the biggest countries in the region searched for an agreement regarding the hydropower technical questions and more broad concerns about the regional integration within the southern region of South America. At that moment Itaipu dam was being built, and Argentina joined Paraguay to launch another hydropower plant in Parana River, the Corpus dam. Because of the proximity between these two dams their performance would be intertwined (Map 2). If Corpus` reservoir was too big it could decrease Itaipu`s slope, therefore decreasing your potential; otherwise, if Itaipu dam was bigger, Corpus would not have enough water to run your turbines. At the beginning of the construction, whereas Brazil was not keen to limit their capacity to produce energy at Itaipu, Argentina tried to establish an agreement with Brazil through diplomatic ways, but also through media campaigns about the negative impacts of Itaipu over the Argentinian economy and alleging that Brazilian works in Itaipu was an attempt to exert a regional hegemony. It was just in 1979 that Brazil, Argentina and Paraguay signed the tripartite Itaipu-Corpus treaty, defining the level that each country could keep in your reservoir without affecting downstream neighbours. Some authors argue that the Brazilian military government just accepted to commit the hydrological limits in Itaipu, therefore ensuring Corpus` feasibility, when they changed their foreign policy perspectives. In the end of the 1980s Brazil started to strengthen its regional ties, seeking for a stronger regional integration and to become more independent of the United States influence, this policy culminated with the formation of the Southern Common Market (MERCOSUR), in 1991. Since the Corpus dam project was not held by Argentina and Paraguay, because of further economic and political reasons, the tripartite treaty is the institutional dispositive that asserts the amount of water that can be dammed by each country and that guarantee the use of water for different uses in Parana River, like navigation (Ferres, 2004; Candeas, 2010; Queiroz, 2012).



Map 2: "The disagreement map". Showing the sits of the hydropower plants along the Parana River and the contentious region. Source: Veja, 1977

2.4. Recent projects and conflicts within La Plata

Recently, the Itaipu treaty, between Brazil and Paraguay, was submitted to a large debate and revision. The reason was the Paraguayan demands to review the clauses that established the price paid by Brazil for the Paraguay energy surpluses and one that gives leverage to Brazil over other potential energy buyers. In 2008, the heretofore presidential candidate Fernando Lugo, was trying to settle a new value that must be paid by Brazil and used it as a campaign platform to your election. He justified the revision through the argument that for each US\$ 45.31 that Brazil paid for megawatt, every US\$ 42.5 were not directed to Paraguayan government, because it was retained by Brazilian government to amortize Paraguayan debt undertook with Brazil to build the dam. This retaining mechanism was predicted in the treaty and would be submitted to a revision just in 2023. However, in 2009, the presidents of both countries – Fernando Lugo (Paraguay) and Luis Inacio Lula da Silva (Brazil) – established the new values to be paid for Paraguayan energy for megawatt. It was increased threefold. Furthermore, other important changes were the revoking of Brazilian state electricity company – Eletrobras - exclusivity to purchase Paraguayan energy, which allow Paraguay to look for private companies to sell their energy within Brazilian market; and 2023 onwards Paraguay can search for different markets to export their energy. Brazil had committed also to fund the construction of a broader transmission line, of 500 kV, between Itaipu and Asuncion, which was launched in 2013; it has 348 kilometres of extension and permitted to increase Itaipu`s energy used by Paraguay (Blanco, 2010; Planalto, 2013).

Another recent issue of interest in the transnational level within La Plata was the improvement of fluvial navigation. Since the beginning of the regional approximations in 1980s materialized by MERCOSUL block creation, the countries are seeking ways to increase joint investments on regional transport infrastructure. The Paraguay-Parana waterway navigation project was assumed as one of the biggest goals to improve the physical integration, and it would undertake different tasks, enabling a logistical alternative to drain the commodities exports from the Brazilian centre west and maintain a feasible autonomous way to the sea for Bolivia and Paraguay (Zugaib, 2006).

Paraguay-Parana waterway project (PPWP) has the goal to turn an extension of 3,400 kilometres feasible to perennial navigation, since the La Plata estuary up to the Caceres port, in Brazilian state of Mato Grosso. Although those rivers are already largely used to transport industrial goods and agriculture commodities they have a huge volume variation along a year, especially Paraguay River, what demands the reduction of the length and weight of the vessels. To tackle this obstacle PPWP predicts dredging, rocks overthrown, rectification of riverbed channel (on Paraguay River), and improvements on ports structure. To organize this project in 1989 were created the Waterway Intergovernmental Committee (WIC), with stakeholders from the five La Plata countries and with financial support from IDB and United Nations Development Program (UNDP). Up to know just a few projects were executed, one of the main constraints concerns the environmental features in the region, mainly the changes in the hydrological regime in the vulnerable Pantanal region (Elhance, 1999; Zugaib, 2006).

This waterway segment extends from Paraguay River`s heads, in Caceres, to the city of Corumba, in Brazilian – Bolivian border. It is the biggest tropical wetland in the world and has a huge hydrological variation along the year, among the wet and dry season. Moreover, Pantanal works as a valve which regulates the volume of the run-off along the Paraguay River

up to their joining with Parana River, therefore affecting the amount of water which reaches important cities, like Asuncion, the Paraguayan capital. Therefore, canalizing works needed to improve navigation in this segment would increase risks for the Pantanal biodiversity, of unpredictable changes on the river outputs, and of increasing erosion ratio in Brazilian Central Plateau (Elhance 1999; Pochat 2011).

Actually, the ongoing projects dealing with navigation are the overcome of national initiatives, as the harbour improvements in Brazil, Paraguay and Argentina, as well as the signalling corrections along the rivers, made by the Brazilian state agency Paraguay waterway administration (AHIPAR, Portuguese acronym). From the IDB previously intended investments up to now just happened the purchase of vessels to transport iron ore from Corumba (Brazil) to Puerto Palmira (Uruguay), as a US\$ 100 million loan to Brazilian Vale S.A Company, what seems as a big dismay given the previous intentions of the project.

In 2005 another conflict started to develop over the uses of water between Argentina and Uruguay. This conflict was deflagrate after the installation of two wood pulp industries in the Uruguayan benches of Uruguay River, near to Fray Bentos city, one owned by the Finnish company Botnia, and another for the Spanish company ENCE. The escalation of the conflict started when doubts arise over the environmental impact evaluation made by those companies. The main contestant were NGOs, the Argentinian departmental government of Gualeguaychú and the Argentinian federal government. Locally, the most common demonstration tactic was the closure of the international bridge General San Martin, therefore blocking the boundary between Argentina and Uruguay (Beloqui, 2013).

The impasse on bilateral agreements took the negotiations to two international spheres: Uruguay made a complaint in MERCOSUL court, in reason of the constant closures of the international bridge and the lack of efforts of the Argentinian governments to avoid it, therefore failing to honour the Asuncion treaty, which ruled about the economic bloc formation and guarantee the free movement of goods. Otherwise, Argentina made a complaint to the International Court of Justice, in Haia, arguing that Uruguayan industrial plants renegades the Uruguay River statute, which predicts the information interchange between the countries and the shared effort to maintain the good environmental conditions of the river. In 2006, Spain was appointed to mediate the conflict, anyway the third party mediation was not very effective to settle down the contention.

Finally, in 2010, after the conclusion of Botnia's industrial plant, the dissension was settled when researches conducted by Uruguayan and Argentinian institution demonstrate that the production of pulp does not affect Uruguay River water quality in a relevant way. The International Court of Justice condemned Uruguay for not informing the Argentinian government about their development projects, even though Argentina have not been impaired by those industrial plants. Another commitments made at that moment were the attempt to avoid any more closure of the international bridge, and the demand to Uruguay comply with the Uruguay River statute to inform Argentina of any further industrial project. Anyhow, in 2013, the tensions rescaled because the Uruguay, now during Pepe Mujica administration, made statements that it pretends to increase the pulp production within Botnia, and again this intention was not informed to Argentina government (Beloqui, 2013). Up to now the distress has been contained, since the increasing of the production had not been held.

In this section was presented how La Plata water resources exploitation to produce hydroelectrically and transport goods were main themes issued in regional hydropolitical up to 20th century. The projects, agreements and treaties resulted from those hydropolitical interactions were the outcome of national political arrangements, with the support of supranational organizations. The next section intends to trace the changes within the La Plata basin assessing some of the initiatives taken within CIC Plata and two cases where environmental concerns involving transboundary communities brought about interactions regarding the use of water resources. Furthermore, those initiatives were undertaken by the national governments, through diplomacy agencies, meaning an intertwining of different political levels addressing the hydropolitical interactions.

3. TRANSBOUNDARY HYDRO POLITICS AND THE ADDRESSING OF ENVIRONMENTAL ISSUES

Within the multilateral scope of CIC Plata several bilateral initiatives were created to execute distinct projects in La Plata sub-basins. These projects use several channels to finance their studies and initiatives of cooperation. However, some of them were formulated within the overall outline of CIC Plata, the normative rules of the La Plata treaty, and were addressed after the Framework Program been stated. Another group of cooperation initiatives in transboundary basins were raised grappling with local demands, within the border zone, which were addressed afterwards by the national governments, through bilateral agreements and treaties.

Therefore, it is argued that within the changing paradigms over water governance the transboundary river basins were adopted as the suitable scale to address transboundary water issues at the border zone level. This change was driven by climate changing insecurities and the search to increase public participation. The political interactions held during the 20th century built the institutions that first dealt with the national antagonisms among La Plata countries concerning water issues, and were the drivers of national investments in infrastructure in the countryside. Although the concerns had changed, those institutions still playing a role at transboundary hydropolitics, whilst they are the institutional landmark, exert a role to foster cooperation initiatives and gather funds to implement them.

Table 2: Transboundary basin projects supported by CIC Plata. Source: CIC Plata, 2014.

Project	Countries	Financial organism
Strategic plan to act at binational basin of Bermejo River (PEA)	Argentina and Bolivia	GEF, PNUMA and OAS
Strategic plan to act toward the joint manage Pantanal and High Paraguay basin (PAE)	Brazil	GEF, ANA (Brazil), PNUMA and OAS
Integrated management project and master plan at Pilcomayo River	Argentina, Bolivia and Paraguay	European Union

Table 3: Binational or tripartite agreements among La Plara countries. Sources: Pochat 2011; Water resources management technical chamber, in Brazilian Ministry of Environment – CTGRHT, 2014.

Agreement	Countries	Year of signature
Cooperation treaty to natural resources use and development at Mirim Lagon basin	Brasil and Uruguay	1977
Cooperation agreement to natural resources use and development at Quarai River basin	Brasil and Uruguay	1991
Binational agreement over the Lower Pilcomayo River	Argentina and Paraguay	1993
Tripartite agreement constituting the Pilcomayo River comission	Argentina, Bolívia and Paraguay	1995
Multiple resources development agreement at the High Bermejo and Big Tarija Rivers.	Argentina and Bolívia	1995
Cooperation agreement over the sustainable development and integrated management at the Apa River basin	Brazil and Paraguay	2006

The comparative cases here assessed are in the Apa and Quarai river basins. The first case is a river basin situated at the Brazilian-Paraguayan border zone, and it is a sub-catchment of the Paraguay River. The second case is at the Brazilian-Uruguayan border, and it is a sub-catchment of Uruguay River. The countries encompassed in this comparative study adopted the river basin as the main frame to address their water policy. Brazil was the precursor in the region, when in 1997 it adopted this unit as the base to gather the actors involved in water management. Along the first decade of 21th century the other South American countries adopted similar legislations, Paraguay in 2007 and Uruguay in 2009.

Concerning shared waters in transboundary basins, Uruguayan water law was the first to straight away state a competent body to assess that issue. In reason of your small area, Uruguay has most part of its water resources shared with other countries, and the Water Resources Regional Councils, created in 2009, have to contain at least one component from the Foreign Affairs Ministry. The three regional councils created – Mirim Lake, Uruguay River and La Plata River Maritime Front – have to create water basin and aquifers commissions, which have to congregate the water users and settle down the disputes that arise.

Within Brazilian executive structure, the attempt to create a structure to deal with transboundary water issues was held just in 2000, when the Transboundary Water Resources Management Technical Chamber (CTGRHT, Portuguese acronym) was created. This organism has the role to propose technical, institutional and legal cooperation initiatives with Brazilian neighbours. Up to now, this chamber actively worked in two transboundary cases: supporting the studies that led to the Apa river basin treaty approval and proposing a similar arrangement in the Acre basin (SAE, 2014).

In the Paraguayan legislation, where the river basin is stated as the main frame to manage and govern the water, is not addressed any normative instrument to deal with transboundary resources, even though the main superficial water bodies and groundwater are shared with other countries.

Therefore, the institutional framework created to grasp transboundary issues among Brazil, Uruguay and Paraguay are unequal, what entails different paths of how the water

cooperation is assessed at national and subnational levels. Meanwhile, the basin trajectory of interactions, conflicts and cooperation of actors situated at the border zone entails how governance over water is fostered at Apa and Quaraí river basins. In that perspective, scales as levels interact between how local actors at the border zone are engaged in transboundary water governance, informing national levels, which formalize those initiatives through treaties and agreements. Furthermore, transnational level institutions, NGOs and global stakeholders in water issues produces the general discourses about how water must be issued. Nevertheless, any sub-catchment are seem as a distinguish frame, where the social actors interact in a contingent manner, depending on the river basin characteristics.

3.1. Quaraí river basin

The border zone between Brazil and Uruguay has some of the most intense interactions among the dyads in South American southern borders. Historical political interactions can be seen since the former Cisplatina province was a part of the Brazilian empire territory. The binds between the gaucho population that occupy the flatlands extending over Brazil, Uruguay and Argentina – locally called Pampas – have formed a cultural landscape unit that oscillate between cooperation to conflicts driven by national policies at La Plata region, as seen during the disputes between Brazil and Argentina to take hegemonic control over the region.

As can be seen in the map 3, several cities in direct contact with the boundary have one correspondent city in the other side of the boundary. Those pairs, called twin cities, arose in this arrangement for several different reasons: as gateway cities between two countries, serving as a hub point to transport and trade services or as a defensive checkpoints, originated as former forts.

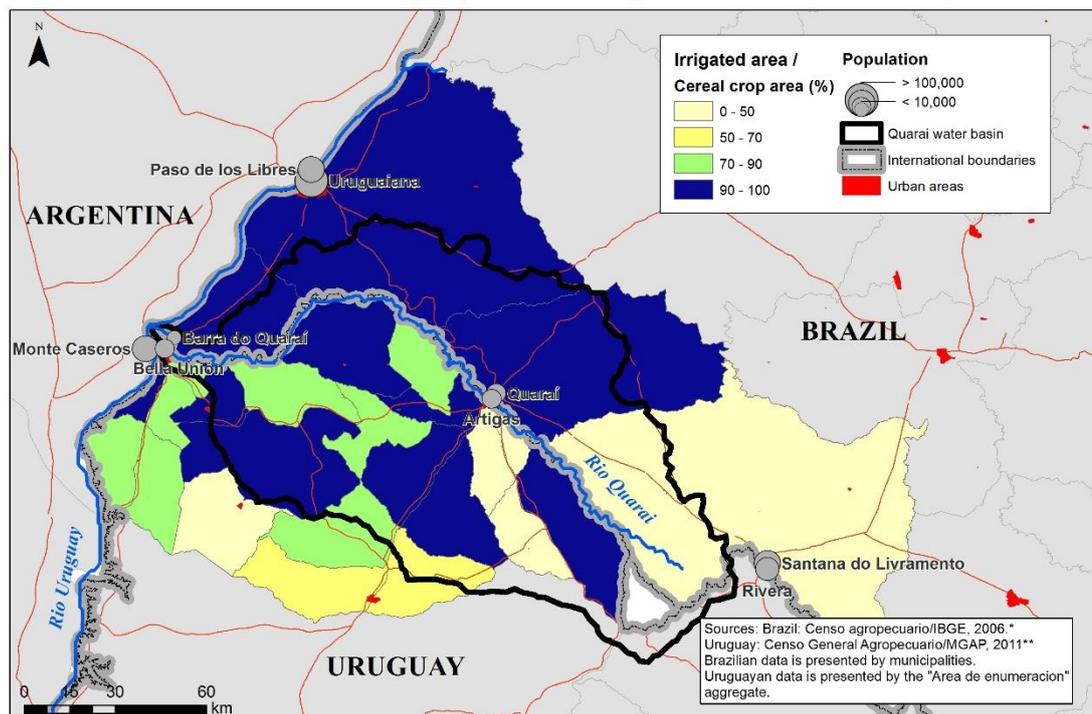
The traditional economic activity in this region is the extensive creation of livestock on the Pampas grass, generally in large estates that often extent on both sides of the boundary. Nevertheless, at the second half of the 20th century the rice production at the floodplains of Mirim Lake had grown exponentially, taken advantages of the flat relief and the periodical floods. Nowadays, the southern Brazilian state of Rio Grande do Sul produces roughly 50% of rice within the country, and Uruguay is one of the top 10 rice exporters worldwide (Ferreira, 2012). This activity that started at the benches of Mirim Lake had spread westwards across the Quaraí valley. It worth noting that the water availability presents a huge oscillation year to year, some years having big drought seasons whist others have big floods during wet season, generating competition over the water allocation in the driest moments (Tucci, 2004; Calhman, 2008).

Tucci (2004) compared the demand for water within the Quaraí sub-catchment with the demand on other catchments areas along the Uruguay River basin. Even though Quaraí has a small area, less than 7 thousand km², your demand for water is one of the biggest in the region. The annual water demand was calculated as 20.9 m³/s, whereas water availability was 9 m³/s, therefore the water demand overstep more than two times the water availability. The rice irrigated production corresponds to roughly 95% of water demand, taken mainly by Brazilian farmers.

Although the biggest area of the basin is in Uruguayan territory, the biggest users are in the Brazilian territory. Hence, a conflict over the partition of this resource is at stake. Another issue is the water provision to the twin cities located at the boundary between the

two countries. It is estimated that 70% of the population inhabiting within the basin live in the Uruguayan side, in the Artigas province. And another origin of conflict is that effluents not treated in the Brazilian side affect the water provision for Uruguayan cities. It is also common the liberation of effluent from the Uruguayan side, but it not affect directly the Brazilian city of Quaraí or another cities downstream (Calhman, 2008).

Analysing the distribution of the irrigated farm crops in the river basin (Map 3), it shows that roughly the totality of the cereal crops are made under irrigated systems within Quarai basin. Other cereals that are cropped in this area, but almost exclusively in the dry season, are soybeans, sorghum and corn. Comparing the yield between the two countries, the Brazilian side production is bigger than Uruguayan. The sum of the area dedicated to rice crops in this four Brazilian municipalities (Santana do Livramento, Quaraí, Uruguaiana and Barra do Quarai) are roughly 90 thousand hectares (Censo Agropecuario/IBGE, 2006); whereas the Uruguayan department of Artigas, which is almost completely within the water basin has an area of rice production of 45 thousand hectares (Censo General Agropecuario/MGAP, 2011). Nevertheless, the yields in Uruguay are slightly more productive than in Brazil: the yields within the `Norte-Litoral Oeste region`, that encompass not just Artigas, but also Salto, Paysandu, Rio Negro and Soriano provinces, are of 8,5 kg per hectare (Encuesta de arroz/MGAP, 2014); whilst in Brazilian municipalities the average yield are 7 thousand kg per hectare (IRGA, 2011).



Map 3: Quarai river basin: proportion of irrigated area under total cereal crops area.

In Uruguay the use of water are regulated by the national government through the Ministry of Households, Territorial Planning and Environment (MVOTMA, Spanish acronym) and your National Water Directory (DINAGUA, Spanish acronym) which provides the water

grants to industrial or agricultural uses. The procedure to obtain a grant requires, by the applicant, an evaluation of the infrastructure needed to obtain the water, like reservoirs, wheels or pumps. Furthermore, the charges and fees are collected by the national agency, which can renovate or review the terms of the grant. Another important actors connected with the rice crops, therefore with the irrigation, are the Ministry of Cattle-raising, Agriculture and Fishing (MGAP, Spanish acronym), which invest in this activity and works closer with the Rice Cropper Association (ACA, Spanish acronym). They work together to construct the reservoirs needed to provide water during the seeding period, between November and February, exactly the most driest months of the year.

The concessions could not be sold, but the water available can be purchased to irrigate the crops. For instance, in the 2013/2014 harvesting 46.2% of the producers had to buy water from third parts, owner of the water grants, beside 46% of this producers had to pay for the pumping of the water. Furthermore, most farmers make their crops under lease contracts adding one more cost to the producer. It is estimated that in the Norte – Litoral Oeste region the water cost to the farmer are of 20 bags of rice by hectare, when added the land leasing the cost raises to 30 bags (Encuesta de arroz/MGAP 2014).

In the Brazilian side of the border the water is regulated by the Water National Agency (ANA, Portuguese acronym), the federal agency which regulates the water distribution and the concession of water grants within rivers with federal regulation (rivers that cross more than one state or are shared with other countries). However, is within the Rio Grande do Sul state level that most of the researches are undertaken, the Water Plans are made and water rights for state regulated rivers are granted, by the Hydric Resources Department (DNH, Portuguese Acronym). Therefore, the water rights in the Quarai River are granted by the federal government, but in your tributaries, where most of the reservoir are made, the grants are given by the state agency.

The municipalities of Quarai, Barra do Quarai and Uruguaiiana are the biggest water users for irrigation. Within that municipalities the rice crops correspond to almost the totality of temporary crops, and in this area the most common land tenure pattern is the large agricultural estates. For instance, in the Uruguaiiana municipality 35% of the farm estates detain 80% of the agricultural area. Therefore, the most bulk of water used in this area are concentrated in just a few properties. The disputes over the use of water can be summarized between irrigation farmers in both countries and between different kinds of uses, agricultural and urban.

Until recently the initiatives to cope with the disputes are more present in norms than in practice. As Calhman (2008) describes, the 1991 treaty between Brazil and Uruguay, and the commission created to execute it, had not been effective to accomplish the definitions of the treaty, like to guarantee the provision of 0.4 litres/second/kilometre along the river for each country. However, the treaty and further regulations indeed agreed on clauses that restrict the use of water for irrigation during extended drought seasons.

The hydropolitical initiatives within the Quarai basin ushered the interest of the European Union which, through the TWINLATIN program. Guided by the principles of the European Water Framework Directive, this program conducted researches seeking to build capacity to carry out IWRM principles in Latin American transboundary basins. Some of the principles adopted in this research was the improvement of the information sharing between

local stakeholders and the production of reliable database to be used in the water management. It is worth note how concerns about the effects of climate change was a present driver on the research, therefore having straight connections with the `Programa Marco` for the whole La Plata basin. Moreover, the TWINLATIN was used to support the recommendations of CIC Plata (Ekstrand *et al* 2009; Paiva *et al* 2011).

Some findings of the TWINLATIN research appoint to the lack of effective tools to implement the decisions taken. Even though the actors in both countries have been keen to agree on common grounds about water distribution and allocation, and the national legislations are alike regarding water management, the dispositive to monitor the changes of the Quarai river level and the overdraws from each country are insufficient.

Finally, the constraints to water intakes for irrigated rice crops and the effects of this activity to the urban water supply within the Quarai river basin brought forward initiatives of cooperation among actors situated at the both sides of the border. Previous multilateral institutions, such as CIC Plata, were not involved in the construction of a water governance perspective in the border region, at least prior to the national level engagement through the negotiation of a binational treaty. Meanwhile, different groups engaged at the construction of the water governance at the region, like European Union researches in the TWINLATIN project, which contributed to the construction of a water governance driven by the need to assesses the effects of climate change in the region and guarantee the quality of water supply to the urban areas.

Regarding the transboundary themes to be addressed, still a long path to be followed by the Brazilian and Uruguayan actors. The transboundary institutions created after the treaty negotiations, like the joint commission, created in 1998, keep lacking tools to execute the decisions held together, like changing the amount of water granted to overdrawn from the river, or prevent the damming of the main Quarai`s river tributaries, what can result in the reduction of the river flows. Nevertheless, projects like TWINLATIN, and others conducted by national and departmental agencies gathered the data needed to implement the joint management. Another overcome of the construction of the transboundary basin governance was the convergence of the national legislations concerning transboundary water management.

3.2. Apa river basin

Finally, the case of the Apa River Basin situated at the Brazil-Paraguay border zone last are here assessed. This comparatively small river basin, with just 1,600 thousand hectares, has a big ecological importance because is located at the transitions between three distinguished South American natural regions: the Pantanal wetland, the Cerrado savannah and the Serra da Bodoquena limestone formations. In the last years the increasing areas being used for agriculture and cattle raising, mainly due to the introduction of sugar cane plantations, intensified the erosion process in the watersheds and the siltation of the river channels. Paraguayan municipal and departmental governments were the first one to complain about the Brazilian constant water uptakes (Broch, 2008). It is worth note that in the Paraguayan side several active NGOs work with environmental conservation, mainly to protect the savannah national parks, like the Paso Bravo Park, with 94 thousand hectares.

Acknowledgement of those issues were the drivers to foster the first attempts to establish cooperation initiatives, initially by Brazilian political actors in the Mato Grosso do Sul state. In 1998 was launched the Intermunicipal Consortium to Integrated Development of Apa and Miranda River Basins (CIDEMA, Portuguese acronym). The Miranda River Basin is situated northward of Apa, its entirely within the Pantanal biome and shares some of the issues observed at Apa river basin. After the first meetings NGOs from both countries started to participate in the CIDEMA group, as well as representatives from Paraguayan municipal and departmental government, therefore gathering a transboundary group of actors concerned with transboundary environmental conservation (Broch, 2008).

The last group to get involved with the CIDEMA initiatives was the Brazilian national government, through the CTGRHT and the Ministry of Environment (MMA, Portuguese acronym). In the Apa river basin the technical chamber started a work group to assemble the actors already interested with the transboundary water management and trying to reunite other interested groups, like the Brazilian state government and Paraguayan partners. The most noticeable outcome of the work group was the development of the Cooperation Agreement over the Sustainable Development and Integrated Management at the Apa River Basin, signed in 2006, that gave more juridical consistency to the cooperation initiatives. According to Broch (2008: 202), this agreement is peculiar because it was the first treaty signed after the promulgation of Brazilian 1997 Water Law, and your elaboration was preceded by the reunion and discussion from different social actors in the border zone. Moreover, your content is more focused in the integrated water management and conservation, instead of a diversion and water allocation. However, it has not yet been created the organism responsible for the joint water management, as fixed in the agreement.

Nevertheless, after the agreement approval, the Apa river basin received attention of NGOs from both countries and international ones. Most recently, the most common way to act on water and environmental conservation is supporting the creation of environmental preservations areas and funding your management plans. Since the discussions held at the work group this strategy was identified as one of the most suitable to address the conservation of water resources. The most comprehensive project, started in 2010, was undertaken by a partnership among the Brazilian municipality of Ponta Porã, the Paraguayan department of Amambay, and the Spanish NGO Paz y Desarrollo, with funds from the European Union. They signed an agreement with a budget of € 2 million to develop the Integrated Management Project of Apa River Basin (GIAPA). Effectively, the project is not focused only on environmental issues, but also in the regional development and integration, with investments on the promotion of transboundary popular retail trade, the creation of a recycling plant to manage wastes from the border cities and expanding the sewage plants.

Regarding the environment and water preservation, GIAPA proposed five areas of preservation within the basin (Table 4), trying to protect sensitive areas concerning ecological diversity and contribution with the siltation of Apa River. The project proposals were made with the management plan and the zoning for each area that need to be approved by the municipalities. Besides the environmental preservation the protected areas are supposed to contribute with touristic activities within the region. Above all because of the Serra da Bodoquena National Park, one of the most visited in Brazilian centre-west and with unique geomorphological and landscape formations. In the Paraguayan side, beyond the Paso Bravo National Park, other two restricted areas exist attempting to preserve the Cerrado, one of the most threatened biomes in South America.

Unit name	Municipality	Area (in hectares)	Year of creation
Protected area of the Apa River Sources	Bela Vista	151 thousand	2005
Municipal Natural Park of Apa waterfalls	Porto Murtinho	58	2000- creation 2004 – demarcation
Protected area of Apa sub-basin	Caracol	195 thousand	2009
Protected area of Apa springs	Ponta Porã	19 thousand	2005
Municipal protected area of Perdido River	Porto Murtinho	36 thousand	2004

Table 4: Conservation units with management plans executed by GIAPA project. Source: GIAPA, 2013.

Conclusion

This paper presented the transboundary river basin trajectory within the La Plata, in South America. The hypothesis explored is that during the 20th century, when the main goals of national governments in La Plata river basin were to develop industrialization and strengthen national power position in South American context, the regional hydrogeopolitics were regarded as a transnational issue, making the interaction between national governments in sometimes contentious ways. Hence, those interactions created institutional arrangements, like CIC Plata and La Plata treaty, which continue to act as spheres of water governance and dialog in the transnational political level. However, with the emerging challenges to water governance stemming from climate change uncertainties and raising concerns about water crisis it is observed that the hydrogeopolitics in La Plata have been rescaled.

Given the theoretical discussion about scales and levels in the first paper's section, it is worth noting that this change is both a change of level, in an ecological approach of scale concept: adopting a sub-basin level to assess water uses within a nested hydrological hierarchy as well as a change of scale, in a human geography approach: the level used to address water issues ensues different relations among social actors, the political interactions arose from specific issues and the political interactions depend on the actors entangled in the river basin.

Empirically, given the two cases analysed above, Quarai river basin had a history of intense connections, not just regarding water issues, but other social spheres like land tenure and trade. Water related concerns had been in the forefront since the rice crops activities started to demand a large amount of water and impinge different kinds of uses. In Apa river basin, environment issues, like siltation process and erosion, were the starters to cooperative initiatives. Meanwhile, other issues are addressed together with water issues, such as regional development and trade cooperation within the border cities. However, in both cases the perception of climate change as a complicating factor and the involvement of foreign agencies that share the view of the water management as an integrated subject are present, related with economic development, environment sustainability and democratic participation.

Despite the change of scales observed, other questions that could not be answered in this paper need to be tackled in the following steps of the research in course. Does the change

of scales can promote a more participative and democratic decision making over the water uses? To answer this question it is needed a deeper research within each case study, what can be just achieved with further field works. Another question is what is the causal relation, if there is any, between the transnational and transboundary levels? The `Programa Marco` of CIC Plata is a directive of sensitive areas and gives suggestions of how to cope with transboundary water governance, however it still needs to be assessed how the transboundary initiatives had taken those suggestions in real action. Even though the La Plata treaty is open to adaptive uses depending on local issues, one of the treaty`s main goal was to implement a common vision of the water resources within La Plata river basin.

Finally, this paper tried to present a perspective of the changing process in transboundary river basin hydro politics in La Plata. In order to do this, the different conceptualizations of scale were discussed, seeking to analyse through a multi scalar lens this process. Therefore, this theoretical and empirical evaluation of the current process in South America can be a helpful tool to find better practices in water governance and analyse the challenges of the regional hydro politics.

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