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Cooperating over Water:
From a Quantitative Analysis to a Qualitative Study of the Okavango River Basin

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PhD Thesis - Executive Summary

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"Cooperating over Water: From a Quantitative Analysis to a Qualitative Study of the Okavango River Basin"

The following research aims at understanding why states cooperate more than they fight over internationally shared natural resources. The debate on those issues has long been polarized between conflict- or cooperation-oriented contributions, respectively based on neo-Malthusian and Cornucopian scientific arguments. The puzzle of this research lies in the paradox between: the dominant pessimistic discourse, relayed by the media and public policy makers, which basically argues that those resources will lead to conflicts and even wars in the future; and the empirical reality, which supports a more optimistic outcome, with occurrences of cooperation largely overwhelming conflictive ones. Inspired by recent – and more nuanced – critical inputs on the matter, the research focuses on the case of transboundary water resources shared by three or more "riparian states" in order to answer the following research question: why do states rather cooperate over transboundary water resources?

In order to identify scientific arguments to explain this empirical reality, the research embraces a mixed-method research design involving quantative investigations of multiple case studies, as well as the in-depth analysis of one specific case. The first contribution consists of testing on 80 multilateral transboundary water resources the arguments proposed in the *international relations*, *international political economy*, *political ecology* and *hydropolitics* literatures. The research notably proposes an innovative conceptualization of power relations as multidimensional, including classical and critical views, along with other variables inspired by liberal peace arguments. Then the research proposes an in-depth qualitative analysis of a "deviant" case: the Okavango river basin (ORB). The ORB involves four riparian states (Angola, Namibia, Botswana and Zimbabwe). An in-depth review of the literature specific to the ORB and the completion of 28 interviews with protagonists of interstate cooperation permitted to: confirm some of the initial results; provide new results that are exclusively related to this specific case; and offers new arguments to the debate on this research puzzle that we test in the third major contribution of the research, which consists of an improved version of the initial quantitative model including both the arguments found in the literature and the ones discovered in the analysis of the ORB.

This choice of method has proven suitable to the development of both a strong quantitative analytical model, and of results of interests on this specific debate. Interestingly, the results of the research suggest that riparian states tend to cooperate (or not), and to do so more (or less), depending on a combination of the following arguments: the level of interstate power asymmetry, water availability, and typical liberal peace arguments, such as economic interdependence. Those results have important implications for the debate under study. Firstly, they reinstate power (as defined and operationalized here) as a key explanatory concept to why states rather cooperate on those resources. They also confirm the importance of liberal contributions to assess the existence of cooperation and the mechanisms behind it. Last but not least, they contradict most pessimistic arguments (such as water scarcity), not only empirically, but also theoretically, by reinforcing the idea that states rather cooperate than fight over internationally shared resources.

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List of Acronyms, Abbreviations, and Terms

BTF	Biodiversity Task Force
CINC	Composite Index of National Capability
ENP	Effective Number of Parties
EWCP	Eastern Water Carrier Project
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
HDI	Human Development Index
HTF	Hydrological Task Force
Int.	Interview
ITF	Institutional Task Force
IFTD	International Freshwater Treaties Database
IRBR	International River Basin Register
IUCN	International Union for Conservation of Nature
JPWC	Joint Permanent Water Commission
MMRD	Mixed-Method Research Design
OBSC	Okavango Basin Steering Committee
OKACOM	Permanent Okavango River Basin Water Commission
OKASEC	OKACOM Secretariat
ORB	Okavango River Basin
ORI	Okavango Research Institute
PJTC	Permanent Joint Technical Commission
RBO	River Basin Organization
SAP	Strategic Assessment Program
Sida[1]	Swedish International Development Cooperation Agency

[1] Representatives of the organization insist on keeping the name as “Sida” and not “SIDA”

SOIWDP	Southern Okavango Integrated Water Development Project
TDA	Transboundary Diagnostics Analysis
TFDD	Transboundary Freshwater Treaties Database
TNR	Transboundary Natural Resource
TWR	Transboundary Water Resource
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development

INTRODUCTION

"Whiskey is for drinking; water is for fighting over". This quote is attributed to the author and humorist Mark Twain at the end of the 19th century (Jarvis, 2010: 1). He could not have put it any better. One century later indeed, as nicely recalled by Jarvis, the current Secretary-General of the United Nations and his two predecessors, along with a former vice-president of the World Bank, shared the same opinion – at least on the water part – but not with the same humoristic pinch (Jarvis, 2010: 1). To start with, Boutros Boutros-Ghali (then Egyptian Foreign Minister) declared in 1985: "the next war in the Middle East will be fought over water, not politics" (Delli-Priscoli, 2010: 3; Selby, 2003a: 49). He endorsed this standpoint in 2003, as the UN Secretary-General this time, affirming "water will be more important than oil this century" (BBC, 2003). Ismael Serageldin, Vice President of the World Bank also argued in 1995 "the wars of the next century will be about water" (Delli-Priscoli, 2010: 3), followed by Kofi Annan in 2001 with "fierce competition for freshwater may well become a source of conflict and wars in the future" (Wolf, 2007: 241; Jarvis, 2010: 1; Delli-Priscoli, 2010: 3). More recently, Ban Ki-Moon argued: "our experiences tell us that environmental stress, due to lack of water, may lead to conflict, and would be greater in poor nations" in 2008 (Ban, 2008). This catastrophist discourse is not only entertained by extremely influential public figures such as United Nations Secretary-Generals, but also by mass medias, policy makers and some scientists.

Humans obviously are at a turning point in our history: overconsumption, climate change, environmental depletion and degradation, increasing poverty, population growth, among others, are all factors that threaten the durability of life on Earth. Debates on those issues are tense between those who believe that we have already crossed the red line, and those who argue that the Earth – and its natural resources – is extremely resilient and thus there is no reason to worry for the future of humankind and the planet. One of the main points of tension is the debate on the impact of human activities on the environment, in other words: our responsibility. Facts tend to support the grim analysis of the first discourse: the rapid melting of the Arctic Ocean and of Antarctica's ice shelves; the occurrence of resource scarcity in many parts of the world – such as water scarcity in the Middle-East, Southern Africa, or Australia; the growing number of environmental refugees (the Darfur case is particularly

noteworthy); the consequences of overfishing and unsustainable fishing techniques (the United Nations argues that wild fishes will disappear from oceans before 2050 if we do not change our consumption patterns); the increasing competition for resources between socioeconomic sectors (agriculture, industry, households, tourism, etc.), among numerous other evidences of human-induced environmental catastrophes. As a consequence, those last few decades, the fear of upcoming conflicts and even wars over resources has increased, to progressively become the major view of the media and in public debates.

The origins of this research lie in the constant strengthening of this catastrophist discourse in the public sphere, and in a desire to understand the ins and outs of such pessimism about the outcomes of environmental issues at the global level, via the study of "transboundary natural resources" (TNRs), the object of this study. In the *political ecology* literature are defined four categories of "goods" (or "resources", for the purpose of this research) on the basis of two variables: the type of access to the resource and its mode of consumption (Le Prestre, 2005: 20-21). Access to a resource is either free (one does not want, or cannot limit its access) or limited (some users are excluded from its access because of rules and norms); and consumption of the good is either joint (the consumption of the good by an actor does not diminish its availability to other potential consumers) or rival (the consumption of the good by an actor reduces the level of consumption by another). The mode of consumption of the good is a property of the good itself, whereas its mode of access depends on social rules and customs (Le Prestre, 2005: 20-21). Political approaches of environmental issues mostly consider natural resources as public (free access/joint consumption[2]) or common goods (free access/rival consumption)[3]. We are of those who perceive TNRs as falling into the category of "international common goods". We define them as "shared environmental common goods located along or across the border of at least two states". Examples of TNRs include the air, oceans, international rivers, aquifers and forests.

[2] One cannot be excluded from a public good (urban lightening, public TV…) and its consumption by an actor does not prevent its access to other actors.
[3] Club goods (Limited access/joint consumption: Cable TV, tolled highways…) and private goods (Limited access/rival consumption: a refrigerator, a car…) are not of interest here.

Yet, international common goods (such as TNRs) face numerous issues (the same issues which fuels the pessimistic public discourse evoked above). The most significant one is the so-called "tragedy of the commons", a metaphoric concept which refers to a situation in which multiple independent rational actors, following their interest, will eventually exhaust a shared limited resource despite the fact that it is not in any actor's long-term interest to act so (Hardin, 1968). If, at the local level, most populations have avoided to fall into this trap thanks to the development of organizational mechanisms to manage common goods in a sustainable manner, Ostrom *et. al.* affirm that, at the international level where environmental issues are much less predictable; where there is no supranational authority to enforce existing rules; and where the legitimacy of agreements is contested, common goods confront states with great challenges for what relates to both their own security and the sustainability of the resource itself (1999). Well-known examples of this type of mismanagement at the international level include the Aral Sea and Lake Chad (UNDP, 2006: 209-15), which both lost most of their surface during the last decennials. Compared to public goods, to which the main threat is the existence of too numerous free-riders[4], common goods are threatened by the opposite dynamics: too many consumers will lead to the destruction of the resource. The tragedy of the commons may affect both the resource's quality and quantity, thereby creating tensions between actors. Several authors explained how some actors developed self-governing rules to reduce the risks inherent to this phenomenon at all levels (Ostrom, 1990). Numerous solutions were proposed in order to prevent such collective mismanagement to occur: the design of clear normative regulations (on consumption, or access); the implementation of fiscal charges (progressive charges against polluters or exploitative attitudes) or subsidies (for those who restrain their consumption to reasonable levels); education (increasing actors' awareness of the issues at stake); or altering the property-rights' regime of the good itself – which is said to have great impact on the dynamics of their exploitation (Bromley, 1992; Ostrom, 1990) – in order to resolve the "non-exclusion" principle at the core of the definition of common goods (Le Prestre, 2005: 20-21). The existence of common goods thus influences actors to operate in favor of their self-interests, meaning they will theoretically both

[4] Free-riders are actors who do not participate to the production of the good but who profit from its existence.

minimize their contribution to the maintenance of the resource (or to the services that it procures), and overuse it (Le Prestre, 2005: 20-21).

In brief, defining TNRs as common goods spots the light on the distribution of the benefits, which can cause great tensions between protagonists. It is those tensions that are of interest in this research, keeping in mind that various other issues act as catalysts of tensions over common goods, such as the social needs for life and socioeconomic development; the existing schemes of resource allocation; the distribution of benefits; the legitimacy of existing international norms, agreements, treaties or regimes; or the presence of negative externalities (pollution…), among others (Stott and Sullivan, 2000; Boulding, 1966; Bromley, 2002).

When briefly looking at the trends regarding conflicts on TNRs (and Transboundary Water Resources), the main idea that transpires is that occurrences of cooperation largely overwhelm occurrences of conflicts on these resources. This paradox caught our researcher's eye to a point where we decided to dedicate this research on testing the veracity of the catastrophist claims through the in-depth analysis of *International Relations* on TWRs. As a consequence, **the subject** of this study is "cooperation and conflict over transboundary natural resources", more precisely over transboundary water resources, the "resource-case study" on which we will concentrate our analysis.
In order to do so, we mobilize several fields of research, of which the most important is the field of *international relations*. The analysis of the concepts of cooperation and conflict mostly lies in this field, and embraces other theoretical concepts, which are central to this research, such as: power and hegemony; and the development, consolidation and most importantly the institutionalization of international regimes. In a nutshell, instead of looking at international regimes and institutions as an end in itself, we mobilize the literature on power relations in order to analyze how much they explain conflictive situations embedded within them. Insights from the *International Political Economy* literature will be central to achieve those objectives since they offer a critical understanding of political structures, patterns and relationships at the international level (Palan, 2000: 13). In particular, they confer specific attention to the role of power structures and hegemonic dynamics in order to explain the complex political-economic relationships among states and institutions (Gill and Law, 1988; Cox, 1996 [1981]) that are central to our object of study. We also mobilize the field of *Political Ecology*, which aims at studying the interactions between politics,

economics, sociology and the environment, with humans as the central actor (Stott and Sullivan, 2000; Bryant and Bailey, 1997). In other words, political ecology is an interdisciplinary field, which attempts to disentangle the complexity of the relationships between humans and their environment through the mobilization of several disciplines and critical thinking. It is based on three sequential assumptions: firstly, the costs and benefits of environmental change are unevenly distributed; secondly this uneven distribution reinforces (or decreases) sociopolitical and socioeconomic inequalities; and finally the two first points have political consequences in terms of power relations between the actors involved (Bryant and Bailey, 1997: 28). Lastly, we mobilize the literature on *Hydropolitics*, i.e. "the systematic analysis of interstate conflicts and cooperation over international water resources" (Elhance, 1997: 218), which implies: the study of conflict and cooperation; a specific focus on international river and lakes' basins (TWRs); and the centrality of states as the main actors (Turton and Henwood, 2002: 15). This field certainly combines theoretical insights of both of the former fields. Hence, our research is located at the crossroads of these three fields of research and contributes to their inherent debates on the notions and concepts evoked above.

The academic debate on this specific subject has long been polarized between two main discourses: one which promotes the idea – evoked above, and relayed in the media and the public sphere – that natural resources will be at the heart of the next conflicts and wars; and the other which sees cooperation as the most probable outcome of tensions on such resources. In short, the first approach is based on neo-Malthusian geopolitical arguments based on a realist view of international relations, which argues that a long-lasting population growth will eventually lead to conflicts over limited natural resources. This quite pessimistic view gave way to numerous other contributions that confirmed this argument, mostly through the analysis of specific cases where conflicts over resources are frequent. "Cornucopians" are more optimistic about the outcomes of issues related to environmental resources. Influenced by a neoliberal-institutionalist perspective of international relations, they consider tensions over resources as opportunities to achieve mutual benefits through cooperation. The progressive institutionalization of such cooperative schemes ultimately becomes a catalyst factor for enhanced collaboration in other sectors. Those two opposite perspectives therefore became mainstream and dominated the debates until recently, when other contributions from authors of radical/postmodern,

critical, or sustainable development schools of thought, among others, added some nuance to the debate notably through completion of various analyses of case studies. In general, the empirical studies show that cooperation overwhelms conflict on natural resources, but cooperation can be paralyzed by less visible forms of conflicts.
This is where we stand in the academic debate. Critical authors paved the way for a deeper examination of the underlying factors that explain why states cooperate or enter into conflicts on such resources. We aim at cross-examining the literature in order to spot the light on potential theoretical and empirical gaps that we could contribute to fill through an in-depth analysis of the case of transboundary water resources.

Here, we study one specific type of international common goods: transboundary water resources (TWRs), which we define as "shared water resources located along or across the border of at least two states". TWRs are common goods particularly prone to "tragedies", as evoked with the cases of the Aral Sea or Lake Chad. Water, in itself, is certainly considered as the most critical natural resource on Earth (Chalecki, 2010: 4). It is an essential biological need, non-substitutable and fundamental to the sustenance of human (and nature's) life, without which life expectancy is limited to several days, a week at most. Water is also more and more consumed in all sectors of domestic, social, political, and economic life. Also, more than 40% of the global population lives in transboundary lakes and rivers' basins, which include at least two countries, while more than 90% live in states that share basins with another. Plus, the 263 TWRs on Earth cover more than 50% of the planet's surface and accounts for 60% of its freshwater flow (GWF, 2013). The uniqueness of this resource, because of its life-sustaining character (Lowi, 1999: 389) and its vital status in all aspects of human society; the fact that most of water resources are transboundary; plus the fact that they are prone to conflicts between stakeholders, make of TWRs a particularly suited resource to study issues related to the specific common goods that are TNRs.

Most importantly, the debate on cooperation and/or conflicts in the case of transboundary water resources is an illustration of the broader one on transboundary natural resources. Water resources are prone to scarcity in many regions of the world, unevenly distributed, more and more polluted, and vulnerable to the effects of climate change and human activities. Those characteristics alone give way to the most

pessimistic predictions about the future. Yet, there has not been any occurrence of "water war" per se for millennia (Pacific Institute, 2013)[5]. Plus, empirically, occurrences of formal cooperation between riparian states sharing the same TWRs largely overwhelm the accounted number of violent conflicts (Dinar, 2009: 109; Hensel et. al., 2006: 407; Toset et. al., 2000; Pacific Institute, 2013; OSU, 2009a). The few manifestations of violence happened at the local level, in areas where water is scarce and where other sociopolitical and socioeconomic factors played a decisive role; i.e. where water is one of the many causes, not the exclusive reason why protagonists fight each other. We do not argue that TWRs have not generated non-violent disputes and conflicts between riparian states, or that cooperation is generally free of conflicts, of strategic national interests and power relations, or that it is always equitable (Dinar, 2014, forthcoming; Zeitoun and Warner, 2006), but one has to state the obvious: despite the worrying features of the state of TWRs nowadays, which could make anyone think that they are obviously prone to conflicts, riparian states tend to institutionalize cooperation on those resources through the creation, development and consolidation of international – or interstate – regimes. This is basically the research puzzle of this study, which made us ask the following question: "Why do states rather cooperate over transboundary water resources?" and sub-questions: "When they do, what are the factors that hamper or improve cooperation?" In other words, "Why is cooperation more institutionalized in some cases than others?"; "What factors can explain it?"; "What pushes them to institutionalize interstate cooperation, hence to create, maintain and often consolidate international regimes on the matter?" Those are the central question(s) and sub-questions of this investigation on cooperation and conflicts over TWRs.

The literature on this specific puzzle has been quite prolific during the two last decades. Most of it has focused on the analysis of individual case studies on their own, thereby covering most of the major basins in the world so as to understand the specific dynamics of those cases (Elhance, 1999; Lowi, 1993; Waterbury, 2002; Allan, 2001; Cascao, 2008, 2009; Percival and Homer-Dixon, 1996, 1998; Howard and Homer-Dixon, 1998; Gizewski and Homer-Dixon, 1996; Kelly and Homer-Dixon, 1998; Homer-Dixon and Blitt, 1998; Homer-Dixon, 1991, 1994, 1995, 1999).

[5] There however exist some discussions about several historical events – such as the one referred to as "the 1967 Arab-Israeli" war – so as to know if they could be labeled as such.

Those single or comparative case-study analyses were usually used to confirm or contradict one of the two dominant schools of thought on the basis of preset theoretical assumptions in favor of either a conflict-oriented or a cooperation-oriented discourse, in a deductive fashion. Recently, more and more quantitative studies have been produced on this subject, on the basis of the theoretical inputs proposed by the single or comparative case-study analyses evoked above (Dinar, 2014, forthcoming). One central variable under study is water scarcity, which interestingly both explains the occurrence of conflicts and of cooperation depending on which side of the debate the author stands. In general, evidences of the risk for interstate disputes is slightly more important in water-scarce areas of the world (Gleditsch et al. 2006; Hensel et al. 2006), but other studies indicate that more scarcity pushes states to formalize interstate cooperation through the creation of international regimes on the matter, either in a linear way (Tir and Ackerman, 2009) or in an inverted U-shaped curve relationship (Dinar, 2009; Dinar et a., 2011). The latter implies that moderate levels of water scarcity increase the propensity of states to cooperate, while very low or very high levels of scarcity tend to have the opposite effect. Other factors such as power asymmetry between riparian states, the level of governance of riparian states, the geographical configuration of the TWR under study (downstream-upstream dynamics), the level of economic development or inter-riparian states trade, have all been tested as variables that could explain the level of conflict and/or cooperation on TWRs (Kehl, 2011; Espey and Towfique 2004, Gerlak and Grant 2009; Zawahri and Mitchell 2011; Brochmann and Hensel 2011).

The originality and thus the importance of our research lie on two major shortages of the literature. The first one is the fact that quantitative analyses on TWRs mostly focus on bilateral basins or agreements, i.e. on resources shared by two states exclusively (Dinar, 2009; Dinar et. al, 2011 Espey and Towfique 2004). If they represent more than two third of the world's TWRs, those analyses, however, let aside more than eighty cases shared by three or more states (up to 18 on the Danube river basin, in Europe). There are differences between bilateral and multilateral basins; not only in their geographical structure, but also on the way hydropolitics are exercised, as shown by Zawahri and Mitchell (2011) while studying the distinctions between bilateral and multilateral interstate negotiations on the development of TWRs' international agreements. **In this research, we will focus exclusively on multilateral TWRs in order to fill this gap and enhance our knowledge of those cases usually**

analyzed separately. The second is the simplistic way in which "power relations" are taken into account as a variable in quantitative analyses on (mostly) bilateral resources. Indeed, power is seen as a one-dimensional concept characterized by strictly materialistic factors (such as military or economic power). We shall use the recently developed framework of hydro-hegemony (Zeitoun and Warner, 2006) in order to improve the definition of power and power resources for the purpose of a quantitative analysis. The authors of the hydro-hegemony framework defined power as complex and multi-dimensional based on a radical view of the concept in order to analyze specific case studies such as the Nile (Cascao, 2008, 2009; Carles, 2006), the Jordan (Allan, 2001; Selby, 2003a, 2003b; Zeitoun, 2006) or the Tigris-Euphrates system (Daoudy, 2005; Warner, 2005) in a deductive fashion. **In this research, we operationalize a multi-dimensional definition of the concept of power from a critical perspective in order to test it in a quantitative analysis of conflict and cooperation on multilateral TWRs.** Hence, the central hypothesis of this research could be formulated as such: the higher the level of power asymmetry between riparian states of the same TWR, the more states cooperate (and institutionalize interstate cooperation). Experts from the fields of international relations and hydropolitics should find an interest in this research because of those two innovations, as should research methods' specialists, as we developed below.

Another major originality of this research is **the use of a mixed-method research design (MMRD), which certainly lacks in the study of TWRs, involving both deductive and inductive analytical approaches in order to grasp as best as possible the ins and outs of the reasons why states cooperate rather than fight on TWR**s. Mixed methods are defined as "research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry" (Tashakkori and Creswell, 2007: 4).

The debate at the origins of mixed-methods has been very long and fastidious between "pro-qualitative" (or constructivist/phenomenological) and "pro-quantitative" (or positivist/empiricist) authors, a period which has been labeled as the "paradigm war" (Bergman, 2011b; Guba and Lincoln, 1994; Datta, 1994; Gage, 1989; House, 1994; Rossi, 1994). Their dissensions focused on the relation of each mono-method toward the nature of reality (ontology) and the relationship between the

researcher and the research subject (epistemology) (Creswell and & Plano Clark, 2007; Tashakkori and Teddlie, 1998; Silverman, 2000; Denzin & Lincoln, 1994), but also on the respective research themes and questions they address, the data collection methods and the analytical approaches they use (Bergman, 2011a: 272). Because of their own historical backgrounds, which shaped the cultural relation of the researcher to the science of his (or her) discipline, and because of the presence of "gatekeepers" in all disciplines, the "paradigm war" lasted for decades before the 1990s, when MMRD issues were possible to formalize (Bergman, 2011b: 100). Before that, the discussion was impossible, a situation called the "incompatibility thesis" (Tashakkori and Teddlie, 1998: 4). In the 1990s, several authors such as Creswell, Tashakkori, and Bryman paved the way for mixed method researchers by providing vocabulary, taxonomy and process description to mixed-method research design (Bergman, 2011a: 271). Since then, one can witness more flexibility in the contemporary conventions, where "professional mixed methods researchers do not invest unduly in clarifying theoretical inconsistencies as outlined in the literature", since "mixed-method research works in practice in the sense that it produces usable results that transcend the limits of mono-method research" (Bergman, 2011b: 101).

In our point of view, this long-lasting debate is outdated since the use of mixed-methods opens the door to new types of data, of data analysis, of results, among others, while it can also reveal hypothetical virtues of mono-methods by combining them with one another. For instance, a quantitative analyst who compares the frequency of result X or Y in the answers of the respondents, could benefit from the addition of a qualitative research component, such as the analysis of the variations "in the meaning structure and boundaries of the constructs embedded in the survey question" (Bergman, 2010: 172). The latter would enrich the findings since it would add a complementary subset of results, and it might help the researcher improving his or her survey model and give another perspective to his or her interpretation and analysis of the same results (Bergman, 2010: 172). Thus, applying those two mono-methods together does not necessitate a different view of the nature of reality or a particular relationship between the researcher and the research subject, or a preset way to analyze and apprehend a research theme or data. We believe that any research question can be answered in many different ways, using different theoretical frameworks, data sets and analytical approaches (Bergman, 2010: 173).

In that sense, on a philosophical level, we include ourselves in the "pragmatist" paradigm in social sciences (Howe, 1988; Brewer and Hunter, 1989) (as opposed to positivism, post-positivism and constructivism[6]), which argues that quantitative and qualitative methods are compatible (Tashakkori and Teddlie, 1998: 12). For pragmatists, the research question is fundamental, "more important than either the method they use or the worldview that is supposed to underlie the method" (Tashakkori and Teddlie, 1998: 21). They use the methodological tools available, influenced by their value system, in order to answer best their research question (Tashakkori and Teddlie, 1998: 26). Pragmatists accept the reality as it is, and tend to select explanations that best produce the anticipated result. Epistemologically, they are open to the idea that researchers be both subjective and objective while exploring their research question (Tashakkori and Teddlie, 1998: 23-25). Hence, pragmatists tend to criticize the permanent attempt of researchers to turn concepts like "truth" into "superconcepts' such as "Truth", which "generates insoluble pseudoproblems in the process" (Howe, 1988). They view qualitative and quantitative researches as similar enough to be associated in scientific studies, notably because they believe in the fallibility of knowledge and that reality is constructed, and multiple (Reichardt & Rallis, 1994: 85 in Tashakkori and Teddlie, 1998: 13) Most importantly, they agree with the "underdetermination of theory by fact principle", i.e. the belief that "any given set of data can be explained by many theories" (Reichardt and Rallis, 1994: 88). Those similarities suffice to pragmatists to promote mixed methods in social sciences. We stand along with them.

There exist five types of mixed-method research designs: *sequential* studies, *parallel/simultaneous* studies, *equivalent status* designs, *dominant - less dominant* studies, and designs with *multilevel uses and approaches* (Creswell, 1995; Tashakkori and Teddlie, 1998: 18). This research is a combination of *sequential* studies (the researcher first conducts a qualitative phase of study and they a quantitative phase, or vice-versa), *equivalent status* design (the researcher conducts the study using both approaches about equally to understand the phenomenon under study), and *designs with multilevel use of approaches* (researchers use different types of methods at different levels of data aggregation) (Tashakkori and Teddlie, 1998: 18)[7]. We note

[6] An excellent account of those four paradigms can be found in Tashakkori and Teddlie, 1998.
[7] Extended definitions of those types of mixed-method research can be found in Creswell (1995)

here that our research involves three sequences, not two (a quantitative phase, then a qualitative, and back to the quantitative). We shall see below how those three types of mixed-methods studies are intertwined. In the end, what we mobilize in this research is even more than a "mixed method design": it is what Creswell refers to as "mixed methodology (or method) designs" (1995), although we prefer Tashakkori and Teddlie's definition (1998: 19): "studies that are products of the pragmatist paradigm and that combine the qualitative and quantitative approaches within different phases of the research process" (Tashakkori and Teddlie, 1998: 19). Broadly, we gather qualitative data (from the literature), which we convert to achieve a quantitative analysis, before gathering complementary data through semi-structured interviews, which we again convert to complete another quantitative analysis, and so forth. Hence, we have chosen to use a mixed method research design – more precisely a "mixed model study" – in order to: expand the panel of data, data analysis and research techniques available for the study of our specific subject (Tashakkori and Creswell, 2007: 4); limit as much as possible the respective weaknesses of both types of mono-method research designs and transcend their limits (Bergman, 2011b: 101); complement each method's findings; and "combine different strands of knowledge, skills and disciplines" (Bergman, 2011a: 275). Last but not least, this study is also a contribution to expand the choices of methodological approaches to studies on conflict and cooperation on TNRs; more specifically to hydropolitical issues.

That being said, we now introduce "what" we do in this research, and "how" we do it. The following table shows a summary of the mixed method design used in this research, which we discuss below.

Table 1.1: Outline of our Mixed Method Design

Research steps	**Type of study**	**Type of data used**	**Data collection method**	**Method of data analysis**	**Analytical approach**	**Results**
Chapter 2: literature review and theoretical framework	/	Qualitative	Review of the literature	/	/	Development of Theoretical Framework for the rest of the study
Chapter 3: Literature-based quantitative analysis	Quantitative	Quantitative	Operationalization of qualitative data	Regressions (Binary logistic & multiple linear)	Deductive (testing theory)	Quantitative results (regressions)
Chapter 4: Qualitative analysis of a deviant case study	Qualitative	Qualitative	• Semi-structured interviews • Complementary literature analysis	• Qualitative analysis of interviews; • Analysis of a case based on existing theoretical framework	• Inductive (generating theory based on new data); • Deductive	• New variables for chapter 5; • Original results exclusive to the case study
Chapter 5: Literature- and case study analysis-based quantitative analysis	Quantitative	Quantitative	Operationalization of qualitative data	Regressions (Binary logistic & multiple linear)	Deductive (Testing new theory)	Quantitative results (regressions)

The first sequence of the process (chapter 2) is an in-depth analysis of the literature on the subject of research in order to produce both a dense literature review and, most importantly, the theoretical framework of the research. The objective of this first step is to identify, in the literature, factors that could explain why states cooperate rather than they enter into conflicts on transboundary water resources. The major innovation that we bring to the academic debate at this point of the research is a holistic definition of power (and power asymmetry) as a multi-dimensional and complex concept, by mixing different approaches, with a strong influence of radical authors such as contributors to the hydro-hegemony framework (Zeitoun and Warner, 2006).

The second sequence (chapter 3) – the "literature-based" quantitative analysis – aims at testing the theoretical framework (exclusively grounded on the existing literature on the subject) in a quantitative analysis of roughly all multilateral rivers and lakes' basins on Earth (another contribution of our research). We thus operationalize all factors identified in the framework into quantitative data; i.e. we "translate components of a research question or hypothesis into variables" (Bergman, 2010: 172), and then we create a link between theory and measurement through a methodical choice of indicator for each theorized factor (or variable). So the data used in this chapter is quantitative, but is collected on the basis of qualitative information. It becomes exclusively quantitative when all variables are operationalized. Then, we process this data in two different regressions (a binary logistic and a multiple linear regressions[8]). We thus test the theory following a deductive analytical approach in order to achieve the first results of this research.

The results of the second sequence are intermediary and are only halfway in the research and methodological process. They however provide us with an overview of the lacks and weaknesses of the theory with regards to conflict and cooperation on TWRs. The following sequence is certainly central to the research. It is a qualitative study, which embraces both inductive and deductive approaches to the study of a "deviant" case identified in the previous section. Broadly, a "deviant" case does not fit the quantitative model, thereby exposing the limits of the latter. The inductive part aims at exploring this case – which happens to be the Okavango River Basin in Southern Africa – in order to both: improve the initial model by attempting to identify new explanations (or variables) to our research question through a thorough

[8] We shall develop the reasons for using two types of regressions in chapter 3

qualitative analysis of the ins and outs of cooperation and conflict over this transboundary resource; and contribute to improving the general knowledge of the interstate politics of the Okavango River Basin and the region, with a particular focus on power relations. To do so, we use qualitative data collected both through an extensive review of the academic literature (and other secondary resources) on this shared resource complemented by nearly thirty semi-structured interviews with involved (or formerly involved) actors of transboundary cooperation on the basin. For this first part, our analytical approach is exclusively inductive, in the sense that we aim at building theory on the basis of this case, whereas the following part is purely deductive. In the latter, we examine our results and field experience thanks to the analytical tools proposed by the "Hydro-Hegemony Framework Theory", in order to grasp best the power relations at stake in this specific case. The objective is to understand the profound power relations – especially less studied forms of power in this type of context, such as the power of ideas – so as to test further, in a qualitative manner this time, our main hypothesis which argues that power asymmetry has a great role to play in the development of international regimes on transboundary water resources.

In the last sequence of this research, we head back to a quantitative method in order to complete the initial model – exclusively based on the literature – with the results issued in the inductive step of the qualitative analysis of the Okavango River Basin. We were able to identify facts, events and other interstate interactions that could explain why the riparian states cooperate on this particular transboundary resource, and why cooperation is sometimes slowed down or enhanced. Some of those explanations are very specific to the deviant case, while others have the potential to be tested in a large-N quantitative analysis in the form of variables, in order to test if they could be applicable to other cases by adding them the initial quantitative model. The method for data collection again starts with the operationalization of those variables identified in the qualitative analysis of the deviant case. We then process the transformed data (from qualitative information to qualitative data) in two regressions (again, a binary logistic and a multiple linear regressions) in order to test if we find any improvement in the quality of our quantitative model and if results concord with our hypotheses. This sequence is the last step of our mixed method design. We thus loop the loop of our methodological design with this presentation of the "literature- and case study analysis- quantitative analysis" and its results.

To summarize, we start with a qualitative analysis of the literature in order to pursue a "literature-based quantitative analysis" through the operationalization of the qualitative information gathered into quantitative data that we process in two complementary regressions. The latter provides us with initial results, which we aim at improving through the systematic study of the deviant case. The information gathered – or the data collected – in this qualitative analysis helps us improving our initial model, but also offers other results of interests, particularly for the political scientists interested in the interstate dynamics of the Okavango River Basin. Finally, we test the improved model through the completion of the last sequence of our methodological approach: the "literature- and case study analysis- quantitative analysis". **We confirm here that one of the main innovations of this research lies in the specificities of our mixed method design, which could inspire many others studies on conflict and cooperation in international relations (not only on Transboundary Natural Resources, though).** We now introduce the outline of the research.

The chapter presenting both the theoretical background and the theoretical framework of the research follows this first introductive chapter. The theoretical background is divided in two sub-sections. The first one introduces the history of the academic debate on the apprehension of environmental issues and resources management, which has long been "polarized" between two – somewhat opposed, somewhat converging – mainstream approaches of the subject, before critical contributors added some color to this black (pessimist) vs. white (optimist) debate. The second focuses on the literature on hydropolitics, which shows how well Transboundary Water Resources fit the previous debate, between a conflict-oriented general discourse and a cooperation-oriented empirical reality. The following theoretical framework firstly introduces the "dependent variable" of the research, i.e. cooperation or, more precisely: "the relative degree of institutionalization of cooperation over transboundary water resources". We then introduce our selection of the main factors – independent variables– used in both qualitative case studies and quantitative analyses in the literature to explain why states cooperate – or not – on transboundary water resources. They are divided in three types of arguments: liberal peace arguments; power asymmetry; and power-asymmetry arguments. Liberal peace arguments take their roots in the neoliberal institutionalist school of international relations and

include “the history of interstate diplomatic relations”, “the history of cooperation on TWRs”, “economic interdependence between riparian states” and “the riparians’ states level of governance”. “Power asymmetry” refers to our main hypothesis. We propose an innovative view of power as a multi-dimensional concept, an index including four dimensions of power (material/ideational, and relational/structural). For the elaboration of this variable, we relied on different views of the concept, from different schools of thought (realist, neoliberal institutionalist, critical, and constructivist). This original view of power is then associated to a number of complementary variables (power-asymmetry arguments), where a power dimension completes other factors developed in the literature. For instance, the factor “geographical configuration of the basin”, often used in the analyses of TWRs’ case studies, is added a “power” component, in the sense that here, what is of interest is the geographical position of the most powerful state (or hegemon). Indeed, we make the hypothesis that cooperation on a basin where the most powerful state is located downstream should be higher than one where the latter is upstream or midstream. “Water endowment” and “governance” variables complete the picture, as detailed in chapter 2. Hence, the purpose of this theoretical framework is to introduce the theoretical assumptions behind the chosen variables. Their respective operationalization is introduced in chapter 3.

The core of chapter 3 is the quantitative analysis of the multilateral transboundary water resources of the world on the basis of the theoretical framework introduced in chapter 2. We first introduce the reasons behind this choice of case studies (the 80 cases). Then, we turn to the operationalization of the dependent variable (the relative degree of institutionalization of cooperation), which circumscribes the rest of the research, notably in terms of period of study (1945-2007). The sources of data, the methodological choices associated with this variable, and its complete operationalization (from the collection of raw data to the final calculations of the chosen indicators) complete the presentation of the dependent variable. We then do the same with the three groups of independent variables, which we summarize in a final table for clarity reasons. The final step of chapter 3 is the completion of both a binary logistic and a multiple linear regression via the SPSS software[9] in order to test

[9] SPSS : Statistical Package for the Social Sciences, a software for statistical analysis in social sciences.

our hypotheses[10]. We then continue with a discussion of the results achieved with both regressions, before concluding the chapter, notably with a justification of the choice of the case study, which will be "qualitatively" analyzed in chapter 4.

After an introduction where we notably share complementary information on the methods used in this chapter (mostly the data collection methods such as the completion of semi-structured interviews), Chapter 4 is divided in three main parts. The first one introduces the context and the origins of the cooperative scheme existing on the Okavango River Basin. We present the historical, geographical and political context of the Okavango River Basin before the states started cooperating in the 1990s. Then, we discuss the exclusion (or non-inclusion) of one riparian state (Zimbabwe) and the implications of this situation on the politics of the basin. Finally, we analyze the reasons why states have chosen to cooperate with one another in order to answer best our main research question. We identified several events, factors and interactions between the three states involved which might have an explanatory power for the purpose of our research (such as the independence of one of the three states: Namibia, or the issue of water scarcity, among others). The second part focuses on the 1994-2007 period (from the beginning of cooperation through the signing of a tripartite agreement in 1994, to 2007, the last year of our study), during which cooperation has been paralyzed by numerous factors that we introduce in four different categories: socio-economic and socio-political; socio-cultural and interpersonal; environmental; and operational factors. We will see that "on-paper" cooperation (through the signing of treaties and agreements) and the actual implementation of the latter are two different things. Several factors help states cooperating, while others hamper daily interstate cooperation. Those two first steps helped us: identify factors that could be translated to variables in the second quantitative analysis (chapter 5); and enhance the general knowledge of the politics of the very unique case that is the Okavango River Basin. In the final part, we turn back to a deductive analytical approach by applying the information, data and results obtained during the in-depth analysis of this case study to the "hydro-hegemony theoretical framework" in order to identify visible and less visible occurrences of power asymmetry between the three riparian states, and the consequences of the latter

[10] As we shall see in chapter 3, we proceed to a binary logistic regression in order to analyze why states do cooperate or not ; and a multiple linear regression in order to analyze why states cooperate more than others on TWRs.

on conflict and cooperation over the Okavango River Basin. We will see, for instance, that the presence of a more powerful actor at the beginning of interstate cooperation had, and still has some – mostly negative – implications on the actual implementation of cooperation on this basin. The completion of this part somewhat confirms and/or balances some of the results previously introduced in this chapter. The conclusions of this chapter both wrap-up the results exclusively related to the Okavango River Basin, and introduces the consequences of the results of this chapter for the rest of our research (such as the identification of new variables to complete the initial quantitative model), i.e. the "literature- and case study-based quantitative analysis".

The "improved quantitative model" based on both the literature and the in-depth analysis of a deviant case is introduced in chapter 5. In this chapter, we go back to our initial quantitative model and add five new factors (independent variables) issued from chapter 4 in order to complement the first model, which was exclusively based on the academic literature. We also modify the data for the dependent variable. Like chapter 3, chapter 5 is divided in two main parts: the first one introduces the new variables, their definitions and operationalization; and the second shows the two regressions, their respective results and includes a discussion of those results.

The final results presented in chapter 5 substantially contribute to the academic debate on those issues. We will notably show the importance of power asymmetry and power asymmetry "arguments" in explaining why states cooperate, or not, on TWRs (despite the denial of our main hypothesis on power asymmetry). However, those variables have no explanatory power for what relates to the degree of institutionalization of cooperation – why states cooperate more, or less – unlike a typical liberal argument (economic interdependence), and another variable obtained from the analysis of Okavango River Basin case study in chapter 4. The case study of this deviant case also contributed to enhance the general knowledge on cooperation over TWRs, both by complementing the initial research model with a new set of independent variables (and with the improvement of the operationalization of the dependent variable), and by introducing results specific to the case study that are of interest for this research, but also for political analysts of international relations on TWRs and the ORB. In particular, the qualitative analysis of interstate power relations on the ORB provides the research with original results on the role of power in enhancing, or hindering, cooperation schemes on international rivers and lakes' basins. Last but not least, we will demonstrate that the innovative method used in this research has been particularly

suitable to achieve the research purposes. Among other things, mixing quantitative and qualitative analyses, and deductive and inductive analytical approaches improved the research model in terms of quality and results. Finally, the last chapter concludes the research by discussing once again the theoretical background, the general approach and the final results of the research. The presentation of this general review provides the reader with potential new paths for further research on the core issues at stake in this study. The final words reinstate the research in the bosom of the broader debate on cooperation and conflicts over (transboundary) natural resources.

CHAPTER 2: THEORETICAL BACKGROUND AND FRAMEWORK

1 Introduction

The main purpose of this part is to introduce the theoretical background and framework of the research. In the first section, we unravel the theoretical background and assumptions that guided us throughout this study, which are grounded in the fields of *international relations* and *political ecology* in order to understand the underpinning assumptions at the heart of the academic debate on interstate conflict and cooperation on transboundary natural resources (TNRs). This first step enlightens where we situate our research within this debate on the basis of the research questions the latter raises. Then, we explain why we chose transboundary water resources (TWRs) as a "resource case-study" and thus adjust our research interrogations to the particular characteristics of TWRs as a type of TNRs, notably through the mobilization of the theoretical and empirical knowledge grounded in the field of *hydropolitics*. The second section of this chapter introduces our theoretical framework. In this one, we present what we identify as the central explanatory variables in the literature for what relates to our research question(s). There, we provide key definitions and hypotheses for the purpose of this research. Insights from the *international political economy* literature will be central to achieve our objectives since they offer a critical understanding of political structures, patterns and relationships at the international level (Palan, 2000: 13). In particular, they confer specific attention to the role of power structures and hegemonic dynamics in order to explain the complex political-economic relationships among states and institutions (Gill and Law, 1988; Cox, 1996 [1981]) that are central to our object of study. We conclude this chapter by briefly summarizing the major contributions of our thesis to the debate.

2 Theoretical background

The debate on the actual influence of natural resources as a catalyst of conflict or cooperation is large, passionate but also quite recent (Bernauer et. al., 2012: 1). It still very much divides the academic world. The starting point of this research is to understand the way the academic literature embraces the influence of environmental changes on interstate political relations. The debate has long been quite polarised between pessimistic and optimistic views, respectively arguing that environmental resources are the source of either conflict or cooperation. Both perspectives are confined in the recent debate on *environmental security* (Mathews, 1989, 1997; Renner, 1989), i.e. on a traditional view of security issue: a bias that numerous critical contributions point at in order to broaden the debate to less categorical outcomes. However, they do not agree on the outcomes of environmental issues. The first perspective grasps those issues as leading to conflictive relations between actors, and even violent conflicts. The second (cooperation-oriented) perspective embraces environmental changes as opportunities for states to cooperate on those issues through the development of international regimes, which gather actors to work together in the common interests of all. Despite the empirical validity of the second, we do not fully use this perspective because of several theoretical shortages. We indeed argue that this vision entails narrow postulates of the interstate system, mostly because of its focus on the analysis of outcomes rather than the underlying mechanisms that lead to cooperation. A complementary review of the more recent critical literature on those issues helps us balance the contributions of those two mainstream perspectives.

2.1 Mainstream theories and critics: The emergence of the environmental security discourse

The most famous historical contribution linking environmental change – scarcity, in this case – and conflict is Thomas Malthus' "An Essay on the Principle of Population", which first edition dates back to 1798. In brief, Malthus argued that because the rate of growth of population is higher than the one of food supply allowed by Earth, eventually there will be conflicts upon food allocation when the population will overwhelm the quantity of means of subsistence available (Malthus and Flew, 1983 [1798]). More recently, Garrett Hardin showed, through the concept of "the

tragedy of the commons", that the overexploitation of a common natural resource could also exacerbate tensions and eventually lead to conflicts (1968). Those two central historical theories contributed to linking transboundary environmental issues to rather pessimistic and security-oriented views of international relations on the matter. If Hardin re-initiated the debate in the late 1960s, it is only at the end of the Cold War, during the 1980s, along with the redefinition of the traditional concept of security, that perceptions and discourses on international security have included aspects of human security as specific subjects of analysis; one of which is the environment (Ullman, 1983; Levy, 1995; Bryant and Bailey, 1997; Buzan et. al., 1998; Matthew, 1999; Stott and Sullivan, 2000; Haas, 2002; Allenby, 2000). During this period of great uncertainty, one could not deny the obsolescence of the underlying assumptions of national security and international relations, based on a bipolar world, in the face of new realities such as the exponential degradation of the environment, climate change, extreme climatic events, demographic growth and the growing role of non-state actors in international politics (Allenby, 2000: 5; Chalecki, 2010: 3).

Academics, politicians, and the civil society progressively recognized the impacts of human economic activities on physical and biological systems at all levels, from the local to the global (Turner et. al., 1990; Allenby, 2000: 6; Bernauer et.al., 2012: 1). The general discourse on the impact of resource scarcity on international political relations shifted in favour of the one of environmental security, thereby making the environment a primary security issue. In the academic world, one could witness a greater understanding of the idea of "purchasing as much security through trees as through tanks", as Myers (1989: 41) nicely put it. At that time, the concept of "environmental security", defined by Chalecki as "environmental degradation, resource scarcity, or resource abundance that can directly or indirectly affect the security of a state" (Chalecki, 2010: 2), began to circumscribe the whole academic debate linking environmental changes to violent conflict. This direct link made between national security and environmental issues has indeed taken precedence over other perspectives, despite numerous critics. Since then, the public knowledge, relayed by the medias, emphasized on the inherent risks of conflicts entailed in environmental resources. The international security literature on those issues is abundant (Haas, 2002: 6). Here, we summarize the two main perspectives (neo-

Malthusian and Cornucopian) before pointing at their empirical and/or shortages through the contributions of other critical point of views.

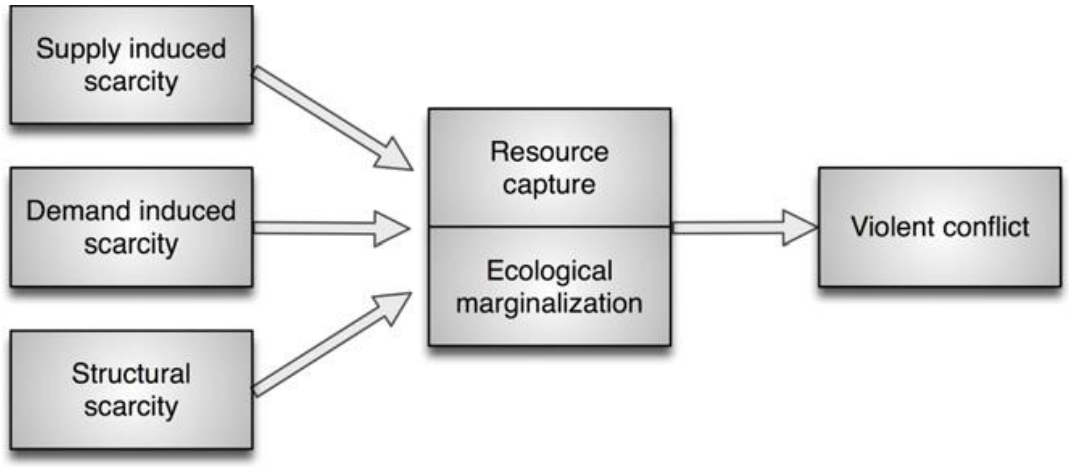
2.1.1 A neo-Malthusian geopolitical approach to resource scarcity

The main perspective linking environment and security is informed by realist approaches shaped by Malthusian geopolitical arguments, and emphasises on the potential risk for conflicts inherent to shared/transboundary natural resources. Malthusians see natural resources as limited, and thus as a constraint to human agency (Haas, 2002: 3). Along with others such as Myers (1989), Baechler (1999), Klare (2000), or Brown et al (1991), the central author of this pessimistic perspective is Homer-Dixon, who asserts that the combination of environmental scarcity (supply-side) and demographic growth (demand-side) will lead to environmental conflicts – and perhaps wars – in the near future (Homer-Dixon, 1994). He defines environmental scarcity as "scarcity of renewable resources such as cropland, forests, river water and fish stocks" (Homer-Dixon, 1999: 4). Following this path, the 1990s saw the development of numerous case-study reports providing evidences that environmental scarcity or change contributed to violent conflicts in specific areas of the world, such as Rwanda (Percival and Homer-Dixon, 1996), South Africa (Percival and Homer-Dixon, 1998), Mexico (Howard and Homer-Dixon, 1998), Gaza (Kelly and Homer-Dixon, 1998), and Pakistan (Gizewski and Homer-Dixon, 1996), among others (Baechler, 1999; Homer-Dixon, 1991, 1994, 1995, 1999; Homer-Dixon and Blitt, 1998). As an illustration, in Bangladesh, land scarcity, along with flooding, gave rise to massive migrations of Bengalis to India in the 1980s, a situation that critically altered inter-religious and inter-ethnic relations, land distribution arrangements, and power relations in the border regions. As a consequence, fierce fights came out of this situation (Homer-Dixon, 1994: 21-23). The Toronto Group's Environmental Change and Acute Conflict Project (ECACP), and the Environmental Conflicts Project (ENCOP) at ETH Zurich have undertaken most of these contributions

Neo-Malthusian theoretical assumptions could be summarized as such: the consequent social changes due to environmental scarcity will trigger or exacerbate tensions between parties sharing the same environmental resource(s) (Floyd and Matthew, 2013; Meadows et. al.. 1992). According to this perspective based on an

economic supply/demand framework, environmental scarcity is composed of three dimensions: the depletion of resources (*supply-scarcity*); an increased demand due higher socioeconomic and demographic needs (*demand-scarcity*); and unequal distribution of the resource (*structural scarcity*) (Homer-Dixon, 1994, 1999). From this point of view, the combination of different types of scarcity leads to 'ecological marginalization' and 'resource capture'. Resource capture refers to situation where powerful elites politically ensure their own access to scarcer and scarcer resources at the expense of the rest of the population. In those situations, the institutional response to social unrest is weakened, which increases the occurrences of conflicts. Ecological marginalization is the migration of social groups in already ecologically stressed regions because of unequal resource access schemes and demographic growth affect resource degradation (Bernauer et. al., 2012: 2). The following diagram shows the causal pathway from environmental scarcity to violent conflicts as theorized by neo-Malthusians:

Figure 2.1: Environmental scarcity and violent conflict:



Sources: Bernauer *et. al*., 2012: 2; Homer-Dixon, 1994; 1999.

In sum, environmental scarcity (due to degradation, or depletion) implies decline in economic productivity and migrations, which eventually generates ethnic, socioeconomic or political conflicts (Gurr, 1985). The influence of this perspective is still important in this debate. For instance, Kahl used this framework in order to

explore the relation between resource scarcity, state failure and state exploitation (2006). The other prevalent perspective is the Cornucopian one, which is based on neoliberal institutionalist assumptions.

2.1.2 The neoliberal institutionalist perspective

"For the same reason that scarcity may initiate interstate conflict, it can initiate cooperation" (Dinar, 2009: 112; Dokken, 1997). The second – and certainly the most prolific – dominant discourse linking security issues with the environment is what Haas names as the "Cornucopian" view (2002: 3). Cornucopians see nature as boundless and robust (Simon and Khan, 1984; Bailey, 1995; Simon. 1995). In short, this perspective is more optimistic and positive than the previous one: environmental issues such as scarcity, or depletion, can be addressed through innovation and progress, and can be encouraged by the liberal economic system through cooperation and the institutionalization of the latter (Simon, 1989, 1996). Cornucopians are inspired by liberal (and neoliberal institutionalist) assumptions about the link between the environment and conflict/cooperation issues, i.e. that environmental issues threaten the achievement of states' national interests (Muir, 2011). But they are more optimistic than neo-Malthusians. If they acknowledge that environmental issues affect humans and their way-of-life, tenants from this perspective evacuate those threats by arguing that market-oriented mechanisms, technological innovation and, most importantly here for our research, the creation of institutions and regimes for resource allocation, will mitigate the impacts of environmental changes (Lowi, 1999: 389; Bernauer *et. al*., 2012: 2; Simon, 1996).

Cornucopians criticize the mainstream neo-Malthusian perspective because they ignore other key socioeconomic and socio-political factors that are more determinant variables than solely environmental degradation, depletion and scarcity (Matthew and Gaulin, 2001; Salehyan 2008; Koubi et. al., 2012, Barnett and Adger, 2007). They do agree that environmental issues can be an intervening variable in violent conflicts, but they tend to see environmental conflicts as a potential long-term threat that requires states to cooperate in order to solve it, rather than as an unavoidable finality (Bernauer et al, 2012: 2). Cooperation between resource users is the solution to mitigate and adapt to environmental changes. Hence, this perspective puts neo-Malthusian

arguments into question, since it provides solutions for environmental challenges such as depletion or scarcity through the promotion of market-based technical and innovative solutions (Haas, 2002: 3; Stucki, 2005). Cornucopians also perceive states' interdependence as a positive rather than negative parameter: an opportunity to cooperate rather than enter into conflicts (See Keohane, 1984). They argue that the creation of institutions allows states to harmonize their national security policies, to reduce transaction costs and to build trust with one another. Hence, states should act together, sign international agreements, and create international institutions and regimes in order to approach environmental problems as common security issues rather than opposing ones (Barnett, 2001: 5-6, 46). They are less interested in relative gains, for which distribution is based on power in an environment characterized by security issues, than in absolute gains on the basis of common interests (Stein, 1990: 46; Axelrod, 1984: 14). Thus, interstate and international institutions have a great role to play in defining national interests and identities, but also in fostering international governance (Young, 1997). Institutions are organizations, informal practices and, central to our study here: regimes. They encourage cooperation because they increase the number of interactions between participants (thereby developing trust and discouraging desertions), they improve the volume of information accessible to all parties, and they reduce transaction costs of agreements. Institutions are the physical representation of the sum of interests of the actors involved in a specific issue-area, but they also have a role in defining those interests, since they are supposed to supply for expertise, information and resources (Haas et. al., 1993). In sum, joint outcomes are preferable to independently reached ones (Stein, 1990: 39).

On TNRs, the institutionalization of cooperation commonly takes the form of international environmental regimes. Indeed, TNRs are grasped as issues of common interest, as motivations for creating international regimes on transboundary environmental resources in order to coordinate their actions towards rational win-win solutions. Interdependence, which is central to TNRs, is not seen as a potential source of conflict due to unbalanced power relations, like realists would argue, but rather facilitates a relationship in which actors will act on the basis of coordinated agreements with other parties (Dinar, 2009, pp. 115-116) The creation, maintenance and consolidation of international regimes as cooperative schemes are thus central to this perspective (Young, 1997; Levy et. al., 1993; Levy et. al., 1995). For instance,

resource scarcity due to environmental degradation encourages states to work together in order to limit degradation and develop a common interest to share the resource in a peaceful way (Deudney, 1991). It also provides benefits to the resource itself, by enabling a better management (Sadoff and Grey, 2002: 403).

Finally, this second dominant perspective is closer to the empirical reality of TNRs. One can indeed easily witness a proliferation of international regimes - through treaties and agreements – since the 1970s on environmental issues, such as on transboundary water resources, marine pollution, ozone depletion, biodiversity, forests, etc. Theoretically too, our perspective is closer to the Cornucopian than the Neo-Malthusian one, despite key theoretical shortcomings evoked below.

2.1.3 Shortcomings of mainstream theories: critical contributions

If those two frameworks are commonly recognized as the principal ones (Haas, 2002: 3; Spring and Brauch, 2009; Bernauer et. al., 2012), the discussion recently expanded to critical authors, who added their contributions to the debate. Most of the shortcomings identified below are issued from critical and radical views (Zeitoun and Warner, 2008; Booth, 2005; Deudney, 1990, 1997), and tenants of the theories of political ecology (Dalby, 1999; Dalby, 2013; Fairhead, 2001; Gleditsch and Urdal, 2002; Robbins, 2004, watts, 2013). The general idea behind these views is that resource availability is not the sole issue. The way resources are distributed and allocated, hence the social context behind which decisions that affect the environment are taken, is missing (Haas, 2002: 3). That being said, the following paragraphs introduce a few critics and shortcomings, which are central to our research objectives; (we do not try to gather a holistic critical account of those two mainstream views). Those critics basically lie in: the theoretical narrowness in the way they embrace the scope of TNRs; and unconvincing epistemological assumptions. We begin with the lack of empirical truth, which is a criticism that only characterizes the neo-Malthusian perspective, then we introduce critics that are specific to liberal-cornucopian arguments, before focusing on what concerns both frameworks, since they overlap in some ways.

Firstly, empirically, numerous contributions have tested the direct or indirect causal inference between environmental issues – in particular environmental scarcity – and

the occurrence of conflicts. The case studies proposed by Neo-Malthusians are chosen for their specific circumstances. They are all looking at developing countries (Liftin, 1999: 363), where a combination of some of the followings occur: resource scarcity is severe; the legitimacy of governments is put into question; and they are characterized by particularly tensed socio-political relations where domestic conflicts might even already happen (Gleditsch, 1998). Bernauer *et. al.* saw this flaw and criticized the fact that most of those case studies are based on a 'grounded theory' approach where "theoretical arguments are developed inductively, based on an in-depth analysis of individual cases" (2012: 3). Thus, those cases are chosen to illustrate their theoretical assumptions rather than to test them. They are useful since they help us understanding in depth specific cases, but they cannot be used to generalize findings of causal relations between environmental issues and violent conflict. Also, they remain unconvincing because their analysis is grounded on a narrow theoretical framework, which essentially tends to ignore other key factors that are more substantial to explain the incidence of conflicts in those regions. Lowi, who strongly doubts that there could be war on resources, admits that it could eventually happen in cases where there is short supply, high dependence on the resource, shared by adversarial states, with constraining geographical positions and power configurations (1999: 385). In other words, it is extremely unlikely. Besides, those cases tend to be selected on the independent variable. In all cases of violence, they see the cause in the "resources" variable rather than any other, and thus "neglect the vast number of cases in which resource scarcity did not generate conflict" (Haas, 2002: 7). Indeed, if a few studies confirmed those findings (see Hauge and Ellingsen, 1998); others demonstrated the prevalence of additional political and socioeconomic variables as more significant explanatory independent variables for the occurrence of conflicts. In reality, this hypothesized causal inference faces more counter-examples than empirical confirmations (Ostrom, 1990). Haas shows that the model neglects fundamental variables such as the importance of prices and markets and policy interventions to push in favor of technological innovation or substitution, poverty reduction, or resource investments, as solutions to avoid the deterministic consequences advanced by the author (2002: 7-9). This recalls the Cornucopian economic arguments. Theisen *et al*, for instance, showed that drought has no real impact on civil conflicts in Africa, compared to other factors such as the political and economic marginalization of ethnic groups (2012). Olson demonstrated that the link between demographic growth on the

one hand, and a decline in economic productivity on the other is not as evident as pretended, since various significant cultural, economic and political factors are wrongly absent of the analysis, as illustrated in the "counter-analysis" of Rwanda's case, as a response to Homer-Dixon's own study of the same case (see Olson, 1994). Haas goes even further and argues: "no one has been killed in direct international conflict over any resource" (2002: 7). In the end, there is a clear lack of empirical evidence, and no study has proven environmental issues to be either a necessary or a sufficient condition for conflicts to occur (Lowi, 1999: 388; Saleyhan, 2008: 317). At best, resource scarcity is an intervening variable that can influence violent outcomes, not a determining one (Lowi, 1999: 390). On this specific point, we agree with Cornucopians.

Secondly, neoliberal-institutionalist views are not free of critics either. Empirically, at least, we agree with the Cornucopian perspective: states tend to cooperate rather than enter into conflicts on shared resources. However, as an analytical framework, it contains several shortcomings. To start with, we argue that the overwhelming amount of cooperation on resources compared to conflicts does not mean that cooperative schemes – or regimes – are conflict-free, which is a notion that is rarely taken into account by neoliberal-institutionalist thinkers. They tend to focus on the situational outcome of international regimes on the matter, i.e. cooperation. This employment of the concept is not convincing enough. It is based on strong positivist epistemology in order to both: investigate the nature of and the limits to international governance; and be capable of making predictions about international orders (Gale, 1998). A regime tends to be understood as a "good thing" that shall proliferate as much as possible to ensure cooperation between protagonists. However, the experiences taken from individual cases might not reproduce in all regions, therefore one should be very careful when making predictions on such variable issue as the environment. Also, we affirm that this view is too optimistic, in the sense that – and one can sense some Neo-Malthusianism influence here – they see resources as limitless growth and new technologies are solutions which will always enable humans to avoid resource scarcity (Myers and Simon, 1994). Indeed, those two factors (growth and innovation) can have a reverse effect, creating more problems than solutions by taking part in the depletion of the environment at all levels, an idea that would involve accepting the influence of humans on the planet's system and functioning (Dalby, 2009). This

theoretical bias is a cause of Cornucopians' conceptualization of nature as a boundless and resilient resource, which should be submitted to market mechanisms through a non-interventionist style of management (Jordan & Riordan, 1997: 28). In the same vein, others argue that the key to avoid conflicts lies in the reduction of social inequalities, since the occurrence of higher levels of inequality implies environmental degradation and resource depletion (Baland et. al., 2006; Boyce, 1994). Hence, the concepts of growth and innovation are variables that have an importance, only if their products are distributed and allocated in a way that reduces inequalities, rather than reinforce them. Like for neo-Malthusians, this perspective tends to forget essential variables of socioeconomic, sociopolitical and geographic nature, such as economic marginalization (Theisen et. al., 2012). In sum, this perspective entails narrow postulates about the nature of the interstate system and the environment. Thus, the key difference between our research and this perspective is that we analyse the fundamental interests that benefit from the established order from a critical perspective in order to understand the underlying processes of the creation and maintenance of regimes, rather than focusing only on their outcomes (Strange, 1982). From this point-of-view, the in-depth study of power relations is central. As Gale nicely puts it: "the purpose of examining international regimes is precisely to reveal the underlying bargains upon which they have been constructed" (Gale, 1998: 261).

Thirdly, the main criticism made to those two perspectives together is their propensity to frame environmental issues as security matters, notably through the diffusion of concept of environmental security. Academics largely agree that resource scarcity can contribute to catalyze existing sociopolitical tensions, yet most of them take their distance with the arguably risky generalization of the link made between the environment and security (Barnett, 2000; Dalby, 2013). This securitization of the discourse relative to environmental issues provides a narrow definition of security, a concept for which the definition is complex and contested (Smith, 2005: 27-28). An illustration that this discourse has become mainstream is proposed by Chalecki, who asserts that despite skeptical arguments, the discourse has shifted in the 1990s "from whether or not the environment could affect security to how the environment could affect security" (Chalecki, 2010: 3). Here, we focus on three main issues relative to this weak conceptual shortcut. Firstly, the materialistic vision (mostly military) of environmental security dominates the political agenda at the expense of broader

definitions of the concept (Deudney, 1990, 1997). This discourse is said to be counterproductive since it privileges military responses to environmental issues, despite the fact that it "discredits efforts at environmental protection by associating it with a flawed causal argument that environmental scarcity contributes to violence" (Haas, 2002: 8). Those assumptions made the case for the tenants of the traditional security doctrine by keeping the environment as a matter of "low politics", which makes them underestimate the potential impact of environmental degradation due to human activity, as induced above (Stoett and Laferriere, 1999: 3-5). Secondly, and linked with the latter, viewing environmental resources as threats to national security justifies a state-centered discourse blinded to defend national interests. This perspective fuels the precedent consequence that only the state' security/military apparatus are able to deal with such threats, which is in reality quite irrelevant, and can lead to severe misunderstandings and biased policies (Dalby, 1997: 16-17; Liftin, 1999: 4). This also means that the most powerful actor, in terms of material capacities (its economic and military ones) will thus deprive its neighbors from accessing the resource, which is itself part of the national power of states. If power asymmetry certainly is an intervening variable in defining resource distributions and international relations' outcomes on the matter (conflict or cooperation), we argue that the exclusively materialistic view of the concept is again too narrow to deal with the reality of TNRs. We agree with Deudney who affirms that those who insist on securitizing environmental issues only wish to "add urgency to environmental problems" in their interest (Deudney, 1991), since it is constructed by the actors that have the capacity to do so. Limiting security to its material aspects gives too much ground to the traditional views of the concept. Because security is also a discursive practice, all social actors concerned should construct it, and analyses should differentiate issue-types and regions (Liftin, 1999: 364). Lastly, there are also several epistemological problems with linking environmental issues with security. Deudney affirms, rightly we argue, that traditional security issues are defined by "them and their behavior", while environmental problems involve a long-term vision of "us and our behavior". Thus the two concepts are problematic to link together because of this fundamental difference in their nature (1990: 468). Allenby confirms that one must differentiate between a global view that is essential to address issues of human security such as the environment, while tenants of the traditional security doctrine tend to focus on a national state view, which focuses on the interests of the state

instead of regional or global systems (Allenby, 2000: 9). Also, some authors even argue that the debate is biased from the beginning, since environmental scarcity may actually be the consequence of conflict, rather than the cause of it (Gleditsch, 1998). Studies supporting neo-Malthusian and Cornucopian perspectives tend to focus on how environmental scarcity affects politics and economy, and not the other way round; thus little attention has been given to the real effect of environmental scarcity and degradation as a direct cause of conflicts (Gleditsch, 1998; Levy, 1995).

To conclude, we will not follow these perspectives, because of these shortcomings. Their analytical frameworks are too narrow, which limit their capacity to embrace the whole complexity of TNRs. Yet, we will keep a few of their assumptions for our own theoretical framework, as we shall see below.

2.1.4 Discussion

In order to do remedy to those issues inherent to case-study analyses, there is a need for developing quantitative studies that focus on a specific resource with its own characteristics, according to the type of conflict under study (intra-state, or interstate). The socioeconomic and socio-political inferences of environmental changes vary depending on the resource under study (forests, soil, water, etc.), but also depending on the specificities of the geographical area's conditions and the social environment of those resources (Bernauer *et. al.*, 2012: 3). However we do not deny that those resources could lead to conflicts under specific circumstances, but we argue that this idea cannot be generalized.

The least one can say is that there is no agreement in the literature dominated by those two antithetic perspectives. Theoretically, these two conflict- and cooperation-oriented views are valuable because they offer a vast, loaded and fruitful debate, which is the way forward to improve the theorization of those issues. However, we sense that they have a limited explanatory power for the analysis of the international security and international political economy dynamics related to this specific issue-area. If we discard the first perspective, the second one will be of interest to fulfil our objectives here despite our divergent epistemological assumptions about regimes with mainstream ones. Also, both perspectives tend to spot the light on either pessimistic or optimistic situational outcomes, which hide other factors such as underlying

circumstances and decisive driving-forces at the heart of any specific transboundary resources' regimes. Liftin offers us a perfect quote that sums it up: "Whether environmental problems are seen as a source of conflict or as an impetus to cooperation, naturalizing them not only obscures the extent to which problems are socially constructed through intersubjective understandings but also predisposes analysts and practitioners to ignore their deeper social, economic, and political roots." (1999: 361). Indeed, in order to understand the deeper reasons for conflict or cooperation to occur on a specific case, one shall analyze all the ins and outs of interstate sociopolitical relations before making any environmental-related generalizations on the basis of case-study qualitative analyses. In this aim, the theoretical contributions of critical and constructivist authors will be central, since they disentangle human-oriented causes and social constructions behind environmental-related conflicts and/or cooperation. Yet, we have only touched upon those contributions while analyzing those two mainstream views, but they will be of great importance in our own theoretical framework, in particular for their conceptualization of power relations. Another lesson from this theoretical background is empirical: we found that it is problematic to generalize any linear causal relations between environmental issues and either conflict or cooperation, especially on the basis of specific case studies' qualitative analyses (Bernauer et. al., 2012: 3). Results are contradictory because of differences in the type of conflict (local, international, political, etc.), the issue itself (the type of resource: water, forests, etc.), and the situation (geographical area, time-period, etc.) under study (Bernauer et. al., 2012: 4). In the end, the research puzzle of this study lies in the paradox between: the worrying features of the state of TNRs nowadays accompanied with the catastrophist discourse based on the Neomalthusian approach introduced above, and relayed by the media, which could make anyone think that they are obviously prone to conflicts; and the empirical reality, which shows that riparian states tend to institutionalize cooperation on those resources through the creation, development and consolidation of international – or interstate – regimes on the same resources.

Yet, this puzzle raises a few central questions for our research. Most importantly, on the basis of those theoretical and empirical findings, we wish to understand **why states rather cooperate with other states on TNRs?** We indeed witness a growing development of international regimes on those issues during the last decades, both at

the regional and global levels, **but what explains this situation? Why do states cooperate on TNRs despite the potential for conflicts that they embed? When they do, what are the factors that hamper or improve cooperation? What are the factors (or variables) that enlighten best these processes and mechanisms that shape, transform and consolidate international regimes over TNRs? Why is cooperation more institutionalized in some cases than others? Are those cooperative schemes really conflict-free or do they embed conflictive interstate relations?** Those are the central research questions and sub-questions of our thesis. We will attempt to answer them as precisely as possible through the analysis of a specific resource: Transboundary Water Resources (TWRs). We will thus try to understand at best why states cooperate, rather than enter into conflicts, on TWRs.

Following this summary of the debates and the questions the latter raised, we wish to undertake a mixed-methods analysis in order to first grasp best the factors that lead states to cooperate (rather than enter into conflicts) with other states sharing the same resource, before analyzing in depth our results through the analysis of one particular case study, in order to limit the methodological constraints of building only on a quantitative or a qualitative analysis. Focusing exclusively on another qualitative case-study analysis of why states enter into conflict while it is clear that environmental issues mostly lead to cooperation is, in our point of view, unproductive. However, trying to understand the reasons why states tend to cooperate through a mixed method design is certainly lacking in this field of research. We will keep in mind the critics made to those two mainstream perspectives in order to achieve our goal.

In the next section, we first explain why TWRs are the best case study for the purpose of our research, showing that they perfectly fit the debate summarized above. We introduce the central theoretical insights at the heart of the field of *hydropolitics* in order to grasp best the specificities of those resources in terms of conflict and cooperation at the international level.

2.2 The case of Transboundary Water Resources

2.2.1 Why Transboundary Water Resources?

As argued by Bernauer et. al., each resource has its own social and political environment that makes it extremely difficult to compare and attempt to make generalizations while studying diverse resources at the same time (2012: 3). We chose to study TWRs for several reasons.

To start with, water is – like most resources – a political resource. Firstly, one can witness increasing competition for the diverse uses of water at the local, national, regional and international levels. Agriculture, for instance, accounts for more than 70% of the world's freshwater consumption (more than 80% in "the developing world" (UNDP, 2006: 137-8). At the same time, all other sectors – industries, domestic use, tourism, cities, transportation, hydropower, among others – increase their consumption over time in all parts of the world (UNDP, 2006: vi). This growing inter-sectorial competition, the limited quantity of water on the planet, and the fact that its natural allocation is very diverse (Le Prestre, 2005: 398), make it a political issue of first importance for the XXIth century, as recalled by several Secretary-General of the UN, such as Kofi Annan in 2001: "fierce competition for fresh water may well become a source of conflict and wars in the future" (Wolf, 2007: 241; Jarvis, 2010: 1; Delli-Priscoli, 2010: 3).

Then, unpredictable factors such as population growth and climate change, but also the existence of some areas in the world that are already "water stressed", tremendously complicates even the idea of making predictions. Climate change, for instance, adds variability to the precipitations and water availability that leave some geographical areas with too much water, or too little (Chalecki, 2010). Broadly, the combination of an increasing demand and a (more and more) limited supply makes freshwater resources a strategic concern for governments at all levels, which tends to give way to pessimist authors for what relates to linking directly water issues and conflicts (Chalecki, 2010).

Another element is the fact that most of the freshwater resources on Earth are transboundary. We define TWRs as "shared freshwater resources located along or across the border of at least two states". The interdependence of states on TWRs

combined with the growing competition over the resource at the local and national levels makes of TWRs international political issues. As Elhance nicely puts it: "the multiple-use of transboundary water makes hydropolitics one of the most urgent, complex, and contentious issues that the developing countries and the international community will have to face and resolve in the next century" (1999: 4). Indeed, the fact that TWRs or lakes do not respect states' borders has great consequences on the interstate politics of management of these resources. River riparians are naturally physically interdependent to each other because of this transboundary characteristic. A riparian (or "riparian state") is "a state sharing a transboundary water resource with at least one other (riparian) state". It is the complexity of the hydrologic, environmental, economic, political and security interdependence that makes TWRs a compelling case for the analysis of conflict and cooperation at the interstate level (Dinar, 2009: 111; Elhance, 1999: 13). This is why we consider hydropolitics as the central theoretical input of our research, since hydropolitics is "the systematic study of conflict and cooperation between states over water resources that transcend international borders." (Elhance, 1999: 3).

Last but not least, TWRs perfectly fit the academic debate on TNRs introduced above, as a typical case of disagreement between, on the one hand, pessimistic authors who grasp the "blue gold" as the main source of conflict of the XXIst century (Starr, 1991; Ward, 2002; Cooley, 1984; Naff and Matson, 1984; de Villiers, 1999), and the more optimist ones who raise doubts on the possibility for water wars on the basis that historically, and in particular recently, states mostly cooperated on TWRs and will continue to do so through the development of win-win solutions notably through the creation, maintenance and consolidation of transboundary regimes on the matter (Frey and Naff, 1985; Postel and Wolf, 2001; Allan, 2001; Deudney, 1999; Ohlsson, 1999; Ohlsson and Turton, 1999).

2.2.2 A conflict-oriented discourse

As induced above with Kofi Annan's quote, the prevalent discourse on TWRs relayed in the media and at the policy-making level is quite pessimistic. Indeed, the supposition that water conflicts or wars will occur sooner or later is very common, as a consequence of the mainstream discourse on environmental security introduced in

the first section of this chapter. More recently, Ban Ki-Moon confirmed this tendency, affirming: "our experiences tell us that environmental stress, due to lack of water, may lead to conflict, and would be greater in poor nations" (Ban, 2008). Neo-Malthusians' general assumption that environmental scarcity is a triggering factor for conflicts paved the way for other authors to associate water scarcity with the same contentious consequences. Elhance confirmed that

> *"it is when severe scarcities of an essential, nonsubstitutable, and shared resource, such as freshwater, are experienced or anticipated by one or more states, or when such a resource is rightly or wrongly perceived as being overexploited or degraded by others at a cost to oneself, that states may become prone to conflict. Even in the absence of debilitating scarcities, conflict among states may arise from the belligerent, resource-expansionist claims of one or more states"* (1999: 4).

Water has indeed been the key resource chosen by pessimistic authors to empirically justify the direct link between scarcity and conflicts. This has led to claims that sharing a river might increase the risk of interstate conflict, the so-called 'water war' hypothesis (Starr, 1991). In terms of interstate conflicts, it is true that mostly all existing quantitative work relates to water scarcity as the key independent variable explaining the occurrence of interstate conflicts (Bernauer et. al., 2012: 3). A central study on the matter was completed by Gleick, who showed that in some cases, water scarcity could lead to armed conflict, even if most disputes lead to political confrontations rather than violence (1993). He illustrated his research with several types of conflicts related to water scarcity in diverse geographical areas of the world: growing competition over limited resources on the Nile, Jordan, in Central Asia or on the Ganges-Brahmaputra river systems; contamination of the resource by upstream parties such as on the Rhine or the Mekong; or already tensed political relations in the Middle East and the Persian Gulf, among others (Gleick, 1993). Other authors confirm that water scarcity can reinforce tensions and eventually lead to violent conflicts, in regions where religious, ethnic and political conflicts are already the norm, such as in the Middle-East, North-Africa, and in many parts of South and Central Asia (Amery 2002; Morrissette and Borer 2004). More recent contributions include Hauge and Ellingsen's research (1998), which explored the importance of scarce supply of freshwater, combined (or not) with high population density, as increasing the probability of armed conflict. Many other large-N empirical studies suggest a direct link between TWRs and low-intensity or latent conflicts (i.e. not

violent or armed conflicts) (Toset et. al., 2000; Gleditsch et. al., 2006; Hensel et. al., 2006; Brochmann and Hensel, 2009; Dinar, 2009; Dinar et. al., 2011; Furlong et. al., 2006; Gizelis and Wooden, 2010).

In international relations, realist and neorealist theorists tend to support such claims. For them, resource scarcity affects the possibility of institutional cooperative development, obliges states to capture resources through the use of power, and eventually leads to interstate conflicts (Hobbes, 1973 [1660]; Morgenthau, 1967; Waltz, 1979; Gilpin, 1975). Interdependence is seen as a weakness that each state will try to reduce, whatever the costs, because it highlights their vulnerabilities to the other riparians (Dinar, 2009: 114). Hence, some states are concerned for their territorial integrity or loss of sovereignty – typical realist and neorealist core concepts – which explains why several of them (such as Egypt on the Nile, or Israel on the Jordan) tend to view TWRs as a national security issue that could lead them to violence, or even war (Elhance, 1999: 7). From this perspective, cooperation seems difficult since states will systematically take their distance with other riparians in order to preserve as much independence as possible on the shared resource (Dinar, 2009: 113-5). This would lead to a decline in trust, and at some point in time riparians' relations might become too unstable, until any further shortage or unilateral action by another riparian could be the straw that will break the camel's back.

In spite of those recent studies, which provide interesting and relevant insights on the risks of violent conflicts between TWRs' riparian states, it is still unclear to what extent water-related issues are truly the causes of such conflicts (Kalbheen, 2011: 716). As for TNRs, water seems to be more of a catalyzing factor, in specific cases, rather than a direct cause.

2.2.3 A cooperation-oriented reality

Nevertheless, the reality is very different. Many other studies emphasize the high amount of cooperation over TWRs (Yoffe et. al., 2003; Wolf, 1998; Wolf, Stahl and Macomber, 2003; Dinar et. al., 2007; Wolf, 2002; Brochmann and Gleditsch, 2006). Water scarcity, which is central in the "pessimist" discourse, is grasped as an opportunity for states to interact with one another, not because of, but rather thanks to the economic, political, environmental and security interdependence embedded in

TWRs (Elhance, 1999: 6). Greater water demands tend to increase the likelihood of successful negotiations between riparian states (Hensel, Mitchell and Sowers, 2006; and Brochmann & Hensel, 2009). It is indeed sounder and more profitable for all riparians to enter into negotiations in times of shortage (Haddadin 2002; Wolf 2007). The interdependencies at the heart of international basins compel states to at least entertain the possibility for cooperation, and despite the anarchic system – dear to realist authors – in which states evolve, "states otherwise openly hostile to each other do often cooperate in many over and covert ways on a variety of issues and problems of mutual concern, hydropolitics being one" (Elhance, 1999: 6, notes 18 et 19).

Empirically, a short outlook of the situation clearly supports this more optimistic perspective, since water issues mostly lead to international cooperation. Indeed, only 17 water-related disputes involved the military in the twentieth century, whereas in History, thousands of water-related agreements have been concluded (Dinar, 2009: 109; Hensel et. al., 2006: 407; Toset et. al., 2000; Pacific Institute, 2013; OSU, 2009a). Some authors have efficiently proven this empirical reality through the rigorous compilation of exactly 1831 interactions between two or more riparian states for which water was the key driver of those cooperative and/or conflictive events for the period 1948-2000 (Yoffe et. al., 2003; MacQuarrie and Wolf, 2013: 177). The results comfort the idea that water issues lead to cooperation. For instance, the amount of cooperative events noticeably overwhelms the record of acute conflict over TWRs. Plus, more than two third of the conflictive events took the form of "verbal" interactions, and only two types of issues let to acute conflict: water quantity and infrastructure issues (MacQuarrie and Wolf, 2013: 177). As Wolf and Hamner nicely put it: "the more valuable lesson of international water is as a resource whose characteristics tend to induce cooperation, and incite violence only in the exception." **(**Wolf and Hamner 2000, 66).

Let aside this extremely useful event-data analysis, Wolf is also involved in the creation (and continuing development) of the International Freshwater Treaties Database, a key resource for hydropolitical researchers which compiles more than 400 agreements on multiple water issues on TWRs between 1820 and 2007 (OSU, 2009c; UNEP and OSU, 2002. Those agreements are the bases of the numerous existing bi- and multilateral regimes on TWRs. They can take many forms: from the simple bilateral agreement on a single specific issue (navigation, hydropower, fisheries, etc.)

to the establishment of advanced cooperative arrangements establishing basin-wide water-related institutions (committees, commissions, or "river basin organisations"), of which goal is the full joint management of resources by riparian states. Echoing Elhance's quote on hydropolitics being one of the issues for which even hostile states cooperate on issues of mutual concern, MacQuarrie and Wolf introduce examples of such situations, such as the Indus River Commission, which outlived two major wars between Pakistan and India or secret talks between Israel and its neighbours on the Jordan, for instance (MacQuarrie and Wolf, 2013: 177).

2.2.4 Discussion

We tend to follow the second voice here, but with some different epistemological assumptions on cooperation than traditional liberal thinkers, as we shall see later. We agree that cooperation is dominating international relations on TWRs: the empirical evidence is obvious and the growing number of international regimes – or the progressive institutionalization of this cooperation – on the matter confirms this tendency. However, we do not rule out the possibility that violent conflicts may occur. We are part of the researchers who argue in favor of the contention that transboundary water resources could lead to conflicts in the future, but only under conditions that are geographically, temporally, socioeconomically and politically very specific to the case itself (see also Lowi, 1999, Macquarrie and Wolf, 2013: 177-8). Yet, most interstate conflict on shared water resources take the shape of diplomatic tensions, or "conflicts of interests" (Dinar, 2009: 109) rather than violent interactions or wars (Dinar et. al., 2007; Wolf, 2002; Yoffe et. al., 2003), and we consider that those interstate disputes are triggering events when states start to talk to each other, and often realize that they are better-off cooperating than entering into conflictive relationships with their neighbors.

A difficulty for this research lies in the fact that some variables such as water scarcity or water stress can both lead to conflict or cooperation (Kehl, 2011: 220). Hensel et al. confirm this puzzle by claiming: "peaceful and militarized means for managing contentious issues are substitutable and driven by similar processes" (Hensel et al., 2008: 132; in Kalbheen, 2011: 716). This is where lie the epistemological grounds of our research: we wish to understand why states cooperate on TWRs while keeping in mind that the occurrence of cooperation does not imply the absence of conflict(s).

Most studies from the fields of environment, security and hydropolitics have tried to explain why institutionalized cooperation takes place on TWRs, principally through the analysis of formal treaties at the interstate level (Stinnett & Tir, 2009; Conca, Wu & Mei, 2006; Gerlak & Grant, 2009; Hamner, 2009; Tir & Ackerman, 2009); or how and why cooperation succeeds or fails (Gleick 1993; Elhance, 1999; Turton and Henwood 2002; Naff and Matson 1984); or even why specific variables – such as water scarcity, power asymmetry between riparian states, the level of governance of riparian states, the geographical configuration of the TWR under study (downstream-upstream dynamics), the level of economic development or inter-riparian states trade, could lead to cooperative schemes on TWRs (Espey and Towfique 2004; Gerlak and Grant 2009; Zawahri and Mitchell 2011; Kehl, 2011; Tir and Ackerman, 2009; Dinar, 2009; Dinar et al., 2011; Dinar, forthcoming, 2014).

We invest efforts not only on disentangling the factors explaining why states cooperate, which corresponds to the next part of the research, but also why states institutionalize this cooperation through the creation of international regimes on the matter while keeping in mind that cooperation "on paper" (treaties, agreements) does not necessarily mean that embedded conflicts and tensions, sometimes hindering cooperation "on the ground", do not exist. Contrary to those previous studies, we will not grasp cooperation as an outcome only, but also as an interstate political process in which power balances have a critical role to play. In this aim, we will have recourse to critical approaches of power relations and hegemony in order to spot the light on omitted – or untested – factors (hence variables) in the literature, and test them through a quantitative analysis focusing exclusively on multilateral rivers and lakes' basins (i.e. that gather three or more states).

3 Theoretical framework

This part introduces our theoretical framework, including the central variables of our study, as they will be tested in the next quantitative analysis based on the literature. The presentation starts with the dependent variable, followed by three categories of independent variables: "liberal peace arguments"; "power asymmetry", "power asymmetry arguments".

3.1 The dependent variable: the institutionalization of international (cooperative) regimes on TWRs.

The subject of this research is *cooperation (or conflict) over transboundary natural resources*. We have seen that cooperation rather than conflict characterizes existing interstate relations on those specific resources. Hence, the dependent variable of this research could be formulated as such: the *institutionalization of international (cooperative) regimes on transboundary water resources*. We wish to understand why – and how – the later are created, maintained and consolidated. Before anything, we introduce here the basic definitions of the central concepts of the study, such as cooperation, regime or institutionalization.

Cooperation is a traditional liberal concept (Hasenclever et. al., 1997; Le Prestre, 2005). Keohane claimed "intergovernmental cooperation takes place when the policies actually followed by one government are regarded by its partners as facilitating realization of their own objectives, as a result of a process of policy coordination" (1984: 51-52). In that sense, he argues that cooperation takes place only in situations where actor's policies are conflictive; else it would be natural or "harmonious". Cooperation thus is a way to achieve an actor's objective, rather than an end in itself. This view of the concept perfectly fits our assumption that cooperation schemes embed conflictive relationships. It also fits TWRs, which are known to be very contentious issues between riparian states.

The hundreds of treaties and agreements evoked above are tangible evidences of interstate cooperation on TWRs. They established numerous international environmental regimes as cooperative schemes (Young, 1997; Levy et. al., 1993; Levy et. al., 1995). International regimes are commonly defined as

> *sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of*

> *international relations. Principles are beliefs of fact, causation, rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or postscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice*. (Krasner, 1982: 185-186)

Regimes give responses to specific problems on a specific issue-area and can materialize in the form of treaties, agreements, traditional rights or even international organizations (Hasenclever et. al., 1997). In our case, the "given area of international relations" is obviously TWRs. Each regime is a specific combination of norms, interests, power relations and knowledge (Young, 1997) that shape its outcomes. Some treaties encourage multilateral projects and others edict specific rules and norms, among others (Levy et. al., 1995). In the case of TWRs, rules and norms can be materialized as distributional arrangements, extraction quotas or quality measures, for instance.

Levy *et al.* add that regimes are institutions, meaning "persistent and connected sets of rules and practices that prescribe behavioral roles, constrain activity and shape expectations" (Levy et. al., 1993: 4-5). It implies that there exist different levels of institutionalization, since some TWRs' regimes edict simple rules, while others establish international organizations in order to deal with water-related issues. Here, we define 'institutionalization of regimes on TWRs' as "the process, which formalizes common interstate codes of conduct, policies, activities, missions and strategies through the ratification and implementation of agreements or even the creation of institutions on TWRs".

The following paragraphs introduce our selection of key independent variables that explain why states cooperate on TWRs, based on a full literature review of the topic. Let us start with the liberal assumptions on the matter since cooperation is a traditional liberal concept, before focusing on the central assumption of our research: the importance of 'power asymmetry' and 'power asymmetry arguments' as key factors explaining the institutionalization of cooperation on TWRs.

3.2 Liberal Peace Arguments

We presented basic insights of liberal theory when introducing the two main voices of the discussion on environmental conflict and cooperation. Liberals and neoliberal institutionalists view cooperation – and ultimately its institutionalization – as the

logical outcome of interstate-shared resources issues. As we aforementioned, we sense that traditional liberal and neoliberal institutionalist arguments undoubtedly have some explanatory power for what relates to the development of international regimes on transboundary water resources..

We sorted liberal and neoliberal institutionalist arguments under the category of "liberal peace arguments". We identified three main categories that could directly explain the occurrence of (more or less) institutionalized cooperative schemes on TWRs: a *strong history of interstate diplomatic relations and cooperation***;** *economic interdependence;* and *the riparian states' level of governance.*

3.2.1 A strong history of interstate diplomatic relations and cooperation

Liberals argue that a constructive historical background of interstate relations is an excellent indicator of their capacity to enter into cooperative schemes. As argued by MacQuarrie and Wolf, one of the two "most crucial factor[s] determining the nature of the cooperation on water any one state will propose [are] is its existing relationship with other states in any given basin" (2013: 181). Indeed, a strong history of diplomatic relations between states is an incentive that encourages further cooperation on other fronts (Russett and Oneal, 2001; Sigman, 2004). On the other hand, the international reputation of one state suffers when it does not cooperate with its neighbors, since it cannot expect successful negotiations in the future because of its refusal to cooperate at some point on some issue(s) (Kalbheen, 2011: 719). The future of its relationship with other states depends on its attitude towards them in the first place, thus governments are supposed to be concerned about their relationships with their neighbors for their current or future economic or political relations (Bannett, Ragland & Yolles, 1998 in Kalbheen, 2011: 719).

A history of strong interstate diplomatic relations ensures that states trust each other and reduces uncertainty about the stability of potential cooperation on other common issues of interest, especially when states are used to participate to institutionalized cooperative schemes together. The participation to institutions through international treaties and agreements that establish rules and obligations for all parties: decreases uncertainty for what relates to the other parties' actions; reinforces interstate's trust; provides common long-term visions and benefits; reduces transaction costs; and

increase the cost of non-cooperation (Moravcsik, 1997). It is a virtuous circle in which trust between parties grow over time, thus they are more willing to ensure their interests in the long term, thereby reinforcing the scope of cooperation in a positive-sum fashion (Russett and Oneal, 2001). TWRs are part of the "other fronts", due to their embedded environmental, economic and political interdependencies that generate conditions favoring cooperation rather than conflict between riparian states (Elhance, 1999: 18).

An excellent example in favour of this argument is the Southern African region, in which the regional political integration of states through the Southern African Development Community (SADC) in the 1990s helped building trust between states with a long-lasting history of internal conflicts such as Mozambique, Zimbabwe, South Africa or Angola, among others. Since then, states cooperate on numerous economic, political and social issues, included transboundary rivers. The SADC Protocol on Shared Watercourses of 1995 (which was revised in 2000 in order to adapt it to new International Water Law rules and procedures) gave rise to numerous interstate agreements at the basins' level, some of which are now part of the most institutionalized schemes in the world, such as on the Orange (South Africa, Lesotho, Botswana, Namibia) or Limpopo (Botswana, South Africa, Zimbabwe and Mozambique) river basins (OSU, 2009c).

For the purpose of our research, we will thus consider two variables that might explain the level of cooperation on TWRs on the basis of this argument. The first one is "*the history of diplomatic relations*", and the second is "*the history of TWRs-related cooperation*". For the first one, we argue that the occurrence of long-lasting diplomatic relations between riparian states affects the institutionalization of cooperation on all realms of politics, including TWRs. The related hypothesis reads as follows: "The more riparian states have a long-lasting history of diplomatic relations, the higher the institutionalization of cooperation on TWRs". For the second one, we argue that if states have cooperated on TWRs for a long time, we expect TWRs' cooperative regimes to be more developed and institutionalized. The related hypothesis reads as follows: "The more riparian states have a long-lasting history of cooperation on TWRs, the higher the institutionalization of TWRs' regimes"[11].

[11] Note that this variable will only be used in the second part of the analysis, where we focus only on institutionalized basins, for which this variable takes all its importance.

Liberal authors also emphasize the importance of states' stability in terms of domestic politics and institutions as well as interstate economic relations as central factors supporting countries' ability to trust each other and thus achieve win-win solutions in the form of agreements, as we introduce below (Keohane & Nye, 2001 [1977]; Axelrod, 1984; Moravcsik, 1997).

3.2.2 Economic interdependence

Despite the lack of a direct link between interstate trade relations and TWRs' issues, economic interdependence is often argued to trigger cooperation on other issues by establishing a positive interstate context, notably through the reduction of transaction costs that it implies (Stinnett and Tir, 2009: 240; Gartzke et. al., 2001) and the facilitation of issue linkages and side-payments (Sigman, 2004; Bernauer & Kuhn (2010**).** The presence of established trade relationships means that trust between parties already exists; especially when they reach a level of interdependence that automatically diminishes the costs and risks of entering into further cooperative schemes with the same parties (Oneal & Ray, 1997; Tir and Ackerman; 2009: 628-9; Gartzke et. al., 2001) and states are more willing to delegate part of their sovereign authority to cooperative international institutions (Stinnett and Tir, 2009: 240). Economic interdependence indeed implies that the actions of one party affects the economic well-being of the other party(ies), and pushes them to use cooperative means to deal with other issues such as TWRs' ones. Neumayer, for instance, showed that trade openness encourages multilateral cooperation on environmental issues, and that the latter further facilitates cooperation in other domains of international relations (2002a**).**

Several authors indeed highlighted the importance trade interdependence as a factor encouraging states to enter into treaties regarding water quantity and water quality (Tir & Ackerman, 2009; Kalbheen, 2011: 715; Stinnett and Tir, 2009). Major trading partners indeed tend to engage in shared-river treaties (Espey & Towfique, 2004). Focusing on bilateral treaties, Tir and Ackerman also view economic integration as promoting bilateral cooperation (2009). Finally, the lack of economic interdependence is sometimes pointed at as an explanatory factor for the absence of cooperation on TWRs, such as in the Himalayan region (Verghese & Iyer, 1993). Tir and Ackerman

summarize: “in short, the established relations make new cooperative ventures easier, more beneficial, and less politically controversial” (2009, p. 629).

In this research, we argue that the presence of strong economic interdependence between riparian states should imply more cooperation on TWRs. More precisely, the linked hypothesis reads as follows: “The more riparian states are economically interdependent, the higher the institutionalization of cooperation on TWRs”.

3.2.3 The riparian states’ level of governance

Advancing similar arguments, liberal authors also embrace the idea that a high riparian states’ level of governance – i.e. in short, the fact that riparian states generally are composed of more democracies than autocracies – is a factor enhancing cooperation and its maintenance on TWRs. It indeed drives incentives in favor of further cooperation with neighboring states (Russett and Oneal, 2001).

The liberal literature argues that the stability of domestic political institutions sustains the functioning of the state and its ability to enter into cooperative schemes with its neighbors, but also its capacity to respect them (Young: 1989: 365). Democracies are said to be the best example on the matter, for several reasons: their rules are more transparent, which minimizes uncertainty over potential interactions with other states (Tir and Ackerman, 2009: 628); they “prefer to proactively deal with unresolved issues by institutionalizing rules that optimize desirable outcomes” (Tir and Ackerman, 2009: 628); they have a tendency to cooperate more in general (McGillivray & Smith, 2004; Leeds, 1999; Bayer, 2010; Mansfield, Milner & Rosendorff, 2002); and, for our purposes here, their governments are also particularly inclined to commit themselves more easily to environmental resources (Neumayer, 2002b; Bernauer and Koubi, 2009; Bernauer and Kuhn, 2010). Transparency implies that political information is public in a democracy, and that its population can access it, as well as its neighboring states. Transparency thus improves trustworthiness at he international level (Kalbheen, 2010: 718-9). Finally, the political structures of democracies hold political leaders accountable for their commitments, which are thus seen as more credible at the international level than the ones of autocratic leaders (Kalbheen, 2010: 718-9).

Following that stand, liberals argue that democracies, which are institutionally more robust than autocracies, tend to cooperate with each other more easily than with

institutionally weaker states (Dinar et. al., 2011: 811). It is the concept of "joint democracy". Russett and Oneal showed that democracies have common values and ways to deal with problems that encourages them to trust each other and cooperate more than with states with less stable domestic institutions such as autocracies (2001 in Stinnett and Tir, 2009: 240-1). Democracies perceive other democracies to be grounded on the same set of norms, values, identities and decision-making procedures (Kalbheen, 2011: 718), such as the way they deal with resolving conflictive political relations by compromise (Risse-Kappen, 1997; Gaubatz, 1996). For the same reasons, democracies also join international institutions and organizations when members are composed of other democratic states (Mansfield and Pevehouse, 2006). They will not fear losing some of their sovereignty in favor of those institutions if they know that the latter's membership is made up of other democratic states (Stinnett and Tir, 2009).

This assessment about the level of governance of neighboring states has critical consequences for our subject of research. Indeed, it suggests that states with a high level of governance (at best, democracies) should be open to higher institutionalization of transboundary basins' agreements with each other. LeMarquand even affirmed that treaties on shared rivers are an illustration of riparian states' respect toward their neighbors (1977). Dinar et. al., working on bilateral treaties, directly proved that the riparian states' level of governance is a salient variable explaining interstate cooperation and agreement formation (2011: 809). Finally, in this research, we expect to witness more evidences of (institutionalized) cooperation in basins where the general level of governance is high. A high level of governance among a TWR basin thus induces mutual trust and better odds for treaties' enforcement. Therefore, we make the hypothesis that "a high level of governance among a river or lake basin implies higher levels of institutionalization of cooperation between riparian states". In the end, both economic and political interlinkages may encourage cooperation over shared rivers (Kalbheen, 2011: 715).

3.3 Power asymmetry

3.3.1 Introduction

In addition to interstate relations, the distribution of power (or power asymmetry) between riparian states has also been argued to directly influence conflict and cooperation mechanisms on shared basins (Elhance, 1999: 18; Zeitoun and Warner, 2006; Cascao, 2009; Dinar, 2009; Lowi, 1993, 1999; Kehl, 2011: 218). This is predominantly a realist argument (Morgenthau, 1967; Waltz, 1979; Mearsheimer, 1995). As we saw before in the literature review, realists view conflict as the logical outcome of TNRs' issues. Indeed, from this perspective, cooperation is difficult to initiate between riparians, but there are some configurations for which it is possible, and in which power asymmetry has a great deal to play, as we shall see below. Some studies still showed that power asymmetry (defined in terms of relative capabilities) improves interstate relations within bilateral configurations (Hensel et. al., 2006; Brochmann and Hensel, 2009). A very powerful state (or hegemon) can indeed force weaker riparians to sign treaties that adversely affect them, and which are in the favor of the hegemon itself, through coercive bargaining mechanisms (Kehl, 2011: 219; Elhance, 1999). From this point of view, powerful states create interstate institutions in order to preserve or reinforce their own interests (Mearsheimer, 1995). But this mainstream perspective of power defines the concept as the possession or mobilization of material capacities which, we affirm, is a theoretical oversight since power is a much more complex concept of international relations than just its visible materialistic form.

We argue that power asymmetry is crucial for the purpose of our research. We make the assumption that historically, TNRs (and thus TWRs) have been spaces where conflict and cooperation coexisted at all times, and where past and current power relations forged the – often institutionalized – existing regimes. Even if most studies imply their existence at all levels – Young, for instance, affirmed that regimes are not necessarily equitable agreements since they can institutionalize inequities (Young, 1997) – seldom are contributions that critically analyze various dimensions of power relations from multiple perspectives, as crucial explanatory variables inherent to the ins and outs of the creation and maintenance processes of international regimes. Doing so will allow us to go beyond utilitarian conceptions of the concept embedded

in rational approaches. We will not limit ourselves to narrow interpretations (like realists' ones), but rather explore several dimensions of the concept, inspired principally by critical approaches. An enlarged conception of power is indeed necessary to enlighten all the complexities inherent to the concept of international regimes – from its potential coercive mechanisms to the ideas at the origin of its norms, rules, principles and decision-making procedures.

In this aim, we were inspired by one specific theory: the hydro-hegemony framework, of which basic objective is to analyze power relations entailed within international water regimes (Zeitoun, 2006; Zeitoun and Warner, 2006). This framework shows how the presence of a very powerful actor (or hegemon) on a TWR affects regional geostrategic relations, socioeconomic development, and the equity of the basin's regime; and demonstrates how much the concept of hegemony proves to be extremely useful to understand the exercise of power. Authors from this approach determine the existence of river basins where the influence of the most powerful state on the water regime can either be somewhat positive in terms of distribution of benefits and regime stability, such as on the Orange river (where South Africa is the hydro-hegemon) (Turton, 2005); or clearly negative and where the situations are obviously unstable (like Egypt on the Nile (Cascao, 2008, 2009; Carles, 2006), Turkey on the Tigris and the Euphrates (Daoudy, 2005; Warner, 2005), and Israel on the Jordan (Allan, 2001; Selby, 2003a, 2003b; Zeitoun, 2006), though without interstate physical violence, as pessimistic views would argue. In accordance with our assumptions, they show that "the absence of war does not mean the absence of conflict" (Zeitoun, 2006: 43), thereby opening the door to investigate regimes where strongly embedded power relations (hegemonic, in this case) might explain the maintenance of – stable or unstable – regimes characterized by asymmetric outcomes, in-between war and peace, in order to take some distance with the (quite) polarized debate exposed above. These situations do not seem to refrain states from reaching official agreements, thereby nurturing well-established regimes or developing new ones, and the case studies evoked above are even part of the most institutionalized basins in the world. In spite of its inspirational content, we will not directly use the framework as it is (see footnote[12]).

[12] The hydro-hegemony framework is perfectly fit to analyze cases independently from one another. In order to achieve our quantitative analysis, and in spite of several similarities, we

The question that centralizes our attention here is: why are there more and more evidences of interstate cooperation on transboundary basins although some embed significant asymmetric power relations between riparians? This phenomenon raises several other questions, such as: does the existence of asymmetric power relations between riparian states catalyze the development of institutionalized regimes? The next section will introduce the contributions of mainstream perspectives, before we introduce our own definitions and assumptions on the matter.

3.3.2 Mainstream contributions and critiques: Theories of Hegemonic Stability

In theories of *international relations*, the contributions of mainstream authors again fail to be entirely convincing. The closest ones to our debate are theories of "hegemonic stability", which attempt to determine the role of extreme power asymmetry (hegemony) as a sufficient and/or necessary condition to explain the development of international regimes.

On the one hand, realists define hegemony as a state's ability to "single-handedly dominate the rules and arrangements ... [of] international political and economic relations" (Goldstein and Pevehouse, 2005: 107). The main contribution of realists to our debate is the Hegemonic Stability Theory (Gilpin, 1987; Kindleberger, 1981), which states: "longer periods of cooperation and order are the result of the exercise of hegemonic power (Gale, 1998: 256)". The hegemon has the capacity to establish regimes and maintain its dominance through the provision of a collective good in favour of its interests (Gilpin, 1987; Keohane, 1984; Kindleberger, 1981). In this aim, the hegemonic state in a world capitalist system will choose to follow economic policies that will enhance its wealth and its economic dominance, i.e. trade openness, while ensuring the compliance of its subordinates to accept the system through the exercise of power resources. This theory is based on the high levels of observed international cooperation in the period after WWII in parallel with US hegemonic dominance, when the international liberal economic order was adopting international

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will not found our analysis on exactly the same definitions of the central concepts of power and hegemony. Also, the framework is said to be adapted to specific situations (weak institutional context, tensed international relations, general water scarcity and significant power asymmetry) (MacQuarrie and Wolf, 2013: 182), but here we wish to test the importance of power asymmetry on all cases, since we sense it has more explanatory power for most TWRs' cases than expected.

regimes in key issue areas, such as the monetary, trade and financial sectors. In the 1970s, academics perceived a decline in US hegemony concomitant to decay in the effectiveness of those key regimes and of the Bretton Woods monetary system, and a rise of protectionist measures at the global level (Gale, 1998: 256; Kindleberger, 1981; Wallerstein, 1974). The realist hypothesis of Hegemonic Stability Theory consequently raised doubts about its theoretical and empirical validity[13].

Liberals, on the other hand, base their analysis of international regimes' establishment on a different view of interstate power[14]. The key contribution that drags our intention here relates to the period "after hegemony", developed by Keohane (1984). Based on rationalist economic models of international relations, he shows that, in the face of declining hegemony (i.e. the [supposed] United States' decline in the last quarter of the 20th century), the formation or consolidation of cooperative economic regimes is seen as the best way of maintaining world peace (Hasenclever, 1997; Keohane, 1984; Keohane and Nye, 2001 [1977]). As Snidal pointed out, "cooperation not only can be sustained in the face of declining hegemony, it may even be enhanced" (1985: 579-80). If joint gains realized by states through cooperation are less than actual gains because of the fear of defection, international regimes reduce this fear by monitoring compliance and improving international agreements' transparency (Gale, 1998). Therefore, economic interdependence in the era of globalization gave rise to an increase of cooperative regimes at the international level, illustrated by the adoption of liberal free trade policies by many states in this period. In the point of view of liberals, the consequent expansion of capitalism and trade would ensure peaceful relations between the states adopting such policies, i.e. between the states that were included in the initial sphere of influence of the hegemon.

[13] Many authors proved it wrong, such as Snidal who asserted that: hegemonic stability defined as such is only an empirical exception; that collective action is in reality possible even in the absence of a dominant state and; thanks to game-theoretic approaches, that the production of international public goods could occur among a small number of self-interested states (Gale, 1998; Snidal, 1985). Strange also showed that the US hegemony was not declining, but rather growing in terms of structural power, and that reasons for the assumed collapse of US-led international regimes find their roots in the US domestic political system itself (Strange, 1987)

[14] They view states as utility maximisers, contrary to realists who understand them as status maximisers. They also include non-state actors such as international or regional organisations and multinational corporations in their analyses, but the state is still central (Gale, 1998). Relating to our discussion above, they do not view the international system as conflictive, rather they see cooperation as the only way for states to maximise their utility. From this perspective, a hegemon is more perceived as either a coercive (understood as dominative and/or exploitative) or a benevolent (persuasive) leader (SNIDAL, 1985).

These attempts from both schools of thought to enlighten the role of hegemony in order to explain the creation and maintenance of international regimes indeed suffer from several gaps. If realists failed to show that hegemony (or extreme power asymmetry) is a necessary condition for the establishment of a cooperative international order, liberals were also unsuccessful to demonstrate how it could be a sufficient condition for such an order to develop. We argue that if those contributions only moderately enlighten our interrogations, it is in large part because of their narrow conceptualizations of power. They both tend to consider it in its basic relational form, where the most powerful is endowed with more military, economic and political resources, and thus on respectively more coercive and bargaining power than other actors under its influence (Gilpin, 1987; Kindleberger, 1981; Waltz, 1979).

The following section introduces the fundamental theoretical contributions of International Political Economy (IPE) to the debate, and establishes our own reading of the core concepts of the field: power and hegemony. Theories of IPE analyze international relations, politics and economics in order to propose a critical understanding of political structures, patterns and relationships at the international level (Palan, 2000). They confer particular thought to the role of power structures and hegemonic dynamics in order to grasp the complex political-economic relationships among states, institutions and other international actors (Cox, 1996 [1981]; Gill and Law, 1988). This framework seems very appropriate for the study of interstate relations on TNRs, which are characterized by regional and global political and economic dynamics that involve multiple hegemonic and power relations among protagonists, institutions and external actors (Cascao, 2009). But which dimension(s) of the complex concept of power do we consider here? From which perspective(s)? Again, the contributions of the Hydro-Hegemony framework are central.

3.3.3 Power: a multidimensional concept

Power is one of the core concepts of the field of International Political Economy, along with hegemony, hegemonic stability theory or international regimes. Thus, there exist numerous definitions of power in IR theory[15]. All of them seek to grasp the forces that enable one actor to gain the compliance of another on a specific issue-area

[15] After Gilpin, power is one of the "most troublesome [concepts] in the field of international relations", in Lukes, 2005b: 477, modification added.

(Lukes, 2005a [1974]; Gilpin, 1981; Cox, 1992 ; Cox, 1996). An exhaustive review of power theories is by all means not the objective here. We will only briefly recognize key theoretical interpretations of the concept that range from basic forms of *coercion* to the control and manipulation of *ideas*.

3.3.3.1 How to exert power: Relational vs. Structural power

Firstly, we argue that the critical analysis of the structural facet of the concept of power perfectly completes its more common – but nonetheless theoretically useful here – relational facet. Both have different perceptions of 'how to exert power', i.e. either in a direct manner, through relationships, or indirectly, through the structures of international society.

Relational power refers to the direct influence exercised in a relationship by one actor over the other(s), and all parties to all relationships have in their possession some resources that gives them more or less influence on other actors. Those resources are either material or ideational, as we shall see below. Both help a powerful actor to gain direct compliance from other actor(s), rather than influence them through more indirect means, for which one valuable contribution toward this objective is the one of Susan Strange, a critical author of IPE, who defines power as "the ability of a person or group of persons so to affect outcomes that their preferences take precedence over the preferences of others" (Strange, 1996: 17). She asserts that a fundamental error of classical theories is that they limit their understanding of power to its relational facet, which only point at the capacities of an actor to make its will prevail over the others', even in the case of resistance. Her conceptualization of structural power is an "indirect" form of the concept that complements perfectly relational power. Indeed, the relative power of each party in a relationship is more, or less, if one party is also determining the surrounding structure of the relationship (Strange, 1998 [1988]: 24-25). As argued by Strange, authority need not to be confined to outcomes consciously or deliberately sought for (as in the case of relational power), it can be exercised through structural power just by "being there", as a sort of "unconscious" power (Strange, 1998 [1988]: 24-25). Strange defines structural power as "the power to choose and to shape the structures of the global political economy within which other states, their political institutions, their economic enterprises, and (not least) their

professional people have to operate". This means more than the power to set the agenda or to design the international 'regime' of rules and customs (Strange, 1987: 565). Structural power confers the power to decide how things shall be done, the power to shape frameworks within which states relate to one another, relate to people, or relate to corporate enterprises[16]. Therefore, power over others, and over the mix of values in the system, is exercised within and across frontiers by those who control structural power (Strange, 1996). In sum, being structurally more powerful than other actors provides one with the opportunity to decide how things shall be done, to shape the frameworks within which states, companies, people and all other societal actors interact. The relative power of actors is unbalanced when one – or several – of them can establish the environment of their interactions.

3.3.3.2 Where power lies: Material vs. Ideational power

Secondly, material and ideational facets of power both differently show 'where power lies'. We claim that the ideational facet of power is too neglected in the literature, despite its strong analytical utility for what relates to the development of regimes' norms, rules and procedures of decision-making, as compared to material power. The latter echoes classical definitions of the concept, essentially realist ones, which narrowly focuses on relational power relations based on material capabilities such as economic, military and technological resources (Gilpin, 1981, 1987; Waltz, 1979; Gallagher and Robinson, 1953), we argue. Power is reduced to the possession of physical assets. On the other hand, ideational power finds its roots in critical and neogramscian approaches of the concept (Cox, 1996[1981]: 105). Strange's definition of structural power very much relate to the works of Cox, the key author of the neogramscian perspective of IPE. Yet, Cox goes even further and localizes power in the realm of ideas. He recognizes that coercion-related material capabilities are essential to sustain power relations (Cox, 1987) – and we do too – but that the greatest power lies in the control and manipulation of ideas. Ideational (or ideological) power is "power over ideas, i.e. the capacity of an actor to impose and legitimize particular ideas, perceptions, knowledge and discourses" (Lukes, 2005a: 28). It is "the power to

[16] Influence on institutional processes; Influence on norms' development; Influence on the setting of political agendas; influence on determining the framework of debate; Agenda-setting by elites who worked in the backrooms and away from public scrutiny in order to exert their power upon society

prevent people, to whatever degree, from having grievances by shaping their perceptions, cognitions and preferences in such a way that they accept their role in the existing order of things" (Lukes, 2005a: 28). It matures when the most powerful actor is capable of controlling the creation, the dissemination and the access to information and knowledge. This facet of power, which is "less visible" than material power, might be exercised through the knowledge structure (Strange, 2002) or Gramsci's ideological hegemony (Gramsci, 1971). Not only the exercise of ideational power secures compliance of the less powerful actor(s), but it also ensures its (their) "*willing* compliance" (Lukes, 2005a: 12). Strange reinforces this point by asserting "the strong implant their ideas, even their self-serving ideology, in the minds of the weak, so that the weak come to sincerely believe that the value-judgments of the strong really are the universally right and true ones" (Strange, 2002: 176). We make the assumption here that ideational power is more effective than relational power for what relates to gaining compliance of other actors on a specific issue-area, corroborating Luke's famous quote: "power is at its most effective when least observable" (Lukes, 2005a: 1).

3.3.3.3 Four dimensions of power

Now that we have detailed both 'where power lies' and 'how to exert power', we crossed both couples of facets of power in the following table. The latter provides us with four combinations, which will be used in our research as the four dimensions evoked above.

Table 2.1: Power: a four-dimensional concept

How to exert power / Where power lies	Relational	Structural
Material	**1 Coercion / hard power / bargaining power**	**2 Production, Security and Finance structures**
Ideational	**3 Socialisation**	**4 Knowledge structure**

The first dimension, "relational-material power" is the one principally used by realist and liberal authors in their respective theories of hegemonic stability evoked above.

Their focus is on hard power, defined by Nye as "the ability to use the carrots and sticks of economic and military might to make others follow your will" (Nye, 1990). Power analysis is thus reduced to comparing physical assets between actors. In order to gain the compliance of its subordinates, the powerful could use either coercion or bargaining power. Coercion is materialized by the use or the threat of force against another actor, thanks to its superior technological and military capacities. Bargaining power, on the other hand, is exerted through incentives or even bribes, thanks to dominant political and economic capacities.

The second dimension, "structural-material power", refers to the material facets of Strange's conceptualization of structural power. Three out of the four major structures identified by Strange through which an actor exerts its power by shaping the surrounding structure of its relationships with other actors are of interest here. Two of them are mostly economic (the structures of production and finance,) whereas the third (the security structure) relates to military and security issues. To start with, the structure of production is the capacity of one (or several) to determine the place, the means and the content of production activities that create wealth; it is the structure in which power is exercised over what is to be produced, where, and by whom on what terms and conditions; in other words: "the way the world's work is done" (Cox, 1987: 5). Through the financial structure, power over others is exercised within and across frontiers by those who have the capacity, or are in a position to offer, or to withhold, credit (Strange, 1996). Finally, the control of the security structure by an actor endows him with the capacity to offer protection or to threat the security of other actors. Power over others is thus exercised within and across frontiers by those who are in a position to offer security, or to threaten it (Strange, 1996).

Those two first dimensions are very related together. For instance, an actor that controls the global financial structure has the capacity to determine the surrounding arrangements of the relationship through which financial exchanges and transactions are made. Thus, the latter certainly detains more financial (economic) coercive and bargaining power resources than other actors. The third and fourth dimensions are both based on the assumption that power lies in the realm of ideas, and thus as "emerging from social and political processes rather than taken for granted in the form of accumulated material capabilities" (Cox, 1996[1981]: 105)

The third dimension, "relational-ideational power", is mostly exerted through a process of socialization "in which the norms and value orientations of leaders in secondary states change and more closely reflect those of the dominant state" (Ikenberry and Kupchan, 1990: 285). Socialization indeed takes place through direct relationships between protagonists, which can lead to more or less desirable outcomes. When it takes place within a relationship characterized by asymmetric power relations, the most powerful (or hegemon) completes its manipulation of material incentives (bargaining power) by altering the substantive beliefs of other actors (Ikenberry and Kupchan, 1990: 285) until they will change their perceptions and preferences so as to consent with the ones of the powerful and accept their situation in the existing order of things.

Finally, the last dimension "structural-ideational power" is exerted by the powerful through the last structure identified by Strange: the structure of knowledge. Controlling the latter endows one with the capacity to define the nature of knowledge, to influence legitimate ideas and social beliefs and to control the access to knowledge and information (Strange, 1987, 1994, 1996), i.e. the creation, the storage, and the diffusion of knowledge, information, culture, and values in the structure. Here again, controlling the knowledge structure clearly provides one with great power when it comes to socialization since it gives the opportunity to define the environment in which the process of socialization takes place.

In our research, we define power as the combination of those four dimensions together. Our hypothesis for this independent variable is: "the more power relations are asymmetric between riparian states, the more the basin's cooperative regime is institutionalized".

3.4 Power Asymmetry arguments

On the basis of those definitions and conceptualizations, we support the idea that the most powerful state on a TWR will ensure its interests through the use of one (or a combination of) dimension(s) of power. The purpose of this section is to introduce other "power-related" variables that might explain further why a powerful state will do so: its geographical position on the basin; its water endowment (or scarcity); and its own level of governance, which echoes one of the "liberal peace" arguments

evoked above. Methodologically, we will have to identify first which state is the most powerful on each basin – through the calculation of the level of power asymmetry – and then only we will be able to define the following variables. Thus, "power asymmetry" is both an independent and an intermediary variable.

3.4.1 Geographical configuration of the basin

Dinar, following the works of Le Marquand (1977: 9-10) stated, "the geographical location of the riparian states, and the respective river configuration, may constitute additional variables important for facilitating or discouraging formal cooperation" (in Dinar, 2009: 129). Indeed, it is obvious that upstream states are advantaged compared to their downstream riparians. The geographical leverage embedded in an upstream position endows a riparian state with a powerful bargaining resource against a midstream/downstream powerful riparian. Their incentives to cooperate are very limited, since their position endows them with power over the other(s). However, the presence of a powerful downstreamer is usually known as a factor that increases the probability for cooperation on a basin (Le Prestre, 2005: 402).

In spite of pessimistic arguments from several authors, who argue that upstream-downstream configurations make problems more difficult to solve because of unilateral externalities (Bernauer, 2002 in Kalbheen, 2011: 117), or that fewer treaties are signed on basins with this type of configuration (Song & Whittington, 2004), we argue that the position of the most powerful state on a basin explains a lot the occurrence (or not) of transboundary cooperative regimes. We consider here, like Lowi, that cooperation is more likely to occur when the most powerful state of a basin is situated downstream (Lowi, 1993: 10), especially if it faces water scarcity. In that case, the downstream "hegemon" uses all power resources at hand to convince the upstreamer to enter into cooperative schemes in order to reduce and even overcome its downstream "weak" position.

This is for instance the case on the Nile with Sudan and Ethiopia. 85% of the Nile waters flow from Ethiopia (the Blue Nile takes its source there) to downstream Sudan and Egypt, while Egypt is by far the hegemonic state of the basin (Kehl, 2011: 229; Cascao, 2008, 2009; Carles, 2006). Relations between Ethiopia and Egypt have long been very tensed. If Egypt's substantial power resources have always allowed it to

fulfill its water needs, Ethiopia's only argument has always been based on its legitimate territorial sovereignty to use the Nile waters. In order to overcome this difficulty, Egypt signed agreements with Sudan in 1929 and most importantly in 1959 (see OSU. 2011k) in order to share all the Nile waters bilaterally at the expense of Ethiopia (and the other upstream states). Egypt achieved it 1959 by offering Sudan incentives that it could not refuse, such as: a water allocation much higher than the real needs of Sudan; equal partition of all increases in the natural yield of the Nile river; and most of the water flows from the Aswan High Dam, and Lake Nasser (Cascao, 2008, 2009; Dinar, 2009: 118; Waterbury, 1979: 72-73). Since then, Egypt's answer to Ethiopia refers to its historical rights to use the Nile waters. This example illustrates our assumption that the presence of a powerful state downstream implies that chances for cooperation to occur increase, and the fact that the existence of cooperation does not means the absence of conflicts at the basin level, thereby giving grist to the mill that is our research. On the other hand, if a powerful state is located upstream – such as Turkey on the Tigris and Euphrates, or China on the Mekong river basins – this geographical position plays in its advantage, and thus it has much less incentive to cooperate with its riparian states, which it does not – or minimally[17] – in those two cases (Lowi, 1993).

Finally, on this point we make the hypothesis that the probability for cooperative regimes to be created and maintained on TWRs is higher when the most powerful state is located downstream of the basin rather than upstream or downstream.

3.4.2 Water endowment of the most powerful state

As discussed above in the literature review on TNRs and TWRs, water scarcity or stress has been the central variable in the debate between optimistic and pessimistic authors. Here again, we follow the more optimistic authors by superposing our argument on power asymmetry to their own argument on water scarcity or stress: we believe that the water endowment of the most powerful state inversely influences the occurrence of cooperation on a basin, i.e. that if the most powerful state is water scarce, it will use of its power resources to achieve agreements with its neighbors in order to reduce its level of scarcity. This contention that scarcity motivates

[17] Despite its position and its power, China is only an « observer » on the Mekong River Commission.

cooperation is in line with the liberal and neoliberal institutionalist way of thinking – states are rational egoists who cooperate when it is in their mutual interests (Dinar, 2009: 115) – but here we view it through the lens of our multidimensional conceptualization of power which gathers several perspectives of international relations' theory.

We believe that the costs of fighting over a TWR are much higher than the potential gains attached to success (Barnett, 2000: 278; Wolf, 1998). The "network of common interests" (Deudney, 1991: 10) embedded in a TWR encourages states to cope with resource scarcity in a cooperative way, thus cooperation will grow as water becomes scarcer (Dinar, 2009: 112). That way we agree with Hamner, who empirically showed that states tend to sign TWRs-related treaties and agreements while they suffer from water stress, especially if the stress is shared by the riparians – such as during a long-lasting drought, for instance (Hamner, 2009**).** Scarcity indeed creates imperatives for riparians to cooperate (Elhance, 1999: 12-13). However, we will not embrace the idea proposed by Dinar and Dinar *et. al.* that the direct relationship between scarcity and cooperation follows an inverted U-shaped curve (Dinar, 2009; Dinar et. al., 2011); but rather a linear relationship, as Tir and Ackerman argue (2009). Indeed, Dinar and Dinar *et. al.* focused on an analysis of bilateral cooperation exclusively, while we will put our energy in the analysis of multilateral TWRs, and on the direct influence of scarcity on the actions of the most powerful state of the basin, which we will consider as linear.

We will test this relationship in three different ways, by considering three different aspects of water scarcity: *water scarcity*, *water stress* and *water dependence*. In our research, we will define water scarcity as natural geographical scarcity, i.e. the natural endowment of a state with fresh water, excluding the potential impact of humans on water. Water stress; however, will include the latter, i.e. the human influence on water availability. If the first one could be a synonym of the total available water resources per capita, the second encompasses the stress put by human consumption on water availability. Finally, the dependence of one state on water resources taking their source externally to its borders might also influence it to find cooperative solutions with its riparian states in order to minimize this external dependence. Some riparian states may be more dependent on one specific source of water, while others might have access to alternative resources (Kehl, 2011: 226; Lowi, 1993: 10**)**. For instance,

Egypt's dependence on the Nile River is of 97%, which means that it mostly depends on the Nile for all its water use, whereas the same figure for China is of less that 1%. Both figures might explain the differences noted above between the Nile and the Mekong cases.

The hypotheses associated with each of those three variables are as follows: "the more the most powerful state of a basin faces water scarcity and/or stress and/or dependence, the more the cooperative regime of the basin is institutionalized".

3.4.3 The level of governance of the most powerful state

Building on the liberal peace argument arguing that if the level of governance on a basin is high, then the level of cooperation between the riparians on TWRs should be developed, we argue that the same inference is valid for the level of governance of the most powerful state of the basin. Our hypothesis is that if the latter is high, we expect the level of institutionalization of the TWR's regime to be high too. Regimes types (democracies or dictatorships) indeed have very different implications for hydropolitics (Elhance, 1999: 18). The point here is not to repeat the arguments exposed above when looking at the variable 'riparian states' level of governance', but we argue that a powerful democratic state with transparent rules, used to cooperate, with stable domestic institutions and structures, should be more open to sign agreements and participate to institutionalized regimes on TWRs than a powerful autocracy, for instance. The argument behind this assessment is that the powerful state with a high level of governance could serve as a hegemonic guide, or leader, to its riparian states on TWRs' matters.

4 Conclusions: our contribution

We built this theoretical framework on the basis of the international relations' debate linking TNRs with either cooperation or conflict, which we summarized in the "theoretical background" section. We showed that two main perspectives share most of this debate in the literature, even though one can witness an increase in the development of alternative – such as critical – theories on those issues. This research is a contribution to this growing literature.

We discarded the first major view because of its narrow and pessimistic assumptions, which are seldom empirically verified. If we felt closer to the neoliberal institutionalist perspective, which is empirically accurate, we pointed at theoretical shortcomings, such as its focus on outcomes rather than on the processes and mechanisms that lead to cooperation. We thus decided to look into critical perspectives of international relations in order to fill those gaps and complete the picture in order to understand better the reasons behind the overwhelming occurrence of cooperative schemes rather than conflicts over TNRs, which is one of the main theoretical contributions of this research to the academic debate.

As we decided to focus on TWRs, the critical literature of the field of *hydropolitics* has shown to be extremely useful to achieve our research objectives. We indeed argue that cooperation is empirically dominant, but we do not agree that the latter is conflict-free. Our emphasis on the key role played by power asymmetry in defining and delineating the development of regimes on transboundary water resources has been crucial here. Our definition of the concept of power as multidimensional, largely inspired by critical perspectives of international relations joining several schools of thought in the same notion, certainly contributes to the originality of the research. We indeed explore neglected perspectives of power, as a complement to mainstream ones. We sense that critical and neo-gramscian definitions of power are usually undervalued in the literature despite their potential for analyzing less visible forms of the concept, such as structural power and in particular the power of ideas and knowledge (ideational power). Even though we did not use the same definitions, we were clearly inspired by the works of hydro-hegemony theorists. Another contribution of this research, linked with the latter, lies in our conceptualization of power-asymmetry arguments. The latter are often talked about in the literature, but none of them has

ever been tested in a quantitative research model, which we ought to do here as another contribution to the scientific debate on the matter. In the next part, we will test them along more common "liberal peace" variables based on the neoliberal institutionalist perspective of international relations.

In the next chapter, we will attempt to answer the main research questions and sub-questions by testing the variables gathered from the literature in this chapter as convincing explanatory factors for the occurrence of institutionalized cooperation on TWRs, in what we refer to as a "literature-based quantitative analysis". The latter is the first step of the three-steps mixed-method research design – another scientific contribution of this research to the debates on those issues – which definitely lack of studies employing both: inductive and deductive analytical approaches; and quantitative and qualitative research methods. This first step of the research will guide us toward a more specific case-study analysis, which will depend on the results of this first step. The results of the latter shall guide us in the choice of a case study which, analyzed in depth, will open our research to new findings that will help us improve and enrich our initial model. Plus, it will provide us with new results that should be of interest to hydropolitical researchers and experts of this specific case study. Last but not least, we decided to focus our attention on multilateral rivers' and lakes' basins[18][19]. Hence, despite a few studies including case-comparisons or specific case studies' analyses, there barely exists any quantitative analysis either including or exclusively dedicated to multilateral basins, despite the fact that they represent nearly a third of the total number of TWRs on Earth (85 out of 263 rivers' and lakes' basins). Most of quantitative studies on the matter indeed focus on bilateral basins (Espey and Towfique, 2004; Dinar, 2009; Dinar et. al., 2011). This is another contribution of our research to the general debate on those issues. Those methodological choices (the research design and the focus on multilateral basins) also contribute to improve scientific knowledge on the issues at stake in this research.

[18] Bilateral vs. multilateral basins: the former are TWRs with only two states; the latter includes all river basins with more than 2 riparian states.
[19] We excluded transboundary aquifers, for which data and knowledge are not available enough so far. Knowledge on the matter is currently progressing a lot with the involvement of new technologies, however it is still very recent and clearly incomplete.

CHAPTER 3: LITERATURE-BASED QUANTITATIVE ANALYSIS

1 Introduction

The previous chapter proposed an in-depth analysis of the literature on the subject of research in order to produce both a dense literature review and, most importantly, the theoretical framework of the research. In the latter, we identified factors (or variables) in the literature that could answer the main question of research (why do states rather cooperate on transboundary water resources?) and sub-questions (What are the concepts and/or variables that enlighten best what shapes international regimes over TNRs? Why is cooperation more institutionalized in some cases than others? What factors can explain it? What does the literature tell us about potential – necessary or sufficient – conditions that could enhance the probability for states to maintain and consolidate international regimes on the matter? Does the existence of asymmetric power relations between riparian states catalyze the development of institutionalized regimes?) The original contributions of this framework to the study of TNRs (and TWRs) lie in the specific use of critical literature in order to answer this main research question, including an innovative conceptualization of power relations as multidimensional concept. Hence, the purpose of this chapter is to test those variables in a quantitative analysis based exclusively on this review of the literature: a "literature-based quantitative analysis". This is the first step of the inventive mixed-method research design developed for this specific research.

To start with, we introduce our choice of case studies: multilateral transboundary lakes' and rivers' basins, i.e. which are composed of three or more states. The exclusive focus of this research on multilateral TWRs is another original contribution of this research. Then, we show how we operationalize each variable introduced in chapter 2. The data obtained in the literature review is qualitative, so this step presents how we link theory and measurement through a methodical choice of indicator for each variable. We start with the dependent variable, which defines the scope of the research (in terms of period of analysis, for instance). We then proceed to the operationalization of the independent variables, which means we introduce the indicators we have chosen to quantify each of them and the sources of the data we

have used to do so. We also distillate some information relative to both: the methodological choices, and the limits, of the data. The operationalization of "power asymmetry" and "power asymmetry arguments" also reflect our desire to innovate in order to contribute as best as possible to the academic debate on those issues. Next, we conduct two complementary quantitative analyses: the first one is a *binary logistic regression*, which tests the variables in order to explain why the institutionalization of cooperative regimes over TWRs occurs, or not; the second focuses only on the cases in which cooperation is institutionalized, for which we complete a *multiple linear regression* in order to identify variables that explain why some TWRs are more (or less) institutionalized than others. This two-steps process allows answering the research questions fully by identifying factors that explain both: the existence of cooperation and, in the cases where it does exist; the degree of interstate involvement into the cooperative management of TWRs. Finally, we conclude this chapter by discussing the results of those regression, and introducing how we select the case study, which will be analyzed in depth in the next chapter: the Okavango River Basin. The last paragraphs of the chapter draw its conclusions and implications for the rest of the research.

2 80 transboundary water resources under study

The number of TWRs on Earth is obviously subject of change over time. It has been growing in the past decades, "largely because of the breakup of the former Soviet Union and former Yugoslavia. In 1978 there were 214 international basins. Today there are 263." (UNDP, 2006: 205). We add that there are still ongoing debates on the borders of states and basins at the local level, which might change the figure over time. The creation of new states, the disappearance of others, or the impact of climate change on water resources, for instance, are all factors that contribute to permanently re-evaluate this socially accepted figure. For instance, when we started this project in 2009, 263 transboundary lakes on basins were counted on Earth. Nowadays, for instance, the figure is supposed to attain 276 (UN-Water, 2013).

On the matter, this study follows the data of the International River Basins Register (OSU. 2009b) (which also includes lakes as transboundary surface water resources) of the Oregon State University's research team led by Aaron Wolf, who brought to us the "Transboundary Freshwater Disputes Database (TFDD)" (OSU, 2009a), which is

the main source of such data for most researchers on transboundary waters. Out of those 263 basins, 86 are multilateral as we defined it: 29 in Africa; 25 in Europe; 22 in Asia; 7 in South America; and 3 in North-Central America.

This research focuses exclusively on multilateral basins for several reasons. Most studies on this subject of research involving quantitative methods focus on states' dyads, thus on bilateral agreements, interactions, cooperation or conflicts (Espey and Towfique, 2004; Dinar et. al., 2011; Dinar, 2009; Bernauer et. al., 2012; Tir and Ackerman, 2009). Multilateral basins represent close to one third of the world's TWRs with more than eighty basins shared by three or more states. Half of them involve three states "only", and the number of riparians goes up to 18 (the Danube river basin, Europe). Also, and as a consequence, multilateral basins are generally studied either on their own, or through a comparison two or more case studies (Kehl, 2011; Elhance, 1999; Zeitoun and Warner, 2006; Waterbury, 1979, 2002; Cascao, 2008; Daoudy, 2005). There indeed exist differences between bilateral and multilateral basins; not only in their geographical structure, but also on the way hydropolitics are exercised, as shown by Zawahri et Mitchell while studying the distinctions between bilateral and multilateral interstate negotiations on the development of TWRs' international agreements (2011). International relations on multilateral basins are obviously more complex for many reasons, such as the (potential) creation of alliances or groups of interest on the same basin, or the fact that the presence of midstream states can influence upstream-downstream relations, among others. An excellent example is the Nile River Basin, which has long been (and is still, at least for Egypt) ruled by one bilateral treaty between Egypt and Sudan (the 1959 bilateral agreement between Egypt and Sudan on the allocation of Nile waters). The agreement shares all Nile waters between those two downstream riparians without the consent of other riparians (Cascao, 2009; Carles, 2006). Last but not least, there are mostly any large-N analyses including exclusively multilateral basins at all in the literature, a situation that is both a difficulty and an opportunity for this research. Hence, the latter contributes to fill this gap via a quantitative study about issues of cooperation on multilateral basins exclusively.

Sometimes, the presence of one state or the other on a specific basin is open to discussion. This is why we have established several criteria to assess the inclusion or exclusion of one state or the other on each basin. Indeed, on several basins, some states are totally absent of any treaties or interstate interactions or events happening

on their respective basins (OSU, 2009c, 2009d). At the same time, most of these "institutionally absent" states often only share a negligible area of their respective basin in their own territory (area of basin in country); or that the area of their territory included in the basin is itself insignificant (area of country in basin) (OSU, 2009b). The former being the reason of the latter, or vice-versa, is not the concern of this research. However, we chose to exclude some states from several basins for the purpose of this research on the basis of the following criteria presented in the following Box 3.1. Those criteria are grounded on the in-depth literature review that led to this research and on a thorough observation of the hydropolitical dynamics at the heart of TWRs.

Box 3.1: Criteria for including or excluding states from the analysis

A state is included in a basin if at least one criterion out of 1a, 1b, 2, or 3 is verified.

- **Criteria 1: Geography**
  a. The area of the basin in the country is of at least 0,1%; and/or
  b. The area of the country in the basin is of at least 0,1%; and/or
- **Criteria 2: Institutionalization (treaties or agreements)**
  - The country participated to the institutionalization of cooperation at the basin level, i.e. is included as participant to a valid water-related treaty/agreement for the period under study; and/or
- **Criteria 3: Participation (events)**
  - The country participated to water-related events that occurred on the basin for the period under study

In brief, the "geography" criteria excludes states for which the part of the basin in the state and/or the part of the state in the basin are so small that the state has absolutely no interest – and credibility – in participating to its institutionalization Criteria 2 and 3 exclude states which have never participated to any discussion, agreement, or event that have occurred on the respective basin they are included. An excellent example is the one of Saudi Arabia on the Tigris and Euphrates, which is supposed to have 80 km^2 of its territory in the basin, which is less than 0,1% of the basin's size. Plus, the latter does not respect any of the other criteria, and is never included as a riparian state in any research directly focusing on this specific basin.

After having tested each basin on the basis of those selection criteria, 17 out of the 86 "multilateral" basins saw a modification of their number of riparian states for the purpose of this research. In the end, six cases were removed from the analysis (the

Kemi, the Rhone, the Orinoco, the Grijalva, the Karnaphuli and the Pu-Lun-T'o rivers' basins) for the simple reason that, after having submitted them to our criteria, they were left out with only two riparian states. The following table 3.1 shows the details of the modifications made on those basins in order to achieve the final list of 80 basins and their respective riparian states. The first column introduces the name of the basin under scrutiny; the second one introduces the name of the state, which inclusion as a basin state is put into question and has been removed from the analysis; and the third column shows the final number of states on the basin under scrutiny.

Table 3.1: Modifications made to the number of riparian states on multilateral basins

Name of basin under scrutiny	**State removed from the basin on the basis of one of the three criteria**	**Final status of the basin**
Kemi	Norway	(2 states only)
Rhone	Italy	*Idem*
Orinoco	Brazil	*Idem*
Grijalva	Belize	*Idem*
Karnaphuli	Myanmar	*Idem*
Pu-Lun-T'o	Russia, Kazakhstan	*Idem*
Amur	Democratic People's Republic of Korea	3 states (instead of 4)
Essequibo	Brazil	*Idem*
Ob	Mongolia	*Idem*
Tarim	Afghanistan	4 states (instead of 5)
Vistula (Wista)	Czech Republic	*Idem*
Ganges-Brahmaputra-Meghna	Myanmar	5 states (instead of 6)
Kura-Araks	Russia	*Idem*
Tigris-Euphrates	Saudi Arabia	*Idem*
Aral Sea	Pakistan	7 states (instead of 8)
Niger	Sierra Leone	8 states (instead of 9)
Congo	Malawi, Uganda	11 states (instead of 13)

The final list of the 80 basins and their respective 128 states, which compose them, are is available in appendix 3.1. The following two sections respectively introduce how the dependent variable and the independent variables are operationalized for the purpose of this research, via: a presentation of the indicators chosen to quantify each of them; the sources of data used to do so; and the methodological challenges and constraints that were encountered during this process.

3 Operationalization of the dependent variable

We start with the dependent variable (*the institutionalization of international (cooperative) regimes on TWRs)*, since the choices made to operationalize it define and circumscribe all other decisions for the independent variables and the rest of the quantitative model. The institutionalization of international regimes on TWRs is "the process, which formalizes common interstate codes of conduct, policies, activities, missions and strategies through the ratification and implementation of agreements or even the creation of institutions on TWRs", as defined in chapter 2. Based on this definition, our choice of indicator for evaluating the dependent variable is what we label the "*relative degree of institutionalization of international regimes on TWRs"*. The latter embeds: the *number* of transboundary agreements or treaties – only the ones with a direct focus on water-related issues (see below) – existing on each basin; the *degree of institutionalization* of formal cooperation embedded in each of them; and the *number of states* in each basin. Indeed, the "relative" part of the indicator's name refers to the fact that figures for this variable are divided by the respective number of states on each basin.

The methodological choices to operationalize this variable are explained below, and include: the main sources of data; the choice of the period of analysis; how we assess the actual validity of each treaty as international agreements (that we preferred to include in the appendices); the way we evaluate the degree of institutionalization of each treaty; and finally how we calculate the final data for "*the relative degree of institutionalization of international regimes on TWRs*" for each basin-case under study.

3.1 Main sources of data

Overall, more than 400 agreements (444 exactly) were signed between 1820 and 2007 concerning the management of those 80 basins. Mostly all of them were found in the International Freshwater Treaties Database (OSU, 2009c), which is our primary source of data. The International Freshwater Treaties Database offers an exhaustive list of transboundary freshwater agreements dealing exclusively with water-related issues, which comprise the following issue-areas: *navigation, fishing, economic development, joint management, territorial issues, flood control, water quantity,*

infrastructure development, *technical cooperation*, *water quality*, *border issues*, *hydropower*, and *irrigation*. Even though they are common water-related issue-areas, a definition for each of those issues can be found on the "issue-type" page of the Transboundary Freshwater Dispute Database (OSU, 2009f). In all cases, we crosschecked the information gathered in the database with other sources of information (UNEP and OSU, 2002; UN, 2014).

3.2 Period of analysis

The International Freshwater Treaties Database gives access to a list of agreements for a period of more than 180 years (from 1820 to 2007). However, we decided to focus on the post-World War II period for several reasons. To start with, most of the previous agreements are not valid anymore nowadays (though it is also the case for some agreements signed after 1945, as we shall see below). Also, some of them have become "tacit" or "customary" agreements over time, and the rest were updated in 1945 or after. As we sought to ensure that data be as recent as possible, we only included all agreements signed in 1945 or after, and which were still valid at the end of year 2007, the last year of data collection in the International Freshwater Treaties Database. As a consequence, all data related to our independent variables were calculated for the same year. Based on those constraints, we have not considered the 121 (out of 444) agreements signed before 1945 in the analysis. Out of the 323 treaties left, 250 correspond to our criteria, while the other 73 have been either replaced by another, or have expired, or have been cancelled. So, the period of analysis for this research is the period 1945-2007. But our main challenge for the operationalization of the dependent variable has been to evaluate the validity of each agreement.

3.3 The validity of international agreements on TWRs

Establishing the validity of international treaties is an extremely complex issue. We directly asked Aaron Wolf, Project Director of the Transboundary Freshwater Dispute Database at Oregon State University: *"Are all treaties included in the database still valid? I would not think so for several reasons (some treaties are very old, some include states that do not exist any more such as the USSR or Yugoslavia, etc.). If not, do you have any idea where to find some official information on their respective*

validity?" In his answer, he emphasized on the difficulty of the task: "The only way you might get at some of these issues is to do a search by basin, then read each treaty to see if it mentions previous treaties. Even then I think you'd only get at a fraction. Sorry I can't be more helpful, but it's a tough issue" (Wolf, 2011).

Dr Wolf is right, it is indeed extremely complex to evaluate the validity of all treaties under study in 2007, such as those signed by former states, for instance. But we decided to follow his advice and thus we analyzed all available treaties, then only we took several decisions on the basis of the information at hand. When there was a doubt, we had recourse to the principles of the International Law on Treaties laid in the Vienna Convention on the Law of Treaties of 1969 (UN, 1969) and the Vienna Convention on Succession of States in respect of Treaties of 1978 (UN, 1978). All scenarios to which we were confronted during this process, the choices we made and their respective justification can be found in appendix 3.2.

3.4 The scale of institutionalization of international agreements on TWRs

After having collected all treaties that corresponded to our criteria in the IFTD, we weighted them in order to evaluate their score on the scale of institutionalization (their "degree of institutionalization"), which is a necessary component of the calculation of the *Relative Degree of Institutionalization of TWRs' regimes* – the dependent variable. The value calculated for each agreement varies depending on: the number of riparian states involved (is it a bi- or a multilateral agreement? Are all riparian states involved?); and the level of commitment induced by the agreement (do states agree on one specific issue, or several? Do they engage in joint management of the resource? Do they create an institution to deal with the issue(s) at stake?) In order to clarify our decision, the following table 3.2 introduces the scale we developed in order to evaluate the degree of institutionalization for each agreement, and thus the *relative degree of institutionalization* on each basin. Details and explanations follow the table. Yet, the information at the heart of this scale is the result of numerous observations and discussions with experts on the subject over the last five or six years.

Table 3.2. Scoring treaties: the scale of institutionalization of TWRs water-related treaties

Degree	Type of treaty	Score
1	Treaty implying "cooperation on one simple issue"	1
2	Treaty implying "cooperation on multiple issues"	2
3	Treaty implying "joint management"	3
4	Treaty implying the creation of an organization focusing on one simple issue	4
5	Treaty implying the creation of an organization focusing on multiple issues	5
Bonus 1	The treaty implies "information exchange"	+1
Bonus 2	The treaty implies a "conflict resolution mechanism"	+1
Bonus 3	The treaty implies "fixed allocation of water quantity or quotas"	+1
Bonus 4	The treaty involves "all riparian states of the basin"	+1

Note: For the list of issue-types, see OSU, 2009f.

It is only after having read all available treaties that we thought of the best way to evaluate the degree of institutionalization of a treaty. The five first degrees are sorted in ascended order in terms of "degree of institutionalization". A degree-3 treaty implies a deeper and stronger formalization of rules and activities between the states involved than degree-1 or degree-2 treaties, for instance. The four other degrees are "bonus points", i.e. they procure another point to the initial score and are cumulative. The rationale behind the inclusion of bonus-points is that they represent factors that are not the core of the treaty in terms of cooperation, unlike for instance the fact that a treaty implies joint management. Those four bonus-points relate to complementary information to the treaty, which imply a more or less institutionalized cooperation.

Treaties scoring "1 point": cooperation on one simple issue

Here, we refer to treaties that either focuses on one particular issue (*water quantity*, or *hydropower*, for instance) for the whole basin, or on treaties that are centered on one particular geographical area of a relatively little size and/or significance compared to the whole basin itself. For instance, the treaty of June 21, 1999 between four riparian states – Cambodia, Laos, Thailand, Vietnam) of the Mekong river basin (*Decision No. 144/1999/QD-TTg, ratifying the plan on the control and use of flood water in Mekong River Delta Area for the period from now to the year 2010*) (OSU, 2011a), focuses on

one specific issue: flood water. It illustrates the first type of treaties which fall into this category, The *Agreement between the environmental protection ministry of the Republic of Lithuania and the ministry of environmental protection, nature conservation and forestry of the Republic Poland* (March 31, 1994) (OSU, 2011b) is an illustration for the second type of treaties falling into this category. It engages both states (Lithuania and Poland) to cooperate via information exchange on the qualitative protection of water resources in the Siesupe and Selmenta rivers and lake Galadusis, which together form a tiny part of the larger Neman river basin. If both those agreements focus on "a particular geographical area", the Mekong delta is a very politicized region, vast and critically significant to the survival of riparian states' local populations, which is less the case for the Siesupe and Selmenta rivers and Lake Galadusis. In the end, this type of choices was made at the discretion of the researcher for all treaties embedding such questions.

Treaties scoring "2 points": cooperation on multiple issues.

Treaties implying cooperation on multiple issues simply formalize common interstate policies on several issue-types at the same time. Besides, their application must be larger than one specific geographical area. For instance, the *Agreement between Finland and the Union of Soviet Socialist Republics concerning frontier watercourses (*Helsinki: April 24, 1964) (OSU, 2011c) clearly states that it applies to all frontier watercourses between the USSR and Finland. In spite of its emphasis on *border issues,* the agreement also discusses matters of *water quality*, *fishing*, and *economic development.* The two states shall also formally exchange water-related information and data (*information exchange*).

Treaties scoring "3 points": joint management.

A 3-points treaty involves *joint management* between two or more states for what relates to a part of, or the whole basin under study. Typically, such a treaty requires joint management to cover a range of issues. For most cases included in this category, *joint management* is the key issue-area of the treaty, such as the *Agreement between the Cabinet of Ministers of Ukraine and the Government of Belarus on joint management and protection of transboundary waterbodies* (October 16, 2001), for which Belarus and Ukraine engage in cooperation through *joint management* of all their common transboundary watercourses (OSU, 2011d). The latter indeed applies to

both the Dnieper and the Vistula the rivers' basins. Also, some treaties engage states in *joint management* for a more specific issue, such as *infrastructure development*, or *water quality*, for instance. In those cases, it is not rare to see that a joint management institutional body is established in order to maintain some consistence in the formalization of cooperation through the organization of regular meetings between political representatives, technical specialists (technical committees) or even both at the same time. However, their mandate is "more narrowly defined than a River Basin Organization (RBO)" (OSU, 2009g: 4). Indeed, in this study, the latter are not considered as permanent organizations (which concerns treaties evaluated at 4 or 5 points, see below), but they imply more institutionalized cooperation mechanisms than treaties of degree-1 or degree-2. It is the case of the *Agreement between the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and the Environmental Protection Ministry of the Republic of Lithuania on cooperation in the field of environmental protection* (April 14, 1995) (OSU, 2011e) for the Neman and the Daugava rivers' basins, which "sets up a permanent working group for the protection of transboundary watercourses and international lakes", thereby engaging the two states to meet regularly for the purpose of *water quality* issues in particular.

Treaties scoring "4 points": creation of an organization on one simple issue

Degree-4 treaties also refer to one simple issue (see degree-1 treaties above), i.e. either one of the numerous issues presented above or with a particular focus on a small part of the basin, but for which a permanent organization is created. It refers to organizations for which the level of institutionalization is just before a RBO (see degree-5 treaties below), i.e. not a technical working group (see degree-3 treaties), but rather a permanent political committee or commission, of which objective is to meet regularly on the specific issue of concern. It usually takes the form of a permanent commission, for instance, for the management of common works (on *hydropower* and *infrastructure development*, such as the construction and maintenance of a common dam at the border of two or more states – which is located in a specific area of the basin) or a permanent joint committee for technical support focusing on one particular issue, such as *water quality*, but for all transboundary waters of the basin shared between the states involved.

A good illustration for the first type of degree-4 treaties is the "*Agreement concerning the utilization of the rapids of the Uruguay River in the Salto Grande area"*(December 30, 1946) [(OSU, 2011f)] between Argentina and Uruguay on the La Plata river basin. If the primary issue-area of this treaty is *hydropower*, it also discusses *economic development* and *navigation*, between others. But the geographical area is very specific: the rapids of the Uruguay River in the Salto Grande area. The treaty engages states in the creation of a permanent inter-state body to manage the operation and administration of the works and installations that have to be constructed under this Agreement (see article 7 in OSU, 2011f). Until the end of the works, the managing organization of the treaty is the Mixed Technical Commission, i.e. delegates from both states working together to manage matters of utilization, damming and diversion of the Uruguay River (articles 2 and following in OSU, 2011f). The *Agreement between the Federal Republic of Germany, the Czech Republic and the Republic of Poland on protection of the Oder river from pollution* (April 11, 1996) (OSU, 2011g), of which the primary issue-area is *water quality* (one simple issue) and which applies to the whole part of the Oder river basin shared by the three states, exemplifies the other main type of degree-4 treaties. It engages contracting states to set up a permanent commission "empowered to suggest pollution control measures, including issues of drinking water quality, information exchange, and the implementation of programs" (OSU, 2011g).

Treaties scoring "5 points": creation of an organization on multiple issues (a river basin organization)

Degree-5 treaties are considered as the highest degree of institutionalization in this research. Most of them are treaties establishing what are known as RBOs, i.e. permanent interstate organizations, which deal with multiple water-related issue-areas, "with a broad, general mandate to manage water issues in the entire basin" (OSU, 2009g: 2). Some institutional bodies labeled as "joint water committees (or commissions)", depending on their mandate and the scope of their respective responsibilities, are also included in this category. An excellent example of such type of treaties (and thus RBOs) is the *Agreement between the governments of the Republic of Angola, the Republic of Botswana, and the Republic of Namibia on the establishment of a permanent Okavango River Basin Water Commission* (OKACOM, September 16, 1994) [(OSU, 2011h)]. The latter establishes the permanent Okavango River

Basin Water Commission (OKACOM), which has an advisory role to the three governments involved, in terms of conservation, development and utilization of the resources of common interests to the parties by, for instance, determining the long term safe yield of the river basin, to define criteria for conservation, allocation and sustainable use of the basin's water, and to recommend measures to safeguard water quality, between other mandates (OSU, 2011h; OKACOM, 2014a). It is a permanent organization, involving three states and focusing on multiple water-related issue-areas.

Then, the degree of institutionalization of a treaty also depends on the following "bonus" criteria.

Bonuses: "information exchange", "conflict resolution mechanisms", "fixed water allocation" and "all riparian states involved".

The four "bonus-points" that complete table 3.2 are criteria that emphasize the degree of institutionalization of a treaty. They are cumulative, but none of the treaties fit the criteria for all bonuses at the same time.

To start with, "*information exchange*" implies durability in exchanges between riparian states. Thus, we decided to include only long-term *information exchange* mechanisms as valid for this bonus, meaning that limited-term *information exchange*, for instance for a planning the building of an infrastructure, do not fit those criteria. Rather, typically accepted *information-exchange* bonuses are "permanent exchanges of data relative to water flows" (from an upstream riparian state to a downstream one thanks to which the latter can elaborate plans for either water level rises, or potential droughts). The main criterion for a treaty to be awarded the bonus for information exchange is its long-term commitment. Point 1 of Article 24 "Exchange of Data and Information", of the *Protocol for Sustainable Development of Lake Victoria Basin* (Arusha, November 29, 2003) (OSU, 2011i) between the Republics of Kenya, the Republic of Uganda and the United Republic of Tanzania, states that "the Partner States shall, on a regular basis, exchange readily available and relevant data and information on existing measures on the condition of the natural resources of the basin, where possible in a form that facilitates its utilization by the Partner States to which it is communicated" (OSU, 2011i). This treaty, which is comprised in the Nile River Basin's list of treaties, fully commits states to exchange all relevant data available with their riparian states. Secondly, "*conflict-resolution mechanisms*" also

provide formality to the riparian states' actions on their respective basins. The fact that states have access to such mechanisms in the case of potential disagreements institutionalize their relations even more since their respective responsibility in managing common resources is at stake. It engages their reputation at the international level for what relates to the way they respect their neighbors, but also the commitments they have taken toward the codes of conduct and policies they are bound to since they ratified the treaty. For the purpose of this research, we only take into account *conflict-resolution mechanisms* that entail any of the following institutional instruments: "a commission" ("an installed commission or one created for that purpose composed exclusively of representatives from the parties concerned is supposed to deal with disputes". OSU, 2009g: 6); "arbitration" ("an independent arbitrational tribunal is supposed to decide about disputes, the decisions are final and binding". OSU, 2009g: 6); "third party involvement" ("third parties help to facilitate consultations between the parties, but they have no power to confer any judgments". OSU, 2009g: 6); or "ICJ", ("the International Court of Justice decides". OSU, 2009g: 6). We thus decided to include only institutionalized mechanisms, from the creation – or use of an already set up – commission or the involvement of one or several independent third party(ies). We voluntarily did not include such mechanisms labeled by the IFTD as "diplomatic channels" (the parties agree to solve disputes in consultations through diplomatic channels". OSU, 2009g: 6) since they do not involve one of those two criteria. For instance, the "*Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the equitable sharing in the development, conservation and use of their common water resources*" (July 18, 1990) (OSU, 2011j) clearly states in PART VII – Settlement of Disputes (Article 17, paragraphs 1 and 2):

1. *"Any difference concerning the interpretation or implementation of this agreement, or of any equitable sharing determination made thereunder, shall be referred to the Nigeria-Niger Joint Commission for Co-operation*; and
2. *Any such difference which cannot be settled by the Commission within six months after a reference to it under the last preceding paragraph, shall be regarded as a dispute and shall, at the request of both Contracting Parties, be referred to the Commission of Mediation, Conciliation and Arbitration of the Organization of African Unity for binding determination"* (OSU, 2011j)

This example shows commitment from both Parties to ensure that differences be discussed through the Joint Commission, and if the latter is not enough, they provide

for bringing the dispute to an independent third party for arbitration (the Commission of Mediation, Conciliation and Arbitration of the Organization of African Unity).

Another "1-point" bonus is awarded to a treaty when the latter clearly states "*fixed allocations or quotas of water"* between riparian states. It usually implies a long-term commitment from the states involved to ensure that they will not use more than their quota or their allocated quantity of water – either in numerical (variable or not) quantity (in m^3) or in proportion of each year's water availability (in percentage of flow). The most famous case in the geopolitical history of transboundary water resources is the *Agreement between the government of the United Arab Republic and the government of Sudan for full utilization of the Nile waters* (November 8, 1959) (OSU, 2011k), for which Egypt and Sudan (under the colonial rule of Great Britain at that time) bilaterally decided to share all Nile waters between them (48 billion cubic meters for Egypt, 4 billion cubic meters for Sudan, the rest of the flow being absorbed by evapotranspiration) without the agreement or even the consultation of the eight other riparian states sharing the Nile River Basin. This treaty is famous firstly because of its importance and its geopolitical impact in 1959, and secondly because its legitimacy is put into question since several decades by other riparian states, especially Ethiopia. Indeed, when there is any claim upstream on the Nile, Egypt always refers to this treaty as a legitimate claim for historical water rights in order to protect its interests (Cascao, 2009; Carles, 2006).

Finally, we argue that when *all riparian states are involved* in a treaty, the latter is more institutionalized than if they were not. Indeed, it means that the whole basin is managed through one treaty for one or several issue-areas. Hence, a treaty that focuses on a particular issue-area but which involves all states that can have an impact on the latter issue clearly should – on paper, at least – deal more efficiently with the resolution of troubles that could occur. For instance, on a river basin where all states but one agree on a treaty that set rules about *water quality*, and if the absent state is upstream, then any polluting activities flowing downstream would not be bound to this treaty, and thus even if all other downstream states do their best to apply it, the outcome cannot be fully satisfactory. If all states are involved, it has greater chance to be more positive for the basin as a whole. An illustration for this "bonus" is the *Agreement Between the Governments of the Republic of Botswana the Kingdom of Lesotho the Republic of Namibia and the Republic of South Africa on the Establishment of the Orange-Senqu Commission* (Windhoek, November 3, 2000)

(OSU, 2011l), for which the four riparian states of the Orange River Basin are involved (Botswana, Lesotho, Namibia and South Africa).

Thus, the degree of institutionalization implied by a treaty can vary from a minimum of *1* to a maximum of *9* (a treaty scoring *5* with all four bonuses). However, out of the 321 treaties under study, none scored the maximum, though we score four treaties which scored "*8*". For instance, the *Convention on the status of the Volta River and the Establishment of Volta Basin Authority*, (January 19, 2007) (OSU, 2011m) reaches *8*, along with two other treaties on the Jordan and one on the Orange river basin. It does so thanks to the five points gained by the creation of the Volta Basin Authority (a river basin organization, RBO), completed by the three following "bonus-points": *information exchange, conflict resolution mechanism* and the fact that *all riparian states* are involved.

The following table shows the number of treaties for each score possible after having analyzed all 250 treaties that correspond to our criteria.

Table 3.3: Number of treaties by score of institutionalization of cooperation

Score	Number of treaties
1	49
2	25
3	35
4	31
5	50
6	42
7	14
8	4
9	0

The final scores for all treaties are quite well distributed in the scale of institutionalization of cooperation. Scores of 1 and 5 are dominant here (respectively 50 and 49 treaties), followed by treaties with a score of 6 (42 treaties). Only four treaties do score 8, and none go up to 9.

3.5 Calculating the relative degree of institutionalization of cooperative regimes on a TWR

The process for calculating the relative degree of institutionalization of a TWR starts with the calculation of the degree of institutionalization of one treaty. Then, we calculate the degree of institutionalization of a TWR by adding up all treaties that characterize the latter TWR, before dividing the figure by the number of riparian state sharing the TWR and obtain the relative degree of institutionalization of this specific TWR.

The formula for the calculation of the *degree of institutionalization of a treaty* is extremely simple. We just multiply the score of the treaty by the number of parties to the treaty itself (see box 3.2 below).

Box 3.2: Formula for calculating the degree of institutionalization of treaty "i".

$$DI_i = n_i * x_i$$

In this formula, $\mathbf{DI_i}$ is the degree of institutionalization of treaty **i**; $\mathbf{n_i}$ is the number of parties to treaty **i**, and **x** is the score of treaty **i** on the scale of degree of institutionalization of treaties. As an illustration, if we take the latter *Convention on the status of the Volta River* evoked two paragraphs above with a score of *8*, its degree of institutionalization is evaluated at *48*, since all six riparian states signed it.

We now defined the essential pieces necessary to finish the puzzling issue that is the operationalization of the dependent variable: *the institutionalization of international (cooperative) regimes on TWRs*. The calculation of its indicator, "the relative degree of institutionalization of cooperation" for basin A reads as follows (see box 3.3 below):

Box 3.3: Formula for calculating the relative degree of institutionalization for basin A

$$RelDI_A = \frac{\Sigma_{(i->n)} (DI)_i}{N_A}$$

Where

- **$RelDI_A$** is the relative degree of institutionalization of cooperation on basin A;
- **$\Sigma_{(i->n)} (DI)_i$** is the sum of the degrees of institutionalization of all treaties (i->n) valid in 2007 for basin A ; and
- **N_A** is the total number of riparian states on basin A.

If we continue with the same example, two international treaties have been signed on the Volta river basin between 1945 and 2007. The first one scores 48, as we have seen above, and the second one is the *Agreement governing the operations of the Onchocerciasis Control Programme in the Volta River Basin area* (Accra, 1 November, 1973). This treaty focuses on one simple issue (score *1*), and includes all six riparian states (bonus *1*). It thus scores *2*, which we multiply by 6 (the number of parties to the treaty). The *relative degree of institutionalization* for this treaty is thus of *12*.

When applying the previous formula, the *relative degree of institutionalization*'s score for the Volta river basin is 10, and is calculated as follows:

$$RelDI_{VOLTA} = \frac{(12 + 48)}{6} = 10.$$

The final scores and data for this variable for both regressions can be found in appendix 3.3 and 3.4 respectively. We now turn to the operationalization of the independent variables, a simpler task but not without challenges.

4 Operationalization of the Independent variables

The previous chapter introduced a selection of factors developed in the literature, which have the potential to become variables that explain the occurrence of cooperation (or conflict) on TWRs. This section's purpose is to show how we operationalized all those variables existing in the literature. Most importantly, we present the indicators chosen for each independent variable, in order to test as best as possible if it has any influence on both: the occurrence; and the level of institutionalization of cooperation on TWRs. The objective of the following paragraphs is not to be exhaustive. We simply introduce the most important information relative to the operationalization of each independent variable, i.e. the

indicator chosen and the mode of calculation used when necessary. Most data introduced here is indeed "national-level" data; we thus show how we have transformed it into "basin-level" data. In terms of presentation, we keep the same structure as for the precedent chapter. We firstly introduce the variables included in the category "liberal peace arguments", before focusing on the details of the construction of the variable "power asymmetry". Finally, we present the last category "power-asymmetry arguments".

We note here, for the rest of this section, that the indicators introduced below to operationalize each variable are sometimes the second-best or even third-best choices. The reason behind this is that because of the large panel of states under study, datasets that could respond perfectly to our research were not always available, either because of data coverage or availability. Hence, some of the chosen indicators might not seem, at first sight, as the best indicator to operationalize variable X or Y, but we selected them because they were the best available.

Also, the sources of data for each variable are available in table 3.7 at the end of this section, which summarizes all those choices and which is located. Finally, all data for each independent variable for both regressions is available in appendices 3.3 and 3.4.

4.1 Liberal peace arguments

As introduced in chapter 2, four variables constitute the "liberal peace arguments". The two first ones compose the subcategory "history of interstate diplomatic relations and cooperation": *History of interstate diplomatic relations and cooperation* and *History of water cooperation.* Then, the variables *economic interdependence* and *riparian states' level of governance* respectively illustrate the arguments of the subcategories "economic relations" and "governance".

4.1.1 History of interstate diplomatic relations and cooperation

We saw in chapter 2 that the history of interstate relations is central to their capacity to develop and sustain cooperation on the long-term. Hence, the two variables chosen to illustrate this factor are *the history of diplomatic relations* and *the history of water cooperation*

History of diplomatic relations

The indicator chosen to evaluate *the history of diplomatic relations* between states is "the regularity of diplomatic representation and exchanges for the period under study (1945-2007)". The "Correlates of War Diplomatic Exchange data set" captures diplomatic representation at the level of chargé d'affaires, minister, and ambassador between states. The dyadic data introduces interstate level of diplomatic representation and diplomatic exchange, and is available for every five years between 1950 and 2005[20]. For instance, each dyad, which has diplomatic links in year 1975, collects 1 point. Else, if no diplomatic links characterize the dyad's relations in 1975, then it collects 0 point. For instance, a dyad of states, which has had diplomatic relations during all 12 periods between 1950 and 2005 (1950; 1955; 1960; […]; 2005) gets "12" points out of 12 points possible.

The formula to calculate *the history of diplomatic relations* for basin ABC (composed of states A, B and C), considering that for the three dyads, data is available since 1950[21], reads as follows:

$$\mathbf{<DiploABC>_{1950\text{-}2005} = (AB + BC + AC)_{1950\text{-}2005} \ / \ n}$$

where:

- **<DiploABC>$_{1950\text{-}2005}$** is the score of diplomatic links on the whole basin between 1950 and 2005;
- **AB** is the total occurrence of diplomatic links between state A and state B for the 12 periods between 1950 and 2005;
- **BC** is the total occurrence of diplomatic links between state B and state C for the 12 periods between 1950 and 2005;
- **AC** is the total occurrence of diplomatic links between state A and state C for the 12 periods between 1950 and 2005; and
- **n** is the total of periods under study for the whole basin (cumulating the three dyads).

[20] For the purpose of this research, we assume that the existing – or non-existent – diplomatic links of 2005 are still valid in 2007.

[21] It is not always the case. For some dyads, interstate diplomatic relations started only later, for instance in 1995. If we consider a 3-states basin, it might happen that two dyads had relations for the whole period under study (12 occurrences between 1950 and 2005) but for the last one diplomatic relations started only in 1995. In those cases, we considered only the occurrences between 1995 and 2005 (3 occurrences per dyad) for the whole basin, in order to have the same period for all dyads of the same basin.

Hence, the maximum score those states will have is 36 out of 36 dyadic diplomatic links possible, and 36/36 = 1. The minimum is of course 0, if the three states never had any official diplomatic relations accounted in the source of data (which never happened here).

Thus, for all basins under study, the scores vary between 0 and 1. More precisely, in our research, scores for this variable vary between 0,46 for the Amur River Basin to 1 for 22 basins under study (Zambezi, Rhine, etc.). The hypothesis behind this variable is that the higher the score on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression).

History of water cooperation

The indicator chosen for the variable *History of water cooperation* is "the period since the first water-related treaty was signed on the basin". The calculation here is very simple. Between 1945 and 2007, our period of study, the maximum score that a basin can attain is 62 (which is the case of the La Plata River Basin), and the minimum is 0, for basins without any institutionalization of cooperation (no treaties, no agreements). 24 basins are not institutionalized at all (they score 0). The hypothesis behind this variable is that the higher the score of *period since the first water-related treaty was signed on the basin*, the higher the institutionalization of cooperation on this basin.

We should not here that it goes without saying that this variable will only be used for the linear regression, which only involve institutionalized basins. Indeed, one cannot test this variable on non-institutionalized basins since it defines the period since the first cooperative occurrence between the riparian states.

4.1.2 Economic relations

We saw in chapter 2 how much interstate economic relations, in the neoliberal institutionalist theory, are a factor, which enhances interstate cooperation.

The variable used to define interstate economic relations is the existing *economic interdependence* between riparian states. Hence, the indicator chosen to evaluate this variable for each TWR is "trade interdependence" between riparian states. Again the equation here is very simple. The data of the "Correlates of War Project's Trade Data Set" includes information on both bilateral trade flows and total national imports and

exports. We simply collect the total trade (exports + imports) for all dyads on each basin that we divide by the total trade of all basin' states with the world in 2007.

$$<\text{TradeInterdep}>_{2007} = (AB + BC + AC)_{2007} / (A_{total} + B_{total} + C_{total})_{2007}$$

where:

- $<\textbf{TradeInterdep}>_{2007}$ is the score of trade interdependence for the basin in 2007;
- **AB** is the total trade (imports + exports) between state A and state B in 2007;
- **BC** is the total trade (imports + exports) between state B and state C in 2007;
- **AB** is the total trade (imports + exports) between state A and state C in 2007;
- $\mathbf{A_{total}}$ is the total trade (imports + exports) between state A and the world in 2007;
- $\mathbf{B_{total}}$ is the total trade (imports + exports) between state B and the world in 2007;
- $\mathbf{C_{total}}$ is the total trade (imports + exports) between state C and the world in 2007

Again, the maximum score is 1, which would mean that basin states exclusively trade with their riparian states and not with any other country in the world. Obviously, it never happened here. The smallest score we encountered is for the Chiloango River Basin, with 0.00031971 (0,032% of the total trade of the Democratic Republic of the Congo, Angola, and the Republic of the Congo happens between those three states). The largest scores are for the Danube and the Rhine Rivers' basins, for which trade interdependence between the numerous European states of this basin amounts to respectively 18,2% and 22,2%. The hypothesis behind this variable is that the higher the score of *economic interdependence* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression).

4.1.3 Governance

Last but not least, the level of governance existing on a basin should also indicate the potential for states to cooperate (or not). Hence, in theory, riparian states with a higher level of governance should be more prone to cooperation than others. Here, the difficulty of the task lies in the operationalization of the level of governance at the basin level (and not the state's one).

The indicator chosen to evaluate the variable *riparian states' level of governance* is the "average level of governance of all riparian states on the same basin", in 2007.

The Worldwide Governance Indicators of the World Bank includes the "Government effectiveness" indicator, which "reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (World Bank. 2013a). The latter estimates governance on a scale ranging from approximately -2,5 (weak) to 2,5 (strong) governance performance.

We simply calculated the average level of governance for each basin by dividing the total of estimates for each states with the number of states sharing the basin under study. Again, the Chiloango river basin has the smallest score (-1,451), while the Torne river basin, shared by Norway, Finland and Sweden (each of them with some of the highest governance scores in the world) attains 1,995. The hypothesis behind this variable is that the higher the score of *riparian states' level of governance* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression).

Below we introduce the variable *power asymmetry*.

4.2 Power asymmetry

The variable *power asymmetry* is operationalized as an index of the four dimensions of power introduced in chapter 2. Each of those dimensions is composed of two to five indicators. We first introduce each of those indicators, for each dimension of power, before showing how we calculated the index, i.e. the value for the independent variable *power asymmetry*. This step is also necessary also in order to identify the most powerful state on each basin, which is central to the operationalization of the "power asymmetry related variables" that we present in the next section. The hypothesis behind this variable is that the higher the score of *power asymmetry* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression). Below we introduce all indicators for each dimension of power (Relational-Material; Structural-Material; Relational-Ideational; Structural-Ideational).

4.2.1 Relational-Material Power

This first dimension of power relates to the "materialistic" and "visible" facet of the concept. The two indicators chosen to operationalize the latter are "National Material Capabilities" and "Gross Domestic Product per capita".

National Material Capabilities

The first indicator chosen is the material capabilities of the riparian states. The Correlates of War "National Material Capabilities" data set offers an excellent index, the Composite Index of National Capability (CINC), which contains annual values for total population, urban population, iron and steel production, energy consumption, military personnel, and military expenditure of all states between 1816 and 2007. We used the data available for 2007, the last year of our period of study.

Gross Domestic Product per capita

The second one is an "economic" indicator, in order to complete the lack of the first one. We chose "Gross Domestic Product per capita" (GDP per capita) in 2007, which is the standard indicator to make interstate comparisons in terms of wealth, material development and capacities.

4.2.2 Structural-Material Power

The structural-material dimension of power introduces indicators for the three structures of international relations identified by Strange (see chapter 2): the production, security and finance structures.

Production Structure:

For the *production structure*, the chosen indicator is the national GDP in 2007. In short, it is the value of all final goods and services produced within the borders of one state during a specific period of time. GDP fits perfectly as an indicator for the influence of one state on the global production structure, when compared with other states.

Security Structure:

For the *security* structure, the chosen indicator is "the total armed forces" of each state under study (data for the period 2002-2008). The latter is an index proposed by the Strategy Page, which includes the total combat capability of a nation's armed forces except for their navies (Strategy Page, 2009). The Total Armed Forces of a country, when compared with other countries', shows the influence of this state on the international security structure.

Finance Structure:

For the *finance* structure, we have chosen to compile three indicators. The two first ones ("Foreign Direct Investments Stock (Inward)", "Foreign Direct Investments Stock (Outward)") refer to foreign direct investments, i.e. "cross-border investment made by a direct investor with the intent of obtaining a lasting interest in an enterprise resident in another country (direct investment enterprise)" (European Commission, 2009). Stocks of foreign direct investments are the value of the investment at a specific point in time. FDI stocks are recorded in the internal investment position: outward FDI stocks are listed as assets of the reporting economy, inward FDI stocks as liabilities. Cumulating both FDI stocks (inward and outward) shows the net influence of one state on the international finance structure in terms of direct long-term investments abroad and from abroad. We complete the picture by adding the indicator "International Reserves", which "comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities" (World Bank. 2013d). The latter complements FDI indicators since it calculates the amount of reserves (thus savings rather than investments) detained by a country in the global finance system. The data for all three indicators is available for year 2007.

4.2.3 Relational-Ideational Power

Indicators for he Relational-Ideational dimension of power need to show the ideational influence of a state on another in terms of direct relations, such as through socialization processes, as evoked in Chapter 2. The four chosen indicators are: The number of foreign students in the country; the values of creative goods exports; the

participation to international organizations; and the number of visitors entering the country.

Number of foreign students in the country

The first indicator relates to education. A comparison of the number of foreign students in a country shows the difference between states of their respective influence on the academic world, or at least the idea that foreigners have of the academic system of this state. An attractive state for students certainly has more ideational power than others. Plus, students who are educated in another state tend to be influenced for the rest of their life by the education they received and the numerous socialization activities they went through during this period. Finally, education refers to the creation and the transmission of ideas and knowledge. The data for this indicator is available for 2007.

Values of creative goods exports

The second one refers to the creativity capacities of states. Creative goods include media, audio-visual (films), publishing (books, newspapers) and art-related (music) goods. These goods influence the idea one has of one state or another. For instance, the influence of Hollywood (and thus the USA) on the global film industry is obvious, and it largely influences the artistic productions everywhere else in the world. For this indicator, the data chosen is the "values of creative goods exports", and is available for the period 2002-2010.

Participation to International Organizations

The third indicator refers to the influence of a state on international politics. It shows the number of international organizations to which the state participates in 2007. International organizations involve interpersonal interstate socialization processes. The participation of a state to more international organizations than another shows its capacity to influence more socialization processes of international politics than its counterpart(s).

Number of visitors entering the country

Finally, the fourth indicator is the number of visitors (tourists, businessmen and businesswomen) entering each state under study in 2007. The cultural impact of any

travel (professional or personal) certainly influences the attitude of the visitor and thus the cultural acceptation of the ideas and values of this state in the international era.

4.2.4 Structural - Ideational Power

Finally, the fourth dimension of power refers to the influence of one state on the international knowledge structure. Here, we chose three indicators, which respectively show the power of states on global innovation (patent grants by country of origin), knowledge creation (scientific journals and articles) and educational development (education index).

Patent grants by country of origin

The first indicator is "patent grants by country of origin", which shows the number of patents granted to nationals of a particular state between 1995 and 2007 (patents are exclusive for 20 years minimum in general, and 1995 is the first year for which the data is available on the World Intellectual Property Organization's website). If a state is granted more patent than another, it shows its dominance in terms of innovation and creation on the global knowledge structure.

Scientific and technical journal articles

The second indicator is "scientific and technical journal articles", which shows the number of scientific articles published by individuals of one state in 2007. The publication of articles in scientific journals is an important part of the creation of knowledge at the global level. They are the source of innovation and creativity in any given research area, and show the capacity of a researcher in participating to the most recent debates on his (or her) field. At the international level, the number of published scientific articles per year by individuals from one particular state is an excellent indicator of the creation of ideas and knowledge of this country at the international level. Plus, one can easily compare figures between states thanks to this data.

Education Index

Finally, the last indicator is "the Education Index", which is one of the three indices on which the Human Development Index is calculated. It is based on mean years of schooling (of adults) and expected years of schooling (of children). The index shows

the quality of the education system and is useful to do state comparisons. A better education system in state A certainly implies more chance for residents of state A to influence the global knowledge structure, i.e. the creation and development of knowledge and ideas at the global level. Data for this indicator is available for 2007.

4.2.5 Calculation of Power Asymmetry

The "effective number of parties" formula

The last point for the variable *Power Asymmetry* is to show how we calculate it. We do so through the "Effective Number of Parties" (ENP) index, developed in the late 1970s by Laakso and Taagepera in order to measure the fragmentation of political party systems in a country (1979). The original use of this formula was to adjust the number of parties in the political system of a country: to both to count parties, and – particularly useful here – to *weigh this count by the relative strength of each party*. The actual number of parties is equivalent to the "ENP" when each of the parties' strength is equal. Else, the ENP is lower than the actual number of parties. For instance, in a state with four parties with equal strength, the ENP equals exactly 4. A figure of 2,38 tells us that the party system is as fragmented as if there were 2,38 equal-sized parties. The formula reads as follows:

$$N = \frac{1}{\sum_{i=1}^{n} p_i^2}$$

In its original conception, "N" is the result of the *ENP index* showing the concentration or fragmentation of political parties in a country's party system; "n" is the number of parties with at least one vote/seat; "p_i" is each party's proportion of all votes or seats.

Illustration

Here is an example of how we calculate power asymmetry for the indicator "Foreign Direct Investments Stock (Outward)" on the Dnieper River Basin, which is composed of the three following states: Ukraine, Belarus and Russia. In the formula, "N" is the concentration (or fragmentation) of power asymmetry for the indicator "Foreign Direct Investments Stock (Outward)" (thus the level of power asymmetry between the

three states for the indicator "Foreign Direct Investments Stock (Outward)"; "n" is the number of riparian states on the basin; and "p_i" the proportion for state i of the total of "Foreign Direct Investments Stock (Outward)" on the Dnieper River basin. Table 3.4 shows the necessary data for calculating "Foreign Direct Investments Stock (Outward)"on the Dnieper.

Table 3.4: "Foreign Direct Investments Stock (Outward)" on the Dnieper River basin

Country	"Foreign Direct Investments Stock (Outward)" (millions USD)	"Foreign Direct Investments Stock (Outward)" (%)
Ukraine	6077	1,615%
Belarus	46,3	0,012%
Russia	370161	98,373%
TOTAL	376284,3	100%

On the basis of the last column's data and the ENP formula showed above, we proceed to the calculation of "Foreign Direct Investments Stock (Outward)", which gives us the following figure: 1,03307971333759 (or 1,033). The fact that the result is very close to 1 shows that there is one country (Russia, in this case) which is much more influent in the finance structure (at least on one out of three indicators) thanks to its overwhelming dominance on this indicator when compared to its two riparian states. Here, 1/1,033 = 0,968, showing an extremely high power asymmetry in favor of Russia (for this specific indicator)

The calculation of *Power Asymmetry*

We then repeat the same calculation for each basin, for each indicator, and then for each dimension of power, and then only for the four dimensions of power in order to obtain the final figure for the variable *power asymmetry*. The figure for each dimension of power is the average figure for all indicators of this dimension, while the final figure for *power asymmetry* is the average figure of the four dimensions for each basin.

For instance, below we show how we calculate the final result for power asymmetry in the case of the Amur river basin (Russia, Mongolia and China). We start with one dimension of power to illustrate the first step (relational-material power, in this case, which only has two indicators).

We first calculate the average proportion for each indicator for each state of the basin, as shown above with the "Foreign Direct Investments Stock (Outward)" on the Dnieper River basin. Thus, for each state, we calculate their respective average proportion of both relational-material power indicators "National Material Capabilities" and "Gross Domestic Product per capita" as follows (see table 3.5):

Table 3.5: Calculation of Relational-Material Power (Amur River Basin)

	"National Material Capabilities" (2007)	"Gross Domestic Product per capita" (2007)	**Relational-Material Power (2007)**
Russia	0,165 (16,5 %)	0,682 (68,2 %)	**0,423 (42,3%)**
China	0,834 (83,4 %)	0,198 (19,8 %)	**0,516 (51,6%)**
Mongolia	0,001 (0,1 %)	0,120 (12 %)	**0,061 (6,1%)**
Total	1 (100%)	1 (100%)	**1 (100%)**

So table 3.5 shows the proportion of the relational-material dimension of power detained by China, Russia and Mongolia on the Amur River basin. We do the same for each dimension of power, and calculate the average of those four averages in order to calculate the proportion of each state's power (including the four dimensions together) on the basin[22]. Here, for instance, China is the most powerful state of the basin, thanks to the fact that China possesses 55,3% of the power resources of the basin (on the basis of our variables and indicators), as shown in table 3.6 below.

Table 3.6: Calculation of the proportion of Power of each state (Amur River Basin)

BASIN - AMUR	Average Relational-material power	Average Structural-material power	Average Relational-ideational power	Average Structural-ideational power	**PAtot**
Russia	0,423	0,399	0,324	0,401	**0,387 (38,7%)**
China	0,516	0,600	0,612	0,485	**0,553 (55,3%)**
Mongolia	0,061	0,001	0,064	0,113	**0,060 (6%)**
Total	1	1	1	1	**1 (100%)**

[22] Note that for the calculation of the finance structure for the second dimension of power (structural-material power), we already calculate the average of all three indicators "Foreign Direct Investments Stock (Inward)", "Foreign Direct Investments Stock (Outward)" and "International Reserves", before calculating the average of the three structures (Finance, Security and Production structures) in order to obtain the figure for the structural-material power dimension.

After having obtained the average proportion of the four dimensions of power together, we finally use the ENP formula to calculate the figure of *Power Asymmetry* for the Amur River Basin on the basis of the data from the last column of table 3.6 above, and following the formula:

$$PA_{TOT} = \frac{1}{\sum_{i=1}^{n} p_{iTOT}^{2}}.$$

Where:

- "PAtot" is "total power asymmetry";
- "n" is the number of riparian states in the basin;
- "p_{iTOT}" is each riparian state's total <u>average</u> of each proportion (of the total on the basin) of each power dimensions.

Here, we already have the final data necessary in the column PAtot. When we use the formula, the ENP for the Amur river basin is 2,1767, which means that if states were equal in terms of power, there would be 2,18 states on the basin out of three states, which means here that power is quite concentrated between 2 more powerful states (Russia and China). Finally, the final figure for the variable *power asymmetry* on the Amur River Basin is 1/(2,1767), thus: **0,459**. The "most powerful state" of the basin is China.

BASIN - AMUR	PAtot	**ENP**
Russia	0,387	
China	0,553	
Mongolia	0,060	**2,1767**
Total	1	**0,459**

Hence, power asymmetry on the Amur River basin is dominated by China with a score of 0,459. In our final dataset, figures for power asymmetry go from 0,192 for the Danube river basin up to 0,815 for the Courantyne river basin, with an average of 0,552 for all basins.

When looking closer to the final figures for this variable (see appendix 3.3), it is interesting to note that, for the binary logistic regression of 80 case studies: we lacked of data for 5 cases; and there exist 27 different hegemons, some of them being several times the hegemon on different basins such as China (13 times hegemon), Russia (7), South Africa and France (5), Germany and Turkey (4), Angola, Brazil, Greece and Senegal (3), Algeria, Cameroon, Ghana, Côte d'Ivoire, Poland and Sudan (2), and Argentina, Chile, Egypt, Guatemala, Guinea, Iran, Israel, Mexico, Nigeria, Serbia, Sweden, Tanzania and Venezuela (1). For the second regression, which gets the same results for only 56 cases, the distribution is very close to the first regression: China (9), Russia (6), South Africa (5). France, Germany, Turkey (4), Greece (3), Algeria, Angola, Brazil, Poland, Senegal, Sudan (2), Chile, Egypt, Ghana, Guatemala, Iran, Israel, Mexico, Serbia and Sweden (1).

4.3 Power asymmetry arguments

The last section on power asymmetry showed how we operationalized this variable, but also which state is the most powerful state on each basin. Knowing which state is "the most powerful state of the basin" is a necessary step for operationalizing "power asymmetry arguments", since we choose the data of the most powerful state for each basin for the following variables. Again, all data for the following variables can be found in appendices 3.3 and 3.4.

4.3.1 Geographical configuration of the basin

The *geographical configuration of the basin* of the basin might have an influence on the institutionalization of cooperation on the latter. We used ordinal data to operationalize this variable with the indicator "geographical position of the most powerful state", in order to identify the position of the most powerful state of the basin. The data is sorted as follows: 0 when the latter is downstream (or both downstream and upstream), 1 when midstream, and 2 when upstream. This technique helps us test our hypothesis, which states that if the most powerful state of the basin is downstream, there is a stronger chance that cooperation on the basin be institutionalized (for the binary logistic regression); or more institutionalized than others (for the multiple logistic regression).

4.3.2 Water endowment (most powerful riparian)

The three following variables *Water Scarcity (most powerful riparian), Water Stress (most powerful riparian)* and *Water Dependence (most powerful riparian)* show three different ways for which the most powerful state of a basin can be affected in terms of its water endowment. Our objective is to test whether the water endowment of the most powerful state affects the existence (or the level) of institutionalization of cooperation on TWRs.

Water scarcity (most powerful riparian)

As defined in chapter 2, we consider water scarcity here as "natural" scarcity, i.e. scarcity that is due to the geographical location of the state in the world (climate, natural water endowment). We chose to use the indicator: "total renewable freshwater resources per capita per year" (in m^3/year/cap for the period 2003-2007), i.e. "the maximum theoretical yearly amount of water actually available for a country at a given moment" per capita (FAO, 2010).

Here, figures vary from 257,2 m^3/year/cap for the Jordan River Basin (Israel) to 55432 m^3/year/cap for the Lake Titicaca-Poopo System (Chile). The difference is huge between those two extreme values. The average figure is of nearly 9600 m^3/year/cap. The hypothesis behind this variable is that the higher level of water scarcity *Water scarcity (most powerful riparian)* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression).

Water stress (most powerful riparian)

On the other hand, we included the human impact on water scarcity in our conceptualization of "water stress". We defined it as the proportion of water abstracted from the country's freshwater resources, and operationalized it as the "Percentage of total actual renewable freshwater resources withdrawn" (in %, for the period 2003-2007) (FAO, 2013). We chose ordinal categorization of the data in order to separate the data in three categories. For this purpose, we followed the FAO's theorization of water stress, which argues that: between 0% and 20% of total actual renewable freshwater resources withdrawn, there is "no water stress"; between 20% and 40%, stress exists; and severe water stress occurs when the percentage exceeds

40%. If some states do not suffer from water stress at all, others like Egypt (119%!) on the Nile or Israel (102%) on the Jordan are in extremely severe situations with regards to the management of their freshwater resources.

So, we used a binary coding for the data: 0 is for basins where the MP state does not suffer from scarcity (score < 20%), and 1 is for cases where scarcity occurs (score >= 20%). When close to 20, data was rounded two the upper percentage. This categorization of the data offers us the opportunity to test our hypothesis for this variable, which states that if the most powerful state of the basin faces water stress, the chances for the basin's regime to be institutionalized are higher than if not (for the binary logistic regression); and the higher this water stress, the higher the *relative degree of institutionalization of cooperation* (for the multiple linear regression).

Water dependence (most powerful riparian)

The Water Dependency ratio of the FAO is the indicator we have chosen to evaluate the dependence of a state on external freshwater resources (i.e. that come from outside their borders). It is the "percentage of total renewable water resources originating outside of the country" (in %, for the period 2003-2007) (FAO, 2013). The dependency ratio is null for some states, such as Angola (Chiloango, Okavango, Zambezi rivers' basins) or Guinea on the Moa. However, it goes up to 97% for Egypt on the Nile and 77% for Sudan (Gash, Congo). The average is just above 15%. The hypothesis behind this variable is that the higher the score of *Water dependence (most powerful riparian)* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression).

4.3.3 Level of governance (most powerful riparian)

In order to test if the *level of governance of the most powerful state* on a basin has any influence on the institutionalization of cooperative regimes of the latter, we used as an indicator the well-known "polity IV index", which examines "concomitant qualities of democratic and autocratic authority in governing institutions, rather than discreet and mutually exclusive forms of governance" (Marshall, 2011). The "polity score" of a state can be located anywhere on a 21-point scale ranging from -10 to 10 (or from hereditary monarchy to consolidated democracy). The authors recommend a three-

part categorization of "autocracies" (-10 to -6), "anocracies" (-5 to +5), and "democracies" (+6 to +10). The lowest score we encounter in our research is China's, with -7, followed by Iran (Helmand river basin) with -6. Several MP states obtain a 10: Germany, Greece, Poland, Israel, Chile and Sweden. The hypothesis behind this variable is that the higher the score of *Level of governance (most powerful riparian)* on a basin: the higher the chances for cooperation on the basin to be institutionalized (binary logistic regression); and the higher the institutionalization of cooperation on this basin (multiple linear regression). The data is available for 2007.

4.4 Summary-table

We have now introduced all independent variables that compose our research model based on the literature. We test it below via SPSS through the completion of both a binary and a linear regression, in order to evaluate the influence of the chosen variables, respectively on the occurrence and, on the *relative degree of institutionalization of cooperation* on the 80 and 56 TWRs under study. Before that, table 3.7 below summarizes our choice of indicators (and the respective source from which we have gathered the data to quantify each of them). The final data for all variables can be found in Appendices 3.3 and 3.4[23].

[23] We note here that for several variables (including the dependent variable), we have proceeded to normalization of the data, so as to respect the assumption of linearity for both regressions. The objective is two-fold: optimize the quality of the data; and minimize the risk of flaws of the model in SPSS. For instance, for the binary logistic regression, the dependent variable must be "categorical", i.e. the outcome must be a category (blood type, political party, etc.). As we shall see below, here it is binary (yes/no), which is a type of categorical outcome. Hence, cooperation exists (and is institutionalized), or not. So, in that specific case, we transformed the data for the dependent variable into binary data for the purpose of the binary logistic regression, while it is "logged" for the multiple linear regression in order to respect the assumption of linearity – which is essential for this type of regressions. Both the original and the normalized data are shown in appendices 3.3 and 3.4.

Table 3.7: Summary of variables and indicators

Category	Variable Name	Indicator name	Source of data
Liberal peace arguments			
History of interstate diplomatic relations and cooperation	History of diplomatic relations	Diplomatic Links (1950-2005)	The Correlates of War Diplomatic Exchange data (Bayer, 2006)
	History of water cooperation	Period since first Treaty in 2007	International Freshwater Treaties Database (TFDD) (OSU, 2009c)
Economic relations	Economic Interdependence	Trade Interdependence in 2007	Correlates of War Project's Trade Data Set (Barbieri and Keshk, 2012)
Governance	Riparian states' level of governance	Average level of governance by basin in 2007	The World Bank (World Bank. 2013a)
Power Asymmetry			
Relational-material power	Power Asymmetry	National Material Capabilities in 2007	Correlates of War Project National Material Capabilities (Singer, 1987)
		GDP per capita (current USD) in 2007	The World Bank (World Bank, 2013b)
Structural-material power	Power Asymmetry	GDP (current USD) in 2007	The World Bank (World Bank, 2013c)
		Total Armed Forces, 2002-2008	Strategy Page (Strategy Page, 2009)
		Foreign Direct Investment Stock (Inward) in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
		Foreign Direct Investment Stock (Outward) in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
		International Reserves in 2007 (current USD)	The World Bank (World Bank, 2013d)
Relational-ideational power	Power Asymmetry	Number of foreign students in the country in 2007	United Nations Educational, Scientific and Cultural Organization (UNESCO, 2013)

		Values of creative goods exports, 2002-2010	United Nations Conference on Trade and Development (UNCTAD, 2013)
		Participation to International Organizations in 2007	The CIA World Factbook (CIA, 2009)
		Number of visitors entering the country in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
Structural-ideational power	Power Asymmetry	Patent grants, 1995-2007	World Intellectual Property Organization (WIPO, 2012)
		Scientific and technical journal articles, in 2007	The World Bank (World Bank, 2013e)
		Education Index (Human Development Indicator, in 2007	United Nations Development Programme (UNDP, 2010)
Power Asymmetry arguments			
Geography	Geographical configuration of the basin	Geographical position of the most powerful state	Various
Water Endowment	Water Scarcity (most powerful riparian)	Total renewable freshwater resources per capita (m3/cap/yr), 2003-2007	Food and Agriculture Organization of the United Nations (FAO, 2013)
	Water Stress (most powerful riparian)	Percentage of total actual renewable freshwater resources withdrawn (%), 2003-2007	Food and Agriculture Organization of the United Nations (FAO, 2013)
	Water Dependence (most powerful riparian)	*Dependency Ratio* (%), i.e. percentage of total renewable water resources originating outside of the country, 2003-2007	Food and Agriculture Organization of the United Nations (FAO, 2013)
Governance	Level of governance (most powerful riparian)	Polity IV Index, in 2007	Polity IV Project (Marshall, 2011)

5 Regressions and results: a two steps analysis

Thanks to the data of the dependent variable, which includes 56 institutionalized and 24 non-institutionalized TWRs, the research introduces two complementary regressions in order to answer the main research questions. We first proceed to a *binary logistic regression* including all 80 cases, with the dependent variable redefined as binary (24 cases not institutionalized = 0; 56 cases institutionalized = 1). This first step permits to identify which variables have an influence on the probability of a basin to be either institutionalized, or not; hence to basically answer the research question "why do states cooperate on TWRs?" However, among the 56 cases where cooperation is institutionalized, the figures are very diverse, with highly institutionalized (Rhine, Incomati, Maputo, Danube rivers' basins) and less institutionalized cases (Congo, Hondo, Helmand, Gash rivers' basins, for instance). Hence, we proceed to a complementary *multiple linear regression* including only the 56 institutionalized cases, in order to identify which variables influence the propensity of cooperation on TWRs to be more, or less, institutionalized. This second step completes the picture by spotting potential inferences between some of the chosen variable and the intensity of cooperation between riparian states; hence to identify factors that could explain why cooperation tends to be strengthened – or hampered – when it is already occurring. This method aims at fully grasping the data at hand in order to answer best the research questions

5.1 The binary logistic regression

This first step of our quantitative analysis is a binary logistic regression, which is used when the data of dependent variable is dichotomous – or categorical (either "yes", or "no", for instance). We do so in order to predict the categorical outcome (the dependent variable) from the independent variables under study (which can be categorical or continuous predictor variables). Here, the two possible answers to the question "is the TWR institutionalized" are "yes" (1) or "no" (0).

That being said, we are confronted to the fact that there exist no widely-accepted methods or guidelines for reporting logistic regressions. We thus follow the guidance of Andy Field (Field, 2005), which is the central publication we have used during this research for what relates to regressions in SPSS. We appreciate the simplicity of his

advices, which are close to our view: being simple and clear, and go straight to the point, notably through the use of tables. The first table introduced here is the summary of descriptive statistics of the model (table 3.8).

Table 3.8: Descriptive statistics of the model – Binary Logistic Regression

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Stat.	Stat.	Stat.	Stat.	Std. Error	Stat.	Stat.
Relative Degree of Institutionalization (Dependent Variable)	80	0	1	,70	,052	,461	,213
Economic Interdependence	80	1,16	7,70	5,1665	,14087	1,26000	1,588
Riparian states' level of governance	80	,00	1,20	,6433	,02890	,25853	,067
History of diplomatic relations	76	,46	1,00	,8332777	,01849164	,16120642	,026
Power Asymmetry	75	,11784	,71834	,4453605	,01752093	,15173573	,023
Water Dependence (most powerful riparian)	74	,00	,37	,0969	,01182	,10165	,010
Water Stress (most powerful riparian)	74	0	1	,42	,058	,497	,247
Water Scarcity (most powerful riparian)	74	5,54985	10,92291	8,3263168	,14881679	1,28017043	1,639
Level of governance (most powerful riparian)	75	-7	10	3,31	,739	6,399	40,945
Geographical configuration of the basin	75	0	2	1,13	,103	,890	,793
Valid N (listwise)	73						

The most important information of this table, apart from the basic descriptive statistics of each variable, is the validity of 73 cases (out of 80). Some cases[24] were excluded by SPSS because of the lack of data for at least one variable. This is due to the limits of the data and data collection, as evoked before. The next step consists of analyzing the quality of the regression model, in order to evaluate how well the model can predict the outcome, i.e. the dependent variable (we note here that in the case of a binary logistic regression, the results of the regression introduce "odds" or "probabilities", rather than "directly readable results").

5.1.1 Model summary and quality

The following table 3.9 – the classification table – shows data on the quality of the model itself. Again, there are no clear guidelines in the literature so as to present best those results. In short, this table shows how well the model predicts the outcome (here the institutionalization – or not – of cooperation between riparians of the same basin).

Table 3.9: classification table – Binary Logistic Regression

Observed		Predicted by the model		
		Relative Degree of Institutionalization (Dependent Variable)		Percentage Correct
		0	1	
Relative Degree of Institutionalization (Dependent Variable)	0	**14**	**5**	73,7%
	1	**4**	**50**	92,6 %
Overall Percentage				**87,7 %**
a. The cut value is ,500				

The overall model has shown to be very successful in predicting the probabilities of each basin to be either institutionalized or not institutionalized. Out of the 73 cases conserved by the mode, 14 (out of 19 TWRs, so exactly 73,7%), were correctly predicted as "not institutionalized". However, 5 of them where wrongly predicted as "institutionalized" on the basis of the data introduced in the model, although their score of institutionalization is

[24] Cases excluded by SPSS : Awash, Drin, Hari-Harirud. Juba-Shibeli, Lake Turkana, Lotagipi Swamp, Vardar

"0". On the other hand, 50 out of 54 basins (92,6%), were correctly predicted by the model as "institutionalized", thus only four were wrongly predicted otherwise. The figure is much better for the "institutionalized" basins. Overall, 87,7% of the cases were predicted correctly (64 out of 73 cases[25]), which is a significant score. Originally, when including only the constant in the model, the percentage of correctness was of 74% (54 out of 73 cases). The model can thus be considered as well shaped (even though it could still be improved) since, when we add the variables of our quantitative mode, 10 more TWRs – hence 13,3% of them – are well predicted. That being said, the next table shows the results of the regression.

5.1.2 Results

The next table is a summary of the essential results that we wish to make available for the reader. The full SPSS results for the binary logistic regression can be found in Appendix 3.5.

Table 3.10: The binary logistic regression: main results

	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Power Asymmetry	-16,932	6,538	6,707	**,010**	,000	,000	,016
Water Dependence (most powerful riparian)	-21,510	8,921	5,814	**,016**	,000	,000	,018
Water Stress (most powerful riparian)	-12,604	4,484	7,900	**,005**	,000	,000	,022
Water Scarcity (most powerful riparian)	1,738	,859	4,089	**,043**	5,683	1,055	30,620
Level of governance (most powerful riparian)	,742	,307	5,824	**,016**	2,099	1,149	3,834
Economic Interdependence	,480	,556	,745	,388	1,616	,543	4,808
Geographical configuration of the basin			5,023	,081			

[25] 7 cases were rejected by the model because of the lack of data for at least one variable, as induced above.

Geographical configuration of the basin: most powerful state downstream or midstream	3,117	1,536	4,118	**,042**	22,567	1,112	457,867
Geographical configuration of the basin: most powerful state upstream	-,193	1,418	,019	,892	,824	,051	13,269
Riparian states' level of governance	,016	3,147	,000	,996	1,016	,002	484,801
History of diplomatic relations	-8,219	6,086	1,824	,177	,000	,000	40,855
Constant	7,562	6,986	1,172	,279	1923,704		

Note : R^2 = 0.61 (Hosmer & Lemeshow) ; 0.501 (Cox & Snell) ; 0.734 (Nagelkerke)

Note : Model χ^2 = 50,69

Note: *p < 0.05; **p < 0.01 and ***p < 0.001

This binary logistic regression was conducted to assess whether quantitative model predicts whether or not cooperation on a TWR is institutionalized. The answer is yes. Indeed, the "chi-square" of the model is of 50,69 (χ^2 = 50,69), with a significance of p (or Sig.) < 0,001. Hence, without entering into too much detail, those figures show that the model *significantly* predicts the outcome (the dependent variable), when all variables are included.

Table 3.10 also introduces the odds ratios for the regression (Column *B)*, which suggest that: the odds of a basin to be institutionalized are increasingly greater as *the level of governance of the most powerful state* and *the geographical configuration of the basin (most powerful riparian: downstream)* scores increase. On the contrary, the odds of a basin to be institutionalized are lesser as the scores of *power asymmetry*, of the three "water endowment*"* variables (*water stress, scarcity and dependence of the most powerful riparian state*), increase. The sign before the figure in the B column shows the positive or negative effect of the variable on the predictions).

The following paragraphs discuss those results for each category of variables.

5.1.3 Discussion

The results of the binary logistic regression are extremely interesting, for several reasons. We shall present them by category of variables, in order to stick to the same presentation, and discuss them in relation to the literature.

On *power asymmetry*

To start with, on the basis of our research background and specific case studies' analyses such as on the Nile, the Mekong, the Jordan or the Tigris and Euphrates rivers' basins, we made the hypothesis that the occurrence of a high level of power asymmetry on a TWR would imply that cooperation on the latter be institutionalized. Hence, the regression results contradict our main hypothesis on *power asymmetry* as a sufficient condition for the institutionalization of TWRs regimes, since the odds of *relative degree of institutionalization of cooperative regimes on TWRs* increase when the level of *power asymmetry* occurring on TWRs decreases. Indeed, on the basis of our model, if the relation between *power asymmetry* and the dependent variable is significant (0,01**), it is however negative (see column B). Thus, for every one-unit increase in *power asymmetry* score, we expect a -16,932 decrease in the log-odds of the dependent variable. In other words, the odds of a basin to be institutionalized are smaller as the *Power Asymmetry* occurring on the basin increases.

In sum, one cannot argue, and even less generalize, despite some cases where this situation is flagrant, that more *power asymmetry* implies institutionalized cooperation. This result contradicts this hypothesis, the arguments of realist authors on the matter – despite a different conceptualization of power between our research and realist assumptions – and the idea that power asymmetry has nothing to do with cooperation. Indeed, realist authors also view *power asymmetry* (in materialistic terms) as central to the development of international regimes, as argued by hegemonic stability theories (see chapter 2). They argue that a powerful state often creates international institutions in order to fulfill its own interests (Mearsheimer, 1995; Barkin and Shambaugh 1999), usually in order to maintain the status quo in its favor (Downs, Rocke, and Barsoom 1996; Zeitoun and Warner, 2006); in other words to ensure that the distribution of water mirrors the distribution of power (Stinnett and Tir, 2009: 242). The contributions of critical authors such as the ones working on the hydro-hegemony framework, who base their research on the same hypothesis but with conceptualizations of the concepts of power asymmetry and hegemony closer to ours than realist ones, also see their hypothesis denied here. However, they do not proceed to quantitative analyses, but rather specific case-studies analyses (such as the Nile or the Jordan rivers' basins), for which they have proven that *power asymmetry* has an influence on the level of inter-riparian states cooperation. Also, this result does not even confirm the conclusions of studies, which affirm that power

distribution offers little insight to the development of cooperation on TWRs (Stinnett and Tir, 2009; Dinar et. al., 2011). Hence, here, power asymmetry influences the formation of cooperative schemes between riparians, but in the opposite way than expected.

Finally, this result is quite unique, because it neither shows that power asymmetry positively influences the outcome (our hypothesis, and realist arguments, despite different theoretical assumptions), or that power asymmetry has nothing to do with it. Indeed, the result shows that the odds of a basin to be institutionalized are smaller as the *power asymmetry* occurring on the basin increases. Plus, other power asymmetry arguments tend to corroborate the idea that even if *power asymmetry* does not directly influence the institutionalization of cooperation on the matter; other variables linked with the presence of a "most powerful state" in their conception do have an influence, as shown below.

On *power asymmetry arguments*

If *power asymmetry* has a reverse effect that we expected, it is also the case for the variables that test if the water endowment of the most powerful state has any impact on the dependent variable. We hypothesized that a basin hegemon living under w*ater scarcity* (in all its forms: *water dependence*, *water scarcity*, and *water stress*) would influence inter-riparian states relations in favor of the development of cooperative schemes in order to ensure that its water allocation needs be secured. However, the results for the three variables operationalizing the water endowment of the most powerful state of the basin also contradict our hypotheses.

Firstly, the relation between *water dependence (most powerful state*) and the dependent variable is significant (0,016*), but negative. For every one-unit increase in *water dependence (most powerful state*), we expect a 21,51 decrease in the log-odds of the dependent variable (hence less probability for TWRs to be institutionalized). The same assessment can be made for the variable *water stress (most powerful state*), the most significant of all variables (0,005**). In this case, one unit is one "category", since the variable *water stress (most powerful state*), is operationalized here as a categorical (binary) variable. Thus, if the most powerful state on a basin starts to suffer from water stress, and thus passes from category "0" (no water stress, data < 20%) to category "1" (water stress, data > 20%), we expect a -12,604 decrease in the log-odds of the dependent variable. Finally, the relation between *water scarcity (most powerful state*) and the

dependent variable (0,043*) is also (negatively) significant, thus an increase of one-unit for the independent variable implies a decrease in the log-odds of the dependent variable. Here, if the relation is positively significant in the results' table, it is due to the fact that *water scarcity (most powerful state*) is operationalized in a way that an increase in the value of the variable implies less scarcity. Indeed, the data for *water scarcity (most powerful state*) shows the (logged) total water availability in km^3 per capita per year. So, as long as the score for this variable increases, scarcity decreases. In reality, the relation between this variable and the dependent one is negatively significant. Hence, our hypotheses on those three variables again proved to be wrong, since the odds for cooperation to be institutionalized increase as *water stress*, *scarcity* and/or *dependence of the most powerful* state of the basin decreases. Thus, we could even argue that a most powerful state will be more willing to cooperate in case its water allocation is already secured, i.e. if the latter does not suffer from *water stress, scarcity* or *dependence*.

Those results are also contradictory to several contributions touched upon in chapter 2 on water scarcity. For instance, Dinar et. al. affirm, on the basis of a quantitative analysis of dyads (bilateral TWRs), that international agreements on TWRs should occur when the level of *water scarcity* on the basin (not only the figures for the most powerful state) is moderate, rather than high or low (2011). Indeed, the result of the regression here implies that the lower the water endowment of the most powerful state, the higher the odds for agreements to be signed between riparian states. However, we operationalized the direct relationship between water scarcity and the dependent variable as linear rather than an inverted U-shaped curve. Also, this result totally contradicts the findings of Stinnett and Tir, (2009) and Tir and Ackerman (2009), which show that "the more plentiful water is, the less institutionalized river treaties tend to be" (Stinnett and Tir, 2009: 244). Moreover, it again contradicts the hydro-hegemony studies on the Nile (Eissa, 2008; Cascao, 2008, 2009; Carles, 2006) and the Jordan (Selby, 2003a, 2003b; Zeitoun, 2008; Zeitoun and Warner, 2006) for instance; where water scarcity is very important and where institutionalized cooperation is very high (although paralyzed by underlying conflicts). A good example that confirms the result of this regression is the one of Brazil, which has no problem institutionalizing interstate cooperation with its neighbors despite the tremendous water resources that flow within its borders. But Brazil is also often downstream (depending on the TWR under study), such as on the largest basin in the world: the Amazon.

The *geographical configuration of the river* also has a significant link with the dependent variable (0,042*). This result confirms our hypothesis for this specific variable. Indeed, the geographical position of the most powerful state of the basin, when downstream or midstream (i.e. not upstream), increases the odds for the development of cooperative regimes on TWRs. Here, our hypothesis is confirmed, and implies that a powerful state is more inclined to cooperate with its riparian states when situated in another position that upstream, as advanced by several authors (Le Prestre, 2005: 402; Lowi, 1993: 10; Dinar, 2009: 115). This result also contradicts contributions, which affirm that fewer treaties are signed on basins with this type of configuration (Song and Whittington, 2004[26]). The logic behind this result is that the powerful tends to use all available power resources at hand in order to convince its riparians that they need to cooperate, in order to secure its own water allocation, which is – or can be – threatened by the fact that it does not directly control the flows. The best example is the one of Egypt on the Nile which, as a downstream riparian, uses all power resources at hand to institutionalize cooperation in order to maintain the status quo in its favor (see Cascao, 2009; Lowi, 1993).

The other variable for which our model confirmed our hypothesis is the *level of governance of the most powerful state of the basin*, which is significant, with a positive relation with our dependent variable. Indeed, this variable happens to be positively linked with the dependent variable (significance: 0,016*). Thus, the higher the polity index of the most powerful state of the basin, the more the odds for cooperation on the basin to be institutionalized are high. If the most powerful state is, for instance, a democracy, chances that the basin's cooperation be institutionalized are much higher than if it were an autocracy, for instance. It is also both the only power asymmetry-related and the only liberal-peace variable for which the hypothesis is confirmed. Hence, a powerful concluded state will be more inclined to participate to cooperative schemes when it is a democracy rather than an autocracy. This result again shows the importance of mixing power asymmetry variables along with liberal-peace ones; hence to give a chance to mix theories together, as we have attempted to do in this research. We could even extrapolate that the most powerful state of a basin acts as a leader when its level of governance is high, especially if it is situated downstream. So this result confirms our hypothesis, but also liberal assumptions on the matter which suggest the same types of inference about

[26] Song and Whittington's findings relate to the difference in interstate relations between diverse geographical configuration of bilateral rivers. They found that find that fewer river treaties are concluded in upstream–downstream configurations.

the level of governance on a basin in general (Elhance, 1999: 18; Kalbheen, 2011)

On *liberal peace arguments*

Interestingly, none of the other independent variables – labeled as liberal peace arguments – do have any significance on the odds of a basin to be institutionalized or not (*economic interdependence among riparian states; history of diplomatic relations between riparian states*; and *riparian states' level of governance*). This is an interesting result also, since it puts into question the arguments advanced by neoliberal institutionalist authors. Hence, neither *economic interdependence* nor the *level of governance* nor the *history of diplomatic relations among riparian states* have any effect on the odds for a basin to be institutionalized. We argue that those variables, when included in a model along with non-liberal peace arguments – such as our view of power asymmetry and power asymmetry arguments – tend to see their influence on the development of cooperation reduced to dust. Indeed, those variables are fully insignificant here, contrary to power-asymmetry and related variables, which are significant, even though not always as hypothesized. By mixing realist, liberal and critical views of international relations in the same model, we happen to find new and interesting results: power asymmetry is significant, but in a different way as realists would argue, and liberal peace arguments are insignificant for explaining the occurrence of interstate cooperation on TWRs.

Those final results confirms the ones of other contributions on the same subject which show that the *riparian states' level of governance* is statistically insignificant (Stinnett and Tir, 2009: 246); and contradicts others showing the opposite inference such as Dinar et. al.'s (2011; even though the latter focus on bilateral basins). Those two key contributions, among others, also showed that *economic interdependence* has a significant positive relationship with the dependent variable (Stinnett and Tir, 2009; Dinar et. al., 2011; Tir & Ackerman, 2009; Kalbheen 2011; Espey & Towfique, 2004) which is proven wrong here; while Dinar et. al. (2011) argue the same inference for the variable *history of diplomatic relations*, along with MacQuarrie and Wolf (2013: 181), Russett and Oneal (2001), Sigman (2004) and Dinar (2009: 128). For the two last variables, those authors see their hypotheses denied by this final regression, at least on multilateral TWRs for what relates to the creation of cooperation. We shall see below that those contributions are closer to the reality when looking at the reasons why states cooperate more – or less –

than others, as developed in the multiple linear regression.

The following table 3.11[27] shows a summary of expectations and findings for this regression.

Table 3.11: Summary of expectations and findings – Binary logistic regression (80 cases)

Variable	Expected impact on the odds of cooperation on TWRs to be institutionalized	Expectation supported?
Liberal Peace Arguments		
History of diplomatic relations	Positive when more relations	No
Economic Interdependence	Positive when more interdependence	No
Riparian states' level of governance	Positive when higher	No
Power Asymmetry and power-asymmetry arguments		
Power Asymmetry	**Positive when higher**	**No, opposite**
Geographical configuration of the basin	**Positive when downstream**	**YES**
Water Scarcity (most powerful riparian)	**Positive when more scarcity**	**No, opposite**
Water Stress (most powerful riparian)	**Positive when more stress**	**No, opposite**
Water Dependence (most powerful riparian)	**Positive when more dependence**	**No, opposite**
Level of governance (most powerful riparian)	**Positive when higher**	**YES**

Finally, one might expect that the odds for a basin to be institutionalized are greater if the latter is characterized by the following features: the presence of a "hegemon" (or most powerful state), which power asymmetry over the basin is low (or moderate); with a high level of governance (a stable democracy, at best); located downstream (or both downstream and upstream at the same time); and which does not – or only very moderately – suffer from water scarcity, water stress and/or water dependence.

This first step showed us the importance of several independent variables as influencing the odds for a basin to be institutionalized, or not. In a second step, we focus on the 56

[27] In bold: the variables, which are statistically significant in the model.

institutionalized basins (binary score = 1 in this first regression) and look at the variables that might have an influence on the score of our dependent variable. We will use the same independent variables (adding the variable *period since first treaty* as an operationalization of the variable *history of water-related cooperation*) as predictors and operate a multiple linear regression including the 56 institutionalized cases.

5.2 The multiple linear regression

The second step of our quantitative analysis is a multiple linear regression, which is used to test the influence of the variables under study on *the relative degree of institutionalization of TWRs cooperative regimes* – the dependent variable. Indeed, here, all basins under study are characterized by more or less institutionalized regimes. The objective is to identify variables that explain why some basins are more institutionalized than others. We carry on with the same variables used for the binary logistic regression, although here the dependent variable is linear (and not binary), and we add the variable *period since first treaty* as an operationalization of the variable *history of water-related cooperation*).

First, we introduce the descriptive statistics of the model in table 3.12 below.

Table 3.12: Descriptive statistics of the model: multiple linear regression

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Stat	Stat	Stat	Stat	Std. Error	Stat	Stat
Relative Degree of Institutionalization (Dependent Variable)	56	1,89712	5,76205	4,1901855	,10139908	,75880126	,576
History of diplomatic relations	54	,46	1,00	,8237	,02431	,17862	,032
History of water cooperation	56	3	62	36,59	2,583	19,329	373,592
Riparian states' level of governance	56	,00	,95	,5034	,03056	,22872	,052
Economic Interdependence	56	1,05	5,40	3,2485	,12655	,94699	,897
Power Asymmetry	56	,12	,71	,4281	,02008	,15024	,023
Water Dependence (most powerful riparian)	55	,00	,37	,0968	,01367	,10136	,010
Water Stress (most powerful riparian)	55	,00	1,00	,4909	,06803	,50452	,255
Water Scarcity (most powerful riparian)	55	5,55	10,92	8,1695	,17418	1,29178	1,669
Level of governance (most powerful riparian)	56	-7	10	4,20	,855	6,397	40,924
Geographical configuration of the basin	56	0	3	1,25	,131	,977	,955
Valid N (listwise)	54						

Like for the binary logistic regression, some cases[28] were excluded by SPSS because of the lack of data for at least one variable. We are left with 54 out of the 56 original cases. The next step consists of analyzing the quality of the regression model, in order to evaluate how well the model can predict the outcome, i.e. the dependent variable, this time with more "directly readable" results, not odds and probabilities.

5.2.1 Model Summary and Quality

Table 3.13 below introduces the model summary. The model is very successful in terms of how it predicts the observed data, with an R of 0,721. The resulting R^2 is the amount of variation in the outcome (dependent) variable that is accounted for by the model. Here, it is of 0,519, which is a normal figure for a good model. The adjusted-R^2 is of 0,407. The R^2 and adjusted-R^2 both show the "goodness-of-fit" of the model, i.e. the pertinence of the independent variables so as to explain the outcome. Here, the model can be considered as well shaped, but it could however be improved. That being said, the next table "coefficients" shows the real meat of the results.

Table 3.13: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,721[a]	,519	,407	,58561127	2,113

That being said, the next section introduces the results of the multiple linear regression.

5.2.2 Main Results

Table 3.14 below introduces the main results of the multiple linear regression. The full SPSS results for the multiple linear regression can be found in Appendix 3.6.

[28] Cases excluded by SPSS : Drin, Vardar

Table 3.14: The multiple linear regression: main results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2,577	,964		2,673	,011
Power Asymmetry	,593	,690	,119	,859	,395
History of water cooperation	,009	,005	,221	1,722	,092
Water Dependence (most powerful riparian)	-,475	1,111	-,064	-,427	,671
Water Stress (most powerful riparian)	,518	,303	,344	1,709	,095
Water Scarcity (most powerful riparian)	,188	,119	,321	1,572	,123
Riparian states' level of governance	,469	,570	,144	,823	,415
Level of governance (most powerful riparian)	,008	,021	,071	,396	,694
History of diplomatic relations	-2,692	,660	-,632	-4,078	**,000**
Economic Interdependence	,364	,133	,459	2,725	**,009**
Geographical configuration of the basin	,065	,096	,084	,678	,501
a. Dependent Variable: Relative Degree of Institutionalization Note: *p < 0.05; **p < 0.01 and ***p < 0.001					

Here, the results are much easier to analyze than for the binary logistic regression, (which shows probabilities of occurrences rather than directly readable results). They show us directly which variable significantly predicts the dependent variable based on our model. Only two variables have a direct influence on the dependent variable of each basin: *economic interdependence* (0,009**), which has a positive relation with the dependent variable, and *the history of diplomatic links between riparian states* (0,000***), which is negatively linked with the dependent variable. We discuss those results below.

5.2.3 Discussion

The following discussion is briefer than the one for the binary logistic regression since: the results are easier to read than for the latter (which shows "odds" rather than directly readable results); only two (out of ten) variables are significant to explain the *relative degree of institutionalization on TWRs* (contrarily to the first regression, where six out of nine variables were significant); and the basic theoretical assumptions of all variables were recalled in the first regression.

On *power asymmetry*

To start with, the variable *power asymmetry* is statistically insignificant so as to explain the higher or lower *relative degree of institutionalization of TWRs*. Instead of being opposite to our hypothesis like in the first regression, this result simply does not consider *power asymmetry* as a variable enhancing (or hindering) *the degree of institutionalization of regimes on TWRs*. Hence, the hypothesis of realist authors, and of case-studies' contributors of the hydro-hegemony framework theory, also see their hypothesis as null. It however confirms the results of some studies, which argue that power asymmetry does not influence the development of cooperative schemes on TWRs (Stinnett and Tir, 2009; Dinar et. al., 2011). It is interesting to note that *power asymmetry* (negatively) influences the odds for cooperation to occur on multilateral TWRs, whereas it has absolutely no influence for what relates to the *relative degree of institutionalization of cooperation* (when cooperation occurs).

On *power asymmetry arguments*

The same can be said for power asymmetry arguments. Indeed, all of them influence the odds for cooperation to occur on multilateral TWRs, but none of them is significant in the case of the multiple linear regression. Indeed, neither *water stress, scarcity* and/or *dependence of the most powerful state* (water endowment variables), nor the *geographical configuration of the river* nor the *level of governance of the most powerful state of the basin* are significantly influencing the dependent variable. In sum, they have an influence in explaining the occurrence of institutionalization (negatively for the water endowment variables, positively for the two others) but not on its level.

Hence, those results contradict the arguments proposed by Dinar et. al. (2011) that moderate *water scarcity* tends to influence the dependent variable, or the ones of Stinnett and Tir (2009) and Tir and Ackerman (2009) who theorize, thanks to quantitative analyses, a positive relationship between *water stress* and *water scarcity*, respectively, and the outcome. The same goes for the *geographical configuration of the river*, since the result of the regression for this specific variable denies any influence of the latter on the dependent variable. Hence, contributions which, like us, argued that the position of the powerful state, if other than upstream, tends to increase the degree of institutionalization of cooperation on TWRs (Le Prestre, 2005: 402; Lowi, 1993: 10), are proven wrong for what relates to multilateral basins. Song and Whittington's argument that fewer treaties are signed on (bilateral) basins when the geographical configuration is "upstream–downstream" is also denied, in the case of our research (2004).

Finally, the variable *level of governance of the most powerful riparian* provides the same result, thereby annihilating our hypothesis for this variable mixing both liberal peace and power asymmetry arguments.

On *liberal peace arguments*

Last but not least, the two variables, which have an influence on the *relative degree of institutionalization of TWRs*, are liberal peace arguments: *economic interdependence* and the *history of diplomatic links between riparian states*. If we were surprised by the absence of liberal arguments in explaining the occurrence of institutionalized cooperation on TWRs, our hypothesis is confirmed here for what relates to the *relative degree of institutionalization* of this cooperation. The results of this multiple linear regression thus suggest that: the higher the level of *economic interdependence* on a TWR resource, the more cooperation on the latter is institutionalized; and the higher the level of *history of diplomatic links between riparian states* on a basin, the less its cooperation is institutionalized.

The level of trade between riparian states is very significant as an influential factor for a basin to be more institutionalized than another. Basins such as the Rhine, or the Danube, in Europe, perfectly fit this argument. Thus, authors who followed this neoliberal institutionalist argument are proven right for this variable (Espey & Towfique, 2004; Kalbheen, 2011; Dinar et. al., 2011; Stinnett and Tir, 2009; Tir &

Ackerman, 2009). Hence, the level of trust between economically interdependent states makes them less unwilling to delegate their authority and more prone to accept further institutionalization of existing cooperation with the same states (Gartzke et. al., 2001; Stinnett and Tir, 2009: 246; Tir & Ackerman, 2009: 628-9; Oneal and Ray, 1997).

However, the result concerning the *history of diplomatic relations* is more surprising. It shows that the presence of riparian states with long-lasting diplomatic relations on a basin does not guarantee a higher institutionalization of the latter. Rather, the most institutionalized basins are those where diplomatic links between riparian states are historically weaker. This contradicts the findings of Dinar et. al. who, like us, hypothesized the opposite relation between this variable and the dependent one (despite their concentration on bilateral basin) (2011). One could argue, for instance, that this phenomenon is logical in the sense that states with long-lasting diplomatic relations do not need to enter into formal treaties to agree on water-related issues since their relations is already filled with trust and potential tacit or informal agreements on the matter. Another, even more optimistic interpretation of this result would be that TWRs are issues for which states cooperate even though they did not build strong diplomatic relations in the past. This argument has yet to be proven through deeper analyses of case studies, but it gives weigh to the authors arguing that TWRs are catalysts for peace, and thus for stronger cooperation at all levels.

The two other liberal peace arguments (the *riparian states' level of governance* and the *history of water cooperation*) are not significant here. The first result denies again the arguments advanced by Dinar et. al., who see the *riparian states' level of governance* as salient in explaining the levels of cooperation occurring between riparian states (2011). It however confirms the results of Stinnett and Tir (2009), which show that the type of regimes on a basin is statistically insignificant. Hence, for them the international commitments made by democracies are more trustworthy than the ones made autocracies, which reputation implies that states be reassured by strong institutions when cooperating with autocracies (Drezner, 2003; Stinnett and Tir, 2009: 246). The second result on the *history of water cooperation* denies the idea that states which already cooperate on TWRs shall be more keen to enhance the institutionalization of this cooperation in the long term. This could be explained by the fact that if states cooperate for a long time on TWRs, they might already trust each other and not need to further institutionalize this cooperation.

On the basis of those results, one could argue that both: a high level of *economic interdependence* between riparian states on a basin is a sufficient condition for it to be highly institutionalized; and a fairly low *history of diplomatic relations between riparian states* of a basin is another sufficient condition for the same outcome.
The following table 3.15[29] shows a summary of expectations and findings for this regression.

Table 3.15: Summary of expectations and findings – Multiple linear regression (56 cases)

Variable	**Expected impact on the institutionalization of cooperation on TWRs**	**Expectation supported?**
Liberal Peace Arguments		
History of diplomatic relations	**Positive when more relations**	**No, opposite**
History of water cooperation	Positive when longer period	No
Economic Interdependence	**Positive when more interdependence**	**YES**
Riparian states' level of governance	Positive when higher	No
Power Asymmetry and power-asymmetry related variables		
Power Asymmetry	Positive when more relations	No
Geographical configuration of the basin	Positive when downstream	No
Water Scarcity (most powerful riparian)	Positive when more scarcity	No
Water Stress (most powerful riparian)	Positive when more stress	No
Water Dependence (most powerful riparian)	Positive when more dependence	No
Level of governance (most powerful riparian)	Positive when higher	No

[29] In bold: the variables which are statistically significant in the model.

Finally, within those 56 institutionalized cases, one might expect that a TWR characterized by the following features be more institutionalized than others: a high level of *economic interdependence* between riparian states and *weak history of diplomatic relations* between riparian states.

6 Conclusions

The following conclusion is divided in two main parts. The first one briefly concludes this chapter by both summarizing it and recalling its function within the greater methodological scope of this research. The second is a transition to the next chapter. It introduces the method used to choose the case that which will be analyzed in Chapter 4: the Okavango River Basin, in southern Africa.

6.1 General conclusions

This chapter was the first of the three-steps mixed method research design: the "literature-based quantitative analysis". We tested the analytical framework introduced in chapter 2, from which we extracted key variables from the literature so as to explain both why states rather cooperate on transboundary water resources; and, when they do, what factors explain that they do more, or less, which are basically the main research questions of this study.

The first part of this chapter consisted in the presentation of the multilateral transboundary water resources under study (80 cases). Then, we showed how we defined and operationalized the dependent variable (*the institutionalization of international (cooperative) regimes on TWRs*). The latter circumscribes the scope of the research in terms of period of study, notably. Next, we proceeded to the same exercise with the independent variables, which we grouped in three categories: *power asymmetry*, *power asymmetry arguments*, and *liberal peace arguments*. The operationalization part consisted in creating a link between theory and measurement through a methodical choice of indicator for each variable. Hence, the data used in this chapter was quantitative, but was collected on the basis of qualitative information in the literature. After this exhaustive presentation of the analytical model and its variables, we proceeded to two regressions: a binary logistic regression (so as to test the variables in the model in order to identify which ones enhance or hinder the

probability of states to cooperate on TWRs) and a multiple linear regression (including only the 56 "institutionalized" cases, i.e. where cooperation already exists, in order to test the variables in the model in order to identify which ones influence the *relative degree of institutionalization of interstate cooperation on TWRs*).

The results of the latter are very instructive, as discussed above. They help answering the research questions and sub-questions as follows.

*Why do states rather cooperate on transboundary water resources? (*sub-question*: what are the concepts and/or variables that enlighten best what shapes international regimes over TNRs?*)

The first regression was completed in order to answer those questions on the basis of the literature. In brief, the first step showed that the odds of a basin's cooperative regime to be institutionalized are higher if the latter is characterized by the following features: the presence of a "hegemon" (or most powerful state), which *power asymmetry* over the basin is low (or moderate); with a *high level of governance* (a stable democracy, at best); *located downstream* (or midstream); and which does not – or only very moderately – suffer from *water scarcity*, *water stress* and/or *water dependence.* Hence, only *power asymmetry* and *power asymmetry arguments'* variables seem to explain the creation of international regimes on TWRs. Thus, the following variables enlighten best the odds of riparian states to shape international regimes on TWRs: *power asymmetry*; *Water dependence*, *stress* and *scarcity of the most powerful state*; the *level of governance of the most powerful state*; and the *geographical configuration of the basin*, with the most powerful state located anywhere but upstream.

Why is cooperation more institutionalized in some cases than others? What factors can explain it? What does the literature tell us about potential – necessary or sufficient – conditions that could enhance the probability for states to maintain and consolidate international regimes on the matter?

Interestingly, only liberal peace arguments explain the degree of this cooperation, when existing. Indeed, the second regression showed that one might expect that a TWR characterized by the following features be more institutionalized than others: a high level of *economic interdependence* and a *weak history of diplomatic relations* between riparian states; both of them being sufficient condition for the same outcome.

Does the existence of asymmetric power relations between riparian states catalyze the development of institutionalized regimes?

As induced by those results, the existence of asymmetric power relations between riparian states does not catalyze the development of institutionalized regimes but rather the opposite. However, the binary logistic regression showed that *power asymmetry* has a role to play in the process of creation of international regimes on TWRs. The latter must however be low, i.e., contrarily to what we hypothesized; a lower *power asymmetry* between riparian states increases the odds for this institutionalization process to start. Plus, all other *power asymmetry arguments* do have a role to play too (see just above), which shows the importance of the role of the most powerful state in this process. So, on the basis of this literature-based quantitative analysis, one cannot answer positively to this last question, but *power asymmetry* has an indirect role to play in the development of international regimes on TWRs (when *power asymmetry* is low, when the most powerful state exercises a *high level of governance*; is *located downstream* (or midstream); and does not – or only very moderately – suffer from *water scarcity, water stress* and/or *water dependence*).

The deductive analysis based on this quantitative model has proven very helpful to preliminarily answer our research questions. So, the arguments proposed in the literature, taken for granted or reshaped here for the purpose of this research, have an important explanatory power. The quality of the quantitative model including variables from the literature exclusively indeed is quite suitable to achieve our goals. However, it can also be improved. So, the objective of the next chapter (the second step of our three-steps method) is to complete the literature with information and data gathered through the in-depth analysis of one case study, through the completion of both a literature- and a field-research, in order to: improve this initial quantitative model (exclusively literature-based) thanks to new complementary information and data that could enlighten our research questions; find other results of interest that are specific to the case study itself; and deepen our analysis of power relations. The two first steps shall be completed via an open-ended (exploratory) research method and an inductive analytical approach, while the last will focus on a deductive analysis of interstate power relations through the lens of the Hydro-Hegemony theory.

In the next chapter, we need not to bind our research and keep an open mind to potentially unexpected findings. But it does not mean that we cannot anticipate any direction that the research could take. Indeed, the qualitative analysis of this case study will be organized in three parts. The first will attempt to explain why states started cooperating, in reference to our main research question. The second will

attempt to understand the reasons which explain why cooperation is improved – or hindered – over time between riparian states (hence answering the second part of the main research question). The last will focus on the deductive analysis of power relations. We justify this last step for several reasons: firstly, power lies everywhere and at all levels of the creation, development and consolidation of any (international) regime. TWRs are no exception to the rule, thus power might be exerted at other levels of analysis (lower or higher) involving different actors than states. Secondly, we might have omitted other pertinent manifestations or sources of power for what relates to TWRs (that could be translated in new power-related independent variables). Thirdly, power resources cannot always be quantified, as Lukes nicely puts it: "power is at its most effective when least observable"[30]. Finally, our considerable investment in the conceptualization and operationalization of power asymmetry certainly provides us with consequent theoretical baggage toward this objective.

Thus, the following open-ended questions might be of useful guidance toward our objective: In this specific case study, why did the riparian states rather cooperate? What factors pushed them to do so in the beginning? Why did they institutionalize this cooperation into a transboundary regime? Since they started cooperating, what are the factors that hinder or improve interstate cooperation? In other words, why is cooperation more institutionalized in some cases than others? Did power relations between riparian states play any role in the creation and development of the OKACOM? If yes, how? What are the underlying processes and mechanisms through which actors influence its institutionalization?

The next paragraphs introduce the choice of case study for chapter 4: the Okavango River Basin.

6.2 The way forward: choice of case study

Instead of pursuing a confirmatory research by, for instance, studying a "typical case" of our model in order to validate it, we chose to focus our attention on a case that is badly explained by our analytical model. Indeed, the study of such a case could spot the light on factors – hence potential variables –omitted in the first place.

[30] LUKES, S, Power: A Radical View, 2nd ed., Hampshire: Palgrave Macmillan, 2005a [1974], p. 1

Two methods are appropriate for this specific purpose: the extreme[31] and the deviant[32] case methods. They have several features in common. Indeed, they both are exploratory research methods, and they are used to probe new – but as yet unspecified – explanations. They only differ in the fact that the choice of the extreme case is based on an unusual value for the dependent variable, compared to the mean value; whereas the deviant case method is slightly more bounded because the deviant case is estimated on the basis of the whole model and its embedded causal relations (Seawright and Gerring, 2008: 302). In other words, if we take our study as background, the extreme case is labeled as such because it has either a very high or very low *relative degree of institutionalization of interstate cooperation*; whereas all the factors (or variables) that define the deviant case show unexpected results when combined together and processed in the model. It often happens because of a lack of variables in the model to explain the outcome for this specific (deviant) case. In order to define our case study, we set several criteria to fit our research objectives[33]. On the basis of the latter, we identified several deviant and/or extreme cases for each regression, before narrowing it to one single case: the Okavango River Basin (ORB).

We start with the binary logistic regression, for which only deviant cases are available (the dependent variable is binary). Here, the available deviant (high residuals) cases correspond to the ones not correctly predicted by our model (9 cases out of 73), i.e. cases which, because of their characteristics (the values of their independent variables), were wrongly evaluated as institutionalized (1 instead of 0) or not institutionalized at all (0 instead of 1). Cases of interest belong to the second category: the Okavango (dependent variable = 4,5); Gambia (11); Ili / Kunes He (0,67) and

[31] The extreme case method "selects a case because of its extreme value on the independent (X) or dependent (Y) variable of interest. An extreme value is understood here as an observation that lies far away from the mean of a given distribution; that is to say, it is unusual". (Seawright and Gerring, 2008: 301).

[32] The deviant case method "selects that case that, by reference to some general understanding of a topic (either a specific theory or common sense), demonstrates a surprising value. The deviant case is therefore closely linked to the investigation of theoretical anomalies. To say deviant is to imply anomalous" (Seawright and Gerring, 2008: 302).

[33] Methodological constraints & Criteria: 1) the extreme case method does not apply to the first step of the research, since the dependent variable was defined as binary (0 representing cases without institutionalization; 1 representing all institutionalized cases). 2) Second, we excluded extreme and deviant cases that are characterised by no institutionalisation (first step) or very low "relative degree of institutionalisation" scores (second step), since our goal is to understand how and why transboundary water resources are institutionalised. A case of interest for our research preferably has at least one permanent institution. Hence, we wish to pursue our research through the in-depth examination of an institutionalised basin that would correspond to our case-selection method criteria.

Hondo (1,6) rivers' basins. The Hondo and Ili/ Kunes-He's *relative degree of institutionalization of cooperation* are quite low, whereas the Gambia and the Okavango rivers' basins better fit the purpose of this research with a higher value for the dependent variable. The objective here is to study interstate cooperation, hence the higher the institutionalization of cooperation; the better. Those two cases are also endowed with a permanent interstate commission dedicated to those specific basins' water-related issues. We now look at the extreme and deviant cases for the multiple linear regression.

We could identify six "extreme" and twelve "deviant" cases when looking at the dependent variable's and the residuals' data respectively. The six extreme cases have unusually high values for the dependent variable: the La Plata (31,8); Rhine (26,67); Incomati (25,33); Danube (19,78); Maputo (19,67); and Orange (18,5) rivers' basins. The twelve "deviant" cases (see footnote[34]) are also managed collectively by riparian states via institutional mechanisms, so they all show a certain amount of institutionalization of interstate cooperation. The following paragraph introduces how and why we excluded the other cases (other than the Okavango).

When comparing the list of extreme and deviant cases, the Danube and the Rhine rivers' basins are extreme, but not deviant cases. Most importantly, they are also "typical" cases (low residuals' cases) in the first step of the analysis, which reduces the potential for new explanations, at least for half of the process (the binary logistic regression), in the sense that studying them would be both confirmatory (step 1) and exploratory (step 2). We chose to pursue a deductive approach in the next chapter, which would best involve a complete exploratory research. Then, the Amazon, Incomati, Maputo, Lake Chad, Limpopo, Senegal and Orange river basins all are deviant cases in the second step (multiple linear regression) of the research (the Incomati, Maputo and Orange are also extreme cases), but are also "typical cases" in the first step, like the Danube and the Rhine rivers' basins. Additionally, the La Plata is both an extreme case and a deviant case, and could be of interest here, as well as the Zambezi, the Pasvik, and the Aral Sea basins, which are deviant cases exclusively. But, again, they are characterized by low residuals for the first step of the analysis –

[34] The deviant cases for the multiple linear regression are : the La Plata (31,8); Incomati (25,33); Maputo (19,67); Orange (18,5); Senegal (12); Pasvik (12); Zambezi (11,67); Limpopo (9,25); Amazon (5,25); Okavango (4,5) rivers basins; the Lake Chad basin (5); and the Aral Sea basin (13,57)

not as low as the cases evoked just above, but much closer to the lowest residuals' scores than to the high-residuals ones. In brief, they are not far from being "typical" cases too. Finally, all those cases are strong candidates here, however they simply are not as pertinent as the Okavango river basin for the specific purposes of this research.

Indeed, the choice of the Okavango river basin is particularly obvious: it is the only case, which is **deviant in both regressions**. In other words, it is the only case that is twice poorly – or not at all – explained by our model. If its *relative degree of institutionalization of cooperation*'s score is not impressive, the Okavango river basin started to be institutionalized recently and possesses a functioning commission that focuses exclusively on the Okavango River's issues (the Okavango River Basin Water Commission, or OKACOM). Despite the numerous possibilities proposed by our data, the Okavango is a very counter-intuitive case. In the first step, the basin was wrongly predicted as a typically "not-institutionalized" case (0). Also, it is characterized by a very high level of *diplomatic links between riparian states*, and a very low degree of economic interdependence, which both totally contradict the second-step model's results. The Okavango carries a lot of potential for our research purposes. We argue that its characteristics make it the best case in order identify new factors: either a multitude of left-out variables that individually have small effects on outcomes (the dependent variable), or one or a few left-out variables with strong influence on the latter (which could become variables and be later included in our quantitative model).

CHAPTER 4: CASE STUDY-BASED QUALITATIVE ANALYSIS – THE OKAVANGO RIVER BASIN

"In conflict lie the seeds of creativity" (Gabaake Gabaake, Int., 2012)

1 Introduction

Chapter 3, the "literature-based quantitative analysis", was conducted in order to test the influence of factors taken from the literature as central to the institutionalization of cooperative international regimes on TWRs. The model proved to be of good quality, and preliminary results for this first quantitative model are encouraging. However, a quantitative model can always be improved, which is one of the objectives of this chapter. We therefore proceed to an exploratory research of a counter-intuitive or "deviant" case (the Okavango River Basin), combining both inductive and deductive analytical approaches, in order to: improve the initial model by attempting to identify new explanations (or variables) to our research question through a thorough qualitative analysis of the ins and outs of cooperation and conflict over this transboundary resource; and contribute to improving the general knowledge of the interstate politics of the Okavango River Basin (ORB) and the region, with a particular focus on power relations.

In order to fulfill our research objectives, we proceeded to interviews and analyzed written documents and articles on this specific case study. The interviews were conducted with actors directly or indirectly involved in the interstate cooperative scheme managing the ORB: the Okavango River Basin Water Commission (or OKACOM). Interviews can be very useful when used to gather information in order to complement secondary data such as literature and reports (Björkdahl, 2002). It is important to note here that in this specific case, where water issues are very complex and sensitive, having recourse to interviews is a good way to overcome the barrier of secrecy over some information, especially when discussions can take place off the record. The sensitivity of the ORB's water issues led most of the respondents to ask for anonymity for what relates to this research.

A total of approximately six weeks were spent in the region during three different trips: in September 2012 (one week in Maun, Botswana; one week in Gaborone, Botswana; one week in Windhoek, Namibia); in November 2012 (two weeks in South Africa for two annual regional conferences on transboundary water issues); and in June 2013 (one week for the annual meeting of the OKACOM in Maun, Botswana). During this lapse of time, we were able to conduct 28 interviews with: former and current representatives of the three riparian states at the OKACOM, representatives of civil society organizations, experts and consultants, academic researchers, and intergovernmental agencies (see appendix 4.1[35]). The selection of interviewees was voluntarily diverse in order to fulfill the exploratory dimension of this inductive part of the field research. For instance, it was very important to meet on the one hand the former (honorary) commissioners at the OKACOM who were at the origin of the first interstate agreement on the ORB in 1994, in order to understand why and how the riparian states came together to cooperate. Conducting interviews with current representatives on the other hand allowed us to complete the frame by helping to understand why cooperation works (or not), and to grasp the underlying factors that can explain this situation. It is precisely this type of complementarity that was sought. Combining the testimony of respondents from all involved countries, and from different sectors and origins, also contributed to the comprehension of the global picture of transboundary water issues on the ORB. In order to constitute as big a sample as possible, each interviewee was systematically asked to provide the contact details of other potential respondents. This is how most of them were approached and met.

Semi-structured interviews were conducted following an exhaustive topic guide[36], which included general questions asked to all interviewees on the research topic in

[35] Appendix 4.1 introduces: the list of interviewees; the date and the location of the interviewees; the position of the interviewee (and, when pertinent, their link with the OKACOM); and the way the interviewee wishes to be referred to in the text. Indeed, 10 out of the 28 respondents did not want their name to appear in the study and asked for an "indirect" citation (such as "a former member of OKACOM representing Namibia", for instance.

[36] In a nutshell, a "topic guide" is a "broad research agenda of topics to be systematically covered", including "a statement and reminder of key objectives and a checklist of essential topics and issues" (Jelen, 2013). We chose to use a topic guide because it is both flexible (the order of questions is not set, so one can organize the interview in the 'most natural order') and structured (in the sense that questions are organized by categories). As we did not know how much time we would have with each interviewee, a topic guide appeared as the most pertinent method. It revealed to be a good choice, since we had interviews of very diverse lengths, and the topic guide helped in adapting the categories of questions depending

order to evaluate their knowledge and specialization. Follow-up questions were then asked depending on the reaction to this initial step. We either used the more specific questions in our topic guide to give a thematic focus to the interview (see appendix 4.2[37]), or followed the links made by the respondents themselves in order to dig an issue that we were not aware of, or that we knew only little about. It also explains why some interviews lasted between 20 and 30 minutes, while others lasted several hours[38]. By the end of the process, 4 interviews out of the 28 had not been recorded, because of the objection of some respondents. In those cases, we refrained from extracting direct quotes from the interview in order to avoid transcription mistakes – because notes had to be taken while listening to the interview. Finally, those interviews were analyzed both separately, through an in-depth discourse analysis in relation to the nationality and professional standpoint of the interviewee, and transversally by themes (Blanchet and Gotman, 2007: 92-96) (such as interstate cooperation, conflict, or power, for instance) in order to distinguish trends and corroborations between interviews on the same issues. The audio files and transcriptions of the interviews can be found in appendix 4.3.

Despite a few challenges[39], the field research eventually proved to be a success. We were fortunate enough to manage to reach respondents who were involved in the

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both on the respondent and the time the latter initially offered us (it often happened that interviews lasted much longer than expected by the respondent).

[37] Appendix 4.2 introduces two topic guides. The first is the general one, used to interview representatives at the OKACOM from Botswana and Namibia, but also external respondents such as consultants or academic researchers. It includes two categories of questions labeled "specific to Botswana" and "specific to Namibia", which present questions exclusively for members – or former members – of OKACOM of the two states respectively. They are more or less the same questions, but reformulated and adapted so as to be addressed to the different parties. The second shows a shortened version of the same topic guide, which was only used during the last field research in June 2013 to interview representatives from Angola. It was the only opportunity to get hold of the point of view of delegates from the last riparian state we did not interview yet. In other words, it was crucial for the research. But we had to proceed to those interviews in difficult conditions, during the OKACOM annual meeting week. Some were done during breaks, or at the end of the day when the respondent was exhausted. So, we had to adapt our strategy in order to get the best out of those interviews. Plus, we did those four last interviews months after the others, so we had a better idea of the topics on which to focus in order to complete those interviews.

[38] Up to 2h 40 min for an interview with two respondents.

[39] Tbe most important challenge was to access to representatives of Angola. We could not travel to Angola for several reasons: the prices for foreigners in Luanda are extremely high, notably because of security reasons; the Angolan government does not easily give visas to foreigners if it is not for official business reasons; and the governmental structure is very hierarchical, so we were advised not to interview them in Luanda because they might have their hands tied when talking about sensitive issues about the ORB, as advised by several interviewees from Botswana, Namibia and members of external organizations. Hence, we decided to wait until June 2013 to meet Angolan representatives at the OKACOM week in

initial stages of cooperation in the 1990s and even before, since states had not waited for the first and constituent agreement on the basin in 1994 to start discussing with each other, as we shall explain in a further section. This was crucial for the purpose of answering best our research questions. A large amount of primary data of great value was gathered for the study of the institutionalization of cooperation on this (very) particular basin. This data was complemented with secondary sources such as OKACOM and other interstate and international organizations, and other non-governmental and civil society organizations reports, documents and data. In particular, we spent some time in the libraries of the Okavango Research Institute (in Maun Botswana, where the OKACOM headquarters are located too) and the University of the Witwatersrand (in Johannesburg, South Africa), where we had access to data unavailable elsewhere. The academic literature on the ORB is also quite important.

Then, we resorted to a deductive analytical approach in the last part of the study, which analyzes more in depth interstate power relations on the ORB. We used the Hydro-Hegemony Framework Theory (Zeitoun and Warner, 2006) – which already inspired our research framework (see chapter 2) – so as to guide us in this final step of the chapter. The latter was very helpful to put names and definitions on interstate events or relations involving power mechanisms and discourses, particularly for the exercise of less visible forms of power, as we shall see below. We thus test the hypothesis, in a qualitative manner this time, that power asymmetry has a great role to play in the development of international regimes on transboundary water resources.

This chapter is divided into three sections: firstly, we present the case study and introduce the reasons which led three out of the four riparian states to officially begin a process of cooperation in 1994; secondly, we focus on the period since then, and point at several factors which either improve or hinder interstate cooperation on the basin; finally we look at the ORB through the lens of power relations.

Maun. Another reason for proceeding to those interviews during the OKACOM week was the presence of official interpreters hired by the OKACOM. Those English-Portuguese interpreters supported us during interviews with Angolan representatives who only spoke Portuguese, thanks to the OKACOM Secretary General Eben Chonguiça.

The first section is divided into three subsections. We present the historical, geographical and political context of the Okavango River Basin before the states started cooperating in the 1990s. We then discuss the exclusion (or non-inclusion) of one riparian state (Zimbabwe) and the implications of this situation on the politics of the basin. This sensitive topic certainly raised interesting discussions about the interstate dynamics of the ORB, which deserve to be introduced here. The last and most important subsection focuses on the origins of cooperation, and on the reasons why states decided to cooperate – or at least engaged together in the 1994 Agreement – in the first place. By doing so, we redirect the research toward its main question: why do states rather cooperate on TWRs? In the case of the ORB, why did the riparian states rather cooperate? What factors pushed them to do so in the beginning? Why did they institutionalize this cooperation by creating the OKACOM regime? In order to answer those questions, we identified several events, factors and interactions between the three states involved.

The second section focuses on the other part of the main research question: since they started cooperating, what are the factors that hinder or improve interstate cooperation?" This question will help answering why cooperation is more institutionalized in some TWRs' cases than in others?" The ORB turns out to provide original answers to those questions. During the period between 1994 and 2007, (from the beginning of cooperation through the signing of a tripartite agreement in 1994, to 2007, the last year of our study), interstate cooperation improved but was mostly paralyzed by numerous factors. We introduce them in four different categories: socio-economic and socio-political; socio-cultural and interpersonal; environmental; and operational factors. We will see that in 1994, when the OKACOM agreement was signed, the inter-riparian's relations were still very fragile, and so was the OKACOM. We point at and analyze the factors that either hampered or improved the development of the Okavango river basin's regime. Hence, the two first sections correspond to the objectives of this research by contributing to identify factors that could be translated into variables in the second quantitative analysis (chapter 5); and enhance the general knowledge of the politics of the very unique case that is the Okavango River Basin.

Thirdly, we switch from a fully inductive method to a partially deductive one via an analysis of the situation on the ORB through the lenses of the Hydro-hegemony

framework in order to identify visible and less visible occurrences of power mechanisms between the three riparian states, and the consequences of the latter on the institutionalization of the Okavango River Basin's cooperative regime. We thereby attempt to answer the research questions relative to power asymmetry that we adapt to this specific case: did power relations between riparian states play any role in the creation and development of the OKACOM? If so, how? What are the underlying processes and mechanisms through which actors influence its institutionalization? We will see, for instance, that the presence of a more powerful actor at the beginning of interstate cooperation had, and still has some – mostly negative – implications on the actual implementation of cooperation on this basin. This last section both confirms and balances some of the results previously introduced in the chapter.

The conclusions of this chapter wrap-up the results exclusively related to the Okavango River Basin, and present their consequences for the following chapter: "the literature- and case study-based quantitative analysis". In particular, we spot the light on potential new variables to complete the initial quantitative model. Finally, we summarize the analysis of interstate power relations on this specific basin, which both confirms some of the previous results and puts others into question, as we shall see.

2 The Okavango River Basin: contextualization and origins of cooperation

The objective here is not to make an exhaustive presentation of what the Okavango River Basin is, but rather to briefly introduce its most important geographical and historical characteristics, in order to grasp best under which circumstances the riparian states started cooperating together at the beginning of the 1990s.

2.1 Geographic and historical contexts

The least one can say is that, at first sight, the geographical configuration and the historical context of the ORB do not seem favorable to the development of strong cooperation between the riparian states.

2.1.1 Cooperation despite geographic adversity

The Okavango River Basin (ORB) is located in Southern Africa, and includes parts of the four following countries: Angola, Namibia, Botswana and Zimbabwe. The following map 4.1 shows the location of the Okavango river basin in Africa.

Map 4.1: The Okavango River Basin's location in Africa

Source: OKACOM, 2011: 35[40]

[40] The Transboundary Diagnostics Analysis of the Cubango-Okavango River Basin is one of the key documents published by the OKACOM. We do have a gentlemen agreement with the Secretary General of the OKACOM (Eben Chonguiça) to use any information, map or data in any material published by the OKACOM for the purpose of presenting it to the jury of the PhD thesis. If the thesis were to be published later on, we agreed to review our agreement in order to make it official and proceed to the administrative arrangements in order to avoid any copyright claims.

The river itself is slightly more than 1600 km long from the headwaters in the central highlands of Angola (via the two main tributary systems: the Cuito and Cubango rivers) to the Thamalakane River, flowing past Maun at the lower end of the delta in Northern Botswana (Ashton, 2003: 16). It is the equivalent of the distance, which separates Paris (France) to Gibraltar, for instance. It is the eighth longest river in Africa among the 29 included in our analysis, still far however from the Nile or the Congo with about 7000 km and 5000 km respectively. Nonetheless, the Okavango can be considered as a long river.

If we consider the data from the International River Basin Register - Africa (IRBR-Africa) of the Transboundary Freshwater Dispute Database (OSU, 2009e), the size of the basin is slightly more than 700 000 km^2, which is the equivalent of more than 23 times the size of Belgium, or slightly more the size of France (including its overseas' territories) or the state of Texas (United States of America), for instance. When compared to the 79 other cases, the ORB would be the 18^{th} in size, largely behind huge river basins such as the Amazon (more than 6 millions km^2) or the Congo in Africa (more than 3,7 millions km^2). The closest are the Tigris-Euphrates basin (765 000 km^2) or the Danube (almost 800 000 km^2), which crosses 18 European states. In other words, its size is above average, but still far from the largest basins in the world. 51% of the basin is located in Botswana, 25% in Namibia, 21% in Angola, and the last 3% of the size of the basin are in Zimbabwe, as shown on Map 4.2 below.

Map 4.2: The Okavango River Basin: borders

Source: UNCS, 2000 (pending request[41])

However, the actual size of the basin is still debated between geologists, hydrologists, and geographers (among others). The principal issue under discussion is the hydrological link between the Makgadikgadi Pans (in Botswana, South East of the Okavango Delta) with the delta and the ephemeral rivers (the Nata river principally) joining Zimbabwe further East (see map 4.2).

[41] Request to use this map has been sent to the United Nations Cartographic Section on April 22, 2014. We are awaiting their answer in order to officially be able to use this map in this research. More information on the conditions and procedures to use UNCS maps available here: http://www.un.org/Depts/Cartographic/english/about.htm.

This debate – which sometimes turns into disputes – is both a reason for which the interstate political dynamics are particularly interesting here, and one of the main challenges of our research[42], as we shall see later. Another central element in the politics of the river is the fact that 94,5% of the river's runoff comes from Angola, while Namibia and Botswana share the rest (2,9% and 2,6% respectively) (Ashton and Neal, 2003: 36). This situation certainly provides Angola with huge leverage during discussions between representatives of the riparian states. The river is also considered as unique for several reasons, the main one being that it does not flow to the sea or the ocean, but in the desert, thereby giving life to a fragile ecosystem that is the Okavango delta (otherwise called the "jewel of the Kalahari"), which hosts an incredible biodiversity including a lot of endemic and protected vegetal and animal species. Another reason is that the Okavango River is certainly the most pristine river system in Africa and the world (Turton et al., 2003b: 9). It has only been lightly affected by human uses and consumption in the past, and the delta and its nature's survival are extremely dependent on the good flow and accumulation of sediments and nutrients from upstream (Mendelsohn and el Obeid, 2004: 93; Ebenizário Chonguiça, Int., 2012). Last but not least, the ORB is also subject to the variability of climatic conditions in the region (where the effects of climate change are particularly obvious). This variability tremendously affects the level of flows, the distribution of water and the sedimentation process all along the river (Jansen and Madzwamuse 2003: 145; Ebenizário Chonguiça, Int., 2012). There have been long periods of drought in recent history, but also severe floods that even linked the Okavango Delta

[42] The figures presented here show the largest possible hydrological size of the basin, but this extent is under scrutiny and discussion, mostly for hydrogeological reasons (see Mendelsohn and el Obeid, 2004: 17). The Permanent Okavango River Basin Water Commission (or OKACOM), which is the central organization for the management of the ORB's waters, shows very different figures, which have consequences for the basin itself, but also for our research. For instance, the OKACOM does not include Zimbabwe, and considers the catchment to be of 413550 km^2, i.e. around 430000 km^2 when adding the delta itself (15844 km^2), with the largest portion of the basin lying in Angola (51,7%), followed by Namibia (33%) and Botswana (15,3%) (OKACOM, 2014b; Scudder, 2008: 82). Turton goes further and argues it has become accepted that the Nata river (ephemeral river linking the Makgadikgadi Saltpans to Zimbabwe downstream of the delta) and the Okavango river are two distinct parts of the Makgadikgadi system (Turton et al., 2003b: 21). The official reason is that the OKACOM only focuses on "active waters", i.e. the river itself, which indeed comes from Angola (with the Cuito and Cubango rivers) flows into Namibia's Caprivi strip to reach the Okavango Delta in Botswana. We shall see later that, more than a hydrological dispute, the ongoing discussion on the "real" size of the basin is a very political one. Not only because it does not include (or excludes?) Zimbabwe, but also because it gives one state or the other more or less leverage on what is happening on the basin.

with the Zambezi River Basin through the Selinda Spillway and the Chobe River (see map 4.2, North-East of the Delta)

All these factors influence the daily life of the population around the river. Nearly 900 000 people live directly along the Okavango (500000 in Angola, 160000 in Botswana and 220000 in Namibia) (OKACOM, 2011: 71). For them, the Okavango River is a vital resource in an otherwise hostile and dry environment (Mbaiwa, 2004: 1319; Ashton and Neal, 2003). As nicely said by (Mbaiwa, 2004: 1319-20), "the ORB provides an example of a transboundary system where human and ecosystem needs compete for scarce water supplies in an otherwise arid region". Most of the population is rural, poor, and strives to survive in a region long impacted by violent conflicts and for which the development of the river is crucial for their future. On the other hand, pressure from outside and from some riparian states to keep the river as pristine as possible complicates even more their perspective of development. The opposition between those in favor of the development of the river, and those who wish to protect it in order to ensure that it stays pristine as long as possible, is one of the central issue at stake between the riparians.

To summarize: the debate on the actual size of the basin; the fact that Angola is in a position of strength in terms of contribution to the flow and its upstream position; the fragility and uniqueness of its quasi-pristine ecosystem; the fact that it is the only noticeable perennial surface water flowing in the region (the only one for Botswana and Namibia); the variability of the climate in a region which is characterized by acute water scarcity; and the daily socio-economic difficulties of its population make the ORB an excellent case in order to understand why states cooperate rather than fight over TWRs. We now turn to the complementary historical background of the ORB.

2.1.2 Cooperation despite a history of violence

The geopolitical context of the Okavango basin's region – and of most Southern Africa – during the 1945-2007 period can be characterized in one word: conflict. It is only since 1990 and the independence of Namibia (from South Africa) and later the end of the civil war in Angola (2002) that relations between the riparian states of the basin have progressively improved. We briefly introduce here the historical

background of those riparian states and their relations with each other during the studied period in order to understand under which political and socio-economic conditions they started to cooperate together (except for Zimbabwe) at the beginning of the 1990s.

Angola was under Portuguese colonial rule during most of the 20th century. In 1975, after a prolonged liberation war since 1961, the country gained its independence following a coup d'état in Lisbon[43]. Between 1975 and 2002, three nationalist movements (MPLA, UNITA and FNLA[44]) fought each other during a devastating civil war that caused hundreds of thousands of casualties and the displacement of millions of people in the whole country, but in particular in the Okavango region. Between 1975 and 1990, the MPLA maintained a socialist regime, backed-up by the USSR and Cuba, while the FNLA and UNITA were supported by the United States and South Africa. The Okavango region was the theater of violent fights between the parties on both sides of the border of Angola and Namibia (then named South West Africa, under the rule of South Africa) up to the Caprivi Strip and the delta in Botswana (see map 4.2). The second largest battle in Africa's history[45] even took place in the Cuando Cubango province in Angola in 1988 (where the sources of both the Cuito and Cubango rivers are located). The independence of Namibia in 1990 somewhat appeased the conflict, but it is only in 2002, after the death of UNITA's leader Savimbi, that the civil war actually ended. Its legacies are however severe, especially in the Cuando-Cubango region, where the population is still slowly recovering from a huge humanitarian crisis. Thousands of refugees came back to a region they had to flee because of the violence, where poverty is rampant and landmine fields abound.

Namibia – at that time "South West Africa" (SWA), under the mandate of South Africa - endured the apartheid policy from 1948. The Namibian War of Independence (1966-1990) involved the apartheid government of South Africa (backed up by UNITA from Angola) against several liberation groups, of which the nationalist

[43] The coup d'état itself occurred in April 1974, but the whole period that led to official independence in November 1975 has not been without problems between the three liberation groups.

[44] MPLA: Popular Movement for the Liberation of Angola ; UNITA : National Union for the Total Independence of Angola) ; and FNLA : National Front for the Liberation of Angola

[45] The Cuito Cuanavale battle (winter 1988), second largest battle in Africa's history after El-Alamein in 1942/3. South African Forces, along with UNITA, attacked a strategically important MPLA's base.

SWAPO (South West Africa People's Organization) was the largest and most influent. Hence, Namibians, Angolans and South Africans (among others) fought against (or with) each other in the territories of both Angola and Namibia for decades, making the region one of the most strategic geographical zones of the Cold War. The transition to independence started at the end of the 1980s, especially in 1988 through an Agreement between South Africa, Angola and Cuba. The independence of Namibia was official on March 21, 1990 and since then the country successfully managed its democratic transition, and progressively improved its political and societal stability.

As for Botswana, it has certainly been the most stable of the four riparian states. Between 1945 and 1966 though, the former Bechuanaland Protectorate was a British Colony until the UK accepted to withdraw progressively from 1964 to official independence on September 30, 1966. Since then, the country developed slowly but surely, mostly thanks to its mining industry (diamonds, in particular) and the development of tourism in the Okavango delta region. Only one major impediment hampers its development, like Namibia: both are some of the driest country in the world.

Zimbabwe is the fourth riparian state of the ORB. However, it has never been involved in discussions relative to water issues on this specific basin. There are several interpretations about this exclusion or non-inclusion of Zimbabwe, be they political, or simply geographical, as we shall see below. Formerly known as "Southern Rhodesia", the country was a British colony from October 1923 to 1980, despite a unilateral declaration of independence of "Rhodesia" in 1965 by the Rhodesian Front, which was rejected by the United Kingdom. A civil war followed, involving the Rhodesian government, Robert Mugabe's ZANU[46]'s military wing "the African National Liberation Army", and Joshua Nkomo's ZAPU[47]'s Zimbabwe's People's Revolutionary Army. After 15 years of conflicts and complex politico-diplomatic arrangements, Zimbabwe achieved independence and Mugabe began the first Prime Minister of the country on April 18, 1980. Violence, demonstrations, corruption, election frauds, public health and land issues, and a widespread humanitarian crisis are the key words that define the rule of Mugabe, who has now

[46] Zimbabwe African National Union (ZANU)
[47] Zimbabwe African People's Union (ZAPU)

been in place for more than 30 years. Despite an agreement to share power with his opponent Tsvangirai (who holds the office of prime minister), the situation has only marginally improved.

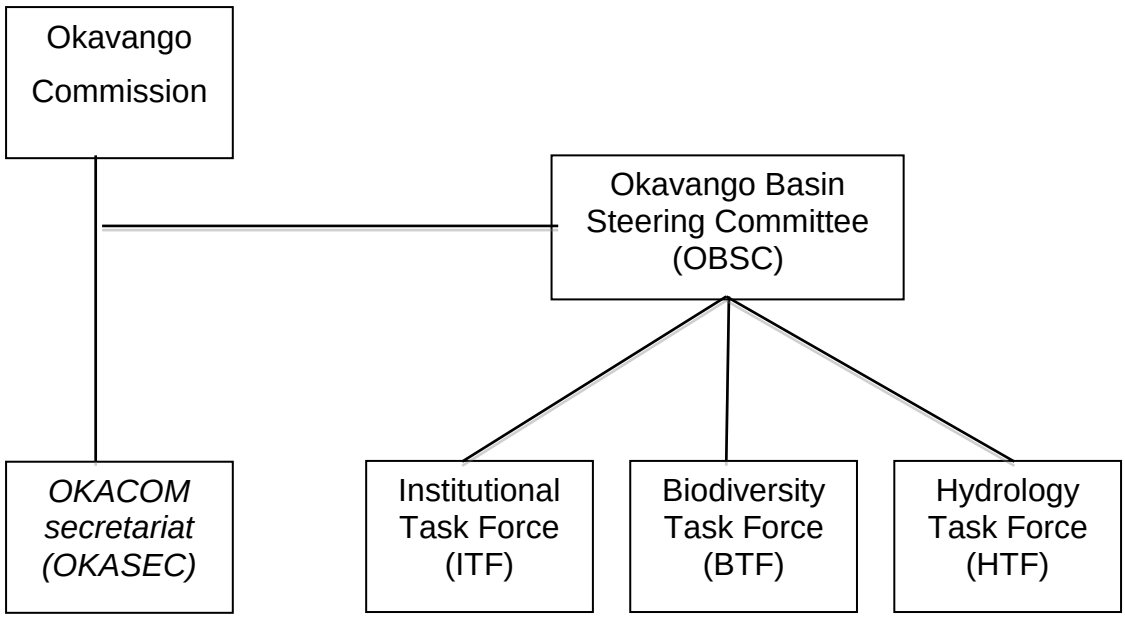
Thus, for most of the second part of the 20th century, the four riparians lived a period of internal and/or international conflicts, and even fought each other on the field (Namibians and Angolans in particular) and in the diplomatic sphere. The region of the Okavango basin was not spared by conflicts and political instability, and the riparian states only recently concentrated their efforts on its (collective) management, since the 1994 Agreement between the governments of the Republic of Angola, the Republic of Botswana, and the Republic of Namibia on the establishment of a permanent Okavango River Basin Water Commission (OKACOM). An interesting fact is that because of those conflicts, states did not have the possibility to build anything on the river (a hydropower dam, or an extensive irrigation scheme, for instance), thus they started discussing about a relatively pristine resource, which was a unique opportunity in itself. Combined with the gradual improvement of political stability and economic development in the region – notably through the impulse of the Southern African Development Community, of which the four riparian states of the ORB are members – one could consider that in 1994 the ORB was at a turning point of its history.

The second step of this section introduces the debate on the absence of one of the riparian states (Zimbabwe) as a member of the OKACOM. We will see that its exclusion (or non-inclusion) has important political ramifications for the rest of the research.

2.1.3 The OKACOM structure

The following briefly presents the structural organization of the Permanent Okavango River Basin Water Commission (OKACOM). The role of the OKACOM is to advise the three governments of Botswana, Namibia and Angola on the management of the basin. OKACOM alerts them about transboundary issues, and facilitates dialogue among the basin's stakeholders (OKACOM, 2014d).
The following figure 4.1 presents the organization chart of the OKACOM.

Figure 4.1: organization chart of the OKACOM



Source: OKACOM, 2014e

The commission is the leading organ of the OKACOM. The commissioners take the final decisions, during confidential meetings, on the basis of the advices and support of the Okavango Basin Steering Committee (OBSC). The OBSC is the technical advisory body of the commission, and implements the decisions of OKACOM at the national level. Three task forces support the OBSC so as to examine specific types of issues (the institutional, biodiversity and hydrology task forces). The Institutional Task Force looks at policies and practices for ensuring effective governance of the basin's resources. The Biodiversity Task Force focuses on issues related to the basin's ecosystems, and the Hydrology Task Force provides technical advices about the quantity and quality flowing in the ORB system. Each of those five organs is composed of three representatives from the three riparian states. Senior officials compose the commission, whereas the OBSC and the Task Forces are mostly constituted of technical staff. The last organ is the OKASEC (the secretariat of the OKACOM), which is the administrative organ of the commission since 2007 (built on OKACOM, 2014a)

2.2 The exclusion (or non-inclusion) of Zimbabwe

When we started taking a closer look at the case of the Okavango River Basin, the first thing that we noticed was the absence of Zimbabwe in the cooperative regime of the ORB: the OKACOM. Despite the existence of diverse arguments to explain this situation, what the literature taught us on this issue is well summarized in Mbaiwa's paper of 2004 on the potential for conflicts on the ORB: "Although Zimbabwe contributes water to the Makgadikgadi Pans through the ephemeral Nata River, it is not a member of OKACOM. There has been no reason given yet for the exclusion of Zimbabwe from OKACOM." (Mbaiwa, 2004: 1324). Because of this lack of official explanation, and because of the geopolitical consequences implied by such non-inclusion or exclusion of one riparian state (see below), this research investigates on the matter. Below we introduce the geographical arguments behind this issue, the OKACOM's viewpoint, the original interests of Zimbabwe, the recent debates on the actual size of the basin, the sensitivity of the issue, and conclusive ideas.

2.2.1 Geographical arguments

The inclusion of Zimbabwe in the ORB is geographically explained by its hydrological links with the delta (and thus the river) through the Makgadikgadi Pans, via the Nata River on the eastern side and the Boteti River in the west (I. Pinheiro, Int., 2013; Honorary Commissioner for Botswana at OKACOM, Int., 2012). Both of them are now ephemeral, which means they only exist for a short period after rainfall. However, and in parallel with the debate on the size of the basin evoked before, some affirm that this hydrological link is not significant enough to include this area as part of the ORB in a perennial way since the runoff in the Nata does not reach the Boteti, even less the Okavango (Pinheiro et. al., 2003: 107). Turton, for instance, argues that it has become accepted that the Nata and the Okavango rivers are two distinct parts of the Makgadikgadi system (Turton et al., 2003b). Mendelsohn goes even further and argues that the basin's map including Zimbabwe is just a mistake:

> *"Somebody, probably some UNDP person, way back, drew a map that showed this basin going into Zimbabwe. It is bullshit. And that's a really big problem. Because it confuses the debate. I'm not even thinking about Botswana. Because then Namibia would say 'we have half the catchment'.*

It's crazy. Namibia does not contribute any water to the river. And that's very different from saying 'we have half the catchment'. So there's a huge confusion about what is the Okavango" (Int., 2012)

2.2.2 The OKACOM's original view: a focus on "active waters"

At the OKACOM, the reason for not including Zimbabwe is that the organization only embraces "active waters", i.e. the river itself, from the Angolan highlands to the end of the delta (S. Motsumi, Int., 2012; G. Khwarae, Int., 2012; E. Chonguiça, Int., 2012; A. R. Tombale, Int., 2012; A.G.M. Da Silva, Int., 2013). At the beginning of the process, the OKACOM took position in favor of the smaller version of the basin, thereby excluding Zimbabwe, or, to be exact, not including it (Honorary Commissioner for Namibia at OKACOM, Int., 2012). Indeed, the OKACOM was formed during a dry phase, so at that time there was not connection with the Zimbabwean part of the basin (S. Motsumi, Int., 2012). This is also why the OKACOM's full name is the "Permanent Okavango River Basin *Water* Commission". The term "water" was added to underline the idea that the OKACOM works on the "active" basin exclusively (G. Khwarae, Int., 2012). Thus, the OKACOM convention does not cover the whole topographical catchment, as well as groundwater links, which is a mistake for those who would wish to see Zimbabwe as a member of the OKACOM (S. Ringrose, Int., 2012; S. Motsumi, Int., 2012; G. Khwarae, Int., 2012; E. Chonguiça, Int., 2012; Honorary Commissioner for Botswana at OKACOM, Int., 2012; L. Namene, Int., 2012; I. Pinheiro, Int., 2013). E. Chonguiça adds that, with the entire climate variability occurring on the basin, the hydrological link might activate, but at this point in time the exclusive focus on the active system confines the ORB to only three riparians (Int., 2012).

2.2.3 Zimbabwe? At the beginning, not really interested…

Also, Zimbabwe did not seem very interested in joining OKACOM when the three states launched it, which is also another reason why it is absent of the process. For some, Zimbabwe's interests exclusively lie in the Zambezi or Limpopo rivers' basins (ORI[48] Member, Int., 2012; B. Meinier, Int., 2012). For others, Zimbabweans were

[48] Okavango Research Institute, University of Botswana

not interested in water issues at that time, on none of their basins (I. Pinheiro, Int., 2013, Honorary Commissioner for Namibia at OKACOM, Int., 2012). What is certain is that they were invited to attend OKACOM meetings several times during the first years of operation. The commissioners at that time even went to visit Zimbabwe during the drought of the 90s in order to discuss transboundary water management, but discussions were shallow and it was "difficult to have officials from Zimbabwe to talk on pipelines, amongst other things" (Honorary OBSC member for Namibia at OKACOM, Int., 2012).

The idea of including them in the process is "still in a drawer somewhere", but "they just don't come! If they come, I don't think there would be any problem", told a Honorary OBSC member for Namibia at OKACOM (Int., 2012). A Honorary Commissioner for Namibia at OKACOM adds that, despite the initial lack of interest of Zimbabwe, the thinking changed over time in the region, notably when Botswana was included in the ORASECOM in 2004 (The Orange River Basin Commission, between Lesotho, South Africa, Namibia, and Botswana), despite the fact that Botswana does not contribute to the flow of the river and that both South Africa and Lesotho were against at the beginning (Int., 2012). However, groundwater links are still active between Botswana and the Orange River Basin (G. Khwarae, Int., 2012).

2.2.4 Recent debates on the "mega-basin"

In the same vein, the whole debate on the size of the basin was put back on the table of discussions during the 2000s. It is only recently that the OKACOM's work expanded to other issues than water such as the local communities, wildlife, tourism, and "how do we get the communities to profit from the resources sustainably" (G. Khwarae, Int., 2012). The OKACOM maintains the confusion by producing maps of both interpretations of the size of the basin (see OKACOM, 2011). As B. Meinier argues: "Two years ago, the maps used by OKACOM were exclusively tripartite (Int., 2012). So, the Zimbabwean part of the basin was excluded. But in the recent "Transboundary Diagnostic Analysis" (OKACOM, 2011), several maps include Zimbabwe back into the geographical limits of the basin! It is very confusing…" It is a very controversial topic for which Botswana and Namibia raised their voices against one another, and for which there has been "hot debates" (S. Motsumi, Int., 2012; HTF member for Namibia at OKACOM, Int., 2012).

On the one hand, Namibia wishes the OKACOM to recognize the "mega-basin" version of the ORB (A. R. Tombale, Int., 2012; S. Motsumi, Int., 2012) (see map 4.2), including a part of Zimbabwe (and a much larger part of Namibia, not limited to the narrow Caprivi strip, but going up to Windhoek in central Namibia via the inclusion of groundwater connections) (HTF member for Namibia at OKACOM, Int., 2012). The idea behind this standpoint is that the size of the basin in each country is an important bargaining factor when comes the time to negotiate water allocation schemes (S. Motsumi, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012). The Namibian position in favor of the mega-basin is certainly coherent since it is the country with the highest need for water. On the other hand, Botswana prefers to stick to the active waters, since it focuses on the delta and "how much does this or that water contributes to it" (A. R. Tombale, Int., 2012; OBSC member for Botswana at OKACOM, Int., 2012). The interests of Botswana indeed exclusively lie in the conservation of the delta, as we shall see later. Thus, considering the mega-basin is not in its interest, since it adds another riparian to the debate, another voice for the management of the delta, and it gives more leverage to Namibia in terms of negotiation. Also, some (in Botswana mostly) argued that adding another riparian would complicate things very much, like on the Zambezi (at ZAMCOM), which is known to be fully paralyzed because it involves too many actors (8, exactly) and consensus is almost impossible to reach among them (G. Gabaake, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012; OBSC member for Namibia at OKACOM). An OBSC member for Botswana at OKACOM adds that the disagreement has been solved recently in favor of the "mega-basin", which might explain why the freshly published Transboundary Freshwater Diagnostics (TDA) introduces maps of the latter. In this aim, Namibia "really had to put [our] their foot out, not to limit the basin to its active parts" (OBSC member for Namibia at OKACOM, Int., 2012).

2.2.5 A political issue

During the interviews, when we asked about the topic of the exclusion – or non-inclusion – of Zimbabwe, linking it with the discussions that occurred at the OKACOM on the size of the basin, we realized that we had touched upon a very

sensitive issue. For instance, a Namibian representative at the OKACOM, who had not already spotted the link between those two issues, told us: "now I understand why we had a big fight concerning the basin's boundaries" (OBSC member for Namibia at OKACOM, Int., 2012). This person even confirmed that it must have been a strategy from Botswana to exclude Zimbabwe from the debate, because of the bad relations they maintain, an information which was confirmed later by other interviewees who argued that there exist obvious hydrological reasons for excluding Zimbabwe, but also political ones since relations between the two countries are very tense (B. Meinier, Int., 2012, HTF member for Namibia at OKACOM, Int., 2012). One even declared that during a recent meeting with Botswana, external water consultants innocently showed the map of the mega-basin (for a specific project without any link with the OKACOM). As a consequence, the Botswana representatives were scandalized because the map included Zimbabwe (B. Meinier, Int., 2012). There exist numerous reasons for which Botswana and Zimbabwe do not get along well politically[49]. Finally, even though the reasons put forward by the OKACOM are hydrological, several interviewees from different backgrounds and origins confirmed that there are certainly some political reasons behind the absence of Zimbabwe at the OKACOM, due to its bad relations with Botswana (Honorary Commissioner for Botswana at OKACOM, Interview, 2012).

2.2.6 Conclusive ideas

Finally, Zimbabwe is not a member of the OKACOM. The analyses of the diverse arguments raised by interviewees showed us that the reasons behind such a decision are either hydrological or political, or both. In short, Namibia wishes to re-evaluate the size of the basin in favor of the recognition of the "mega-basin", whereas Botswana wants to limit access to the OKACOM to states that can directly affect the Okavango Delta, which is very precious to them. However, one should not forget the political instability prevailing in Zimbabwe for decades now. The authorities of the country have a lot of internal problems more urgent to them than the discussions

[49] An important one is the bad relation that Zimbabwe maintains with the United Kingdom (via the voice of Mugabe), which is one of the historical partners of Botswana (F. Witbooi, Int., 2012). They were also opposed during the Apartheid war (Zimbabwe considered Botswana as a South African supporter). More recently there were issues with numerous illegal Zimbabwean immigrants following the events in Zimbabwe in the mid-2000s.

about the Okavango with their neighbors. Plus, they do have other water resources such as the Zambezi river basin (Honorary Commissioner for Botswana at OKACOM, Interview, 2012; Bertrand MEINIER, Interview, 2012) and thus might not be interested in the organization. If the non-inclusion of Zimbabwe at the beginning of the process (because of the emergency of the draught in the mid-1990s) seemed justified for some, others such as David Phillips simply do not understand how such things can happen, drawing parallels with the absence of Eritrea on the Nile's cooperative regime, or of China and Burma on the Mekong's:

> *"there's no kind of logic to it, so you come along after the process has been launched since 20 years or whatever, you look at it and you're like 'what the fuck is going on we're missing some people?!'". It is "stupid. And it tells you straight away, in all of those cases, the process is political rather than about water management! It's more of a political process in the end although it's dressed up as a water management problem.",* (Int., 2012)

Finally, this issue is symptomatic of the problems of the OKACOM, as we shall see later. It shows that the riparians cannot agree on the basic geographical characteristics (not even the size!) of the basin. For its part, Zimbabwe has never asked anything of the OKACOM. However, some respondents would be happy to welcome Zimbabwean representatives if they were willing to participate (S. Ringrose, Int., 2012; NGO member, Botswana, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012).

The last sub-section of this part introduces the reasons why states started cooperating in 1994 (despite the potential for conflicts existing on this specific basin, as introduced above), which is basically the main research question of this study.

2.3 The origins: until 1994

This subsection focuses on understanding the origins of cooperation between the three riparian states at OKACOM: Angola, Namibia, and Botswana. With this aim, we were guided by some of our research questions such as: why do the riparian states of Okavango River Basin rather cooperate? What factors pushed them to do so at the beginning? Why did they institutionalize this cooperation by creating the OKACOM regime? If the literature is quite detailed on the matter, some of the interviews – especially the ones with honorary commissioners of the OKACOM, i.e. those that were there since the beginning of the process – perfectly complemented the information gathered from secondary sources.

In brief, the signing of the agreement that created the OKACOM on September 16, 1994, is due to a combination of factors that led the three states to decide to work together on the Okavango. We will discuss those factors below, but the triggering event has certainly been **Namibia's desire to use the Okavango waters** as soon as the country **became independent in 1990** (Pinheiro et. al., 2003: 114). The **need for water** in the central areas of Namibia and Windhoek in particular (Honorary Commissioner for Namibia at OKACOM, Int., 2012) had already been identified in the 1970s, but the country was not independent at that time (Pinheiro et. al., 2003: 114). This situation, reinforced by a **severe drought** that began in the 1980s, **started to worry Botswana**, the downstream riparian, since potential extraction of water in Namibia could impact the Okavango delta. Thus, the two countries decided to sit at the same table and discuss. They were joined later by Angola (Honorary Commissioner for Botswana at OKACOM, Int., 2012), when they signed the trilateral agreement in 1994 on the basis **of existing bilateral agreements.**

2.3.1 Before 1990: the existence of former relations and agreements

The three countries already had relations, and even agreements, with one another on their shared water resources before Namibia's independence, except for the Botswana-Angola couple – certainly because they do not share other water resources than the Okavango. Botswana and Namibia have a history of cooperation on issues related to the Okavango, but also on other rivers (Taylor & Bethune, 1999).

In the 1950s already, the two states proceeded to joint flow-gauging exercises on the Okavango, Chobe and Kwando rivers. They also worked together to regulate the invasion of *Salvinia molesta*, an aquatic weed, in rivers shared by the two countries (Taylor & Bethune, 1999). At the time, their interactions were mostly about technical matters. Most of the meetings involved technical staff from both governments. The two countries had a positive and regular bilateral collaboration, but it was not properly institutionalized, via official agreements for instance (Honorary OBSC member for Namibia at OKACOM, Int., 2012). On their side, Angola and Namibia cooperated on the Cunene River during the colonial period (Honorary OBSC member for Namibia at OKACOM, Int., 2012; E. Chonguiça, Int., 2012; Honorary Commissioner for Botswana at OKACOM, Int., 2012). South Africa and Portugal respectively represented Namibia and Angola, until their respective independences. They signed several agreements already in the 1920s and 1930s and another regarding the development of water resources of the basin, in 1969 (see UNEP and OSU, 2002: 34; OSU, 2009c). After Angola's independence, relations were very tensed with South Africa. Most of the fighting occurred in the Cunene region (including parts of Namibia and Angola) (Honorary Commissioner for Botswana at OKACOM, Int., 2012), but as Angola helped Namibia to take its independence (J. M. David, Int., 2013), their discussions on water resumed in the late 1980s, despite some difficulties due to the civil war in Angola.

2.3.2 The independence of Namibia in 1990: the beginning of the process of institutionalization?

For some interviewees, the independence of Namibia on March 13, 1990 was the triggering event of the whole process that led to the creation of the OKACOM (OBSC member for Botswana at OKACOM, Int., 2012). It might certainly be true since Namibia, as soon as it became independent, started to contact Angola and Botswana on matters of shared water resources, in order to formalize those relations as a sovereign state (Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012). Namibia was indeed the pivotal actor in the whole process of institutionalization of cooperation between the three states, which ultimately led to the creation of the OKACOM in 1994 (D. J. H. Phillips, Int., 2012; J. Mendelsohn, Int., 2012).

2.3.3 Dealing with Water Scarcity

The hurry in which Namibia contacted its neighbors can also be explained by the occurrence of a long drought that started in the mid-1980s and culminated at the beginning of the 1990s. Namibia is the driest country of the basin, in a particularly dry region (ORI Member, Int., 2012; A.R. Tombale, Int., 2012) and the Okavango River is the only consequent perennial river for Namibia (as well as for Botswana) (OKACOM, 2014b). The water stress endured by the country and reinforced by the prolonged drought pushed Namibia to consider water as a national priority issue. Essentially, the Namibians were very worried about the water situation in the capital (Windhoek). The easiest water resources available to them was the Okavango, and they started to think of getting water from there around 1988-1989 (Honorary Commissioner for Botswana at OKACOM, Int., 2012), on the basis of their existing National Water Master Plan, which dated back to 1973 (OKACOM, 2014c) and involved extracting water from there and other border rivers of the country (S. Motsumi, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012).

2.3.4 The creation of bilateral institutions: the beginning of the institutionalization of the Okavango River Basin's cooperative regime

For Namibia, it was "important to start water commissions as a sovereign state, because of [their] National Water Master Plan to use border rivers to import water in the central parts of the basin" (Honorary Commissioner for Namibia at OKACOM, Int., 2012). If Namibia already had some contacts with its counterparts in Angola and in Botswana before its own independence, Namibia formalized those relations at the international level in the first year of its independence (E. Chonguiça, Int., 2012; Honorary Commissioner for Botswana at OKACOM, Int., 2012; Pinheiro et. al., 2003: 114). In September 1990 already, Angola and Namibia agreed to sanction the colonial agreements between Portugal and South Africa, and thus re-establish the Permanent Joint Technical Commission (PJTC) on the Cunene river basin (A.G.M. Da Silva, Int., 2013). Two months later (on November 13, 1990), it was the turn of Namibia and Botswana to create a Joint Permanent Water Commission (JPWC) on waters of mutual interest, including the Okavango (Pinheiro et. al., 2003: 114;

OKACOM, 2014c). At that time, Angola was not involved in the process on the Okavango, because it had a lot of difficulties in the Cuando-Cubango Region (A. G. M. Da Silva, Int., 2013). The role of those commissions was to study water development projects and advise the respective governments about the most appropriate future course of action (OKACOM, 2014c). At the first meeting of the JPWC with Botswana, Namibia informed the latter of its intention to investigate on the river, in order to possibly proceed to extracting water from the Okavango River (Honorary Commissioner for Namibia at OKACOM, Int., 2012).

2.3.5 Namibia's hydraulic mission[50]: The Eastern Water Carrier Project

The objective of Namibia was to inform Botswana about its projects to extract water from the river. The Namibians formally provided information about the main project of their National Water Master Plan: the Eastern Water Carrier Project. The project aimed at building pipelines from the Okavango River in Rundu, just before the confluence of the Cuito and Cubango in Namibia, to bring water up to the central areas of Namibia, and Windhoek. An Honorary Commissioner for Namibia at OKACOM personally accompanied Botswana's minister of Mineral Resources and Water Affairs, Archibald Mogwe, as early as February 1991, to show him all the details of the project (Int., 2012). The objective of this move was to inform Botswana officially that, because of the urgency due to the prolonged drought in the region, Namibia would certainly have to proceed to the construction of the pipelines as fast as possible, in order to ensure water availability in Windhoek should the drought last much longer (Honorary OBSC member for Namibia at OKACOM, Int., 2012). In the end, Namibia's plans for the Rundu-Grootfontein pipeline played a great role in the future creation of OKACOM (Turton and Earle, 2003), partly due to Botswana's immediate reaction to the project.

[50] The hydraulic mission of a state refers to the period when states exclusively trust engineers to deal with water issues; hence the building of numerous infrastructures as the first response to those issues: dams for storage, canals for distributions, large-scale irrigation schemes for food security. Governments often act so to strengthen their legitimacy to their own population to show that they can handle the management of huge infrastructures (Molle, et. al., 2009)

2.3.6 Botswana's reaction to the projects of Namibia

When Botswana heard about this project for the first time, it "was like if we were dropped a bomb" (K. Kalaote, Int., 2012). Some are less categorical but still argue that "there was a bit of tension" (OBSC member for Namibia at OKACOM, Int., 2012), or that "it caused maybe some discomfort on the part of some of the riparians" (G. Gabaake, Int., 2012). The idea behind those reactions was that, firstly, Botswana was also suffering from water scarcity due to the same drought and, secondly because of the possible impact that those withdrawals would have on the Okavango Delta (G. Khwarae, Int., 2012; ORI Member, Int., 2012; Honorary Commissioner for Botswana at OKACOM, Int., 2012). G. Khwarae, for instance, affirms "Botswana saw the dangers of withdrawals of water from Namibia and then sat down, contacted Namibia and said 'hey, if you withdraw so much water we are going to be affected downstream, so let's talk and we think you should stop doing this'" (Int., 2012). Some went further and blamed Namibia for creating a problem for Botswana, which felt very concerned about potential water extraction upstream of the delta (Honorary Commissioner for Botswana at OKACOM, Int., 2012). Botswana is obviously the state that has the most to lose from any change in the flow of the river upstream because of the delta (ORI Member, Int., 2012). After this first meeting, the motivation of Botswana to participate in the process of cooperation increased very much. Indeed, the downstream riparian state wanted to ensure that it would have a voice in the elaboration of this project, and Botswana ultimately pushed for an agreement to be achieved (Honorary Commissioner for Botswana at OKACOM, Int., 2012).

2.3.7 1991-1994: Joining the three countries together

Namibia did not wait long to think of including Angola in the process. The Namibian government soon suggested bringing the commissioners of both bilateral commissions together in order to start discussions on a tripartite water commission (Pinheiro et. al., 2003: 114). Because Angola is upstream, and most of the catchment is located there, it was an obvious necessity to include it in the cooperation scheme already existing between the two downstream states on the Okavango (Honorary Commissioner for Botswana at OKACOM, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int.,

2012). But it has not been an easy task, for two main reasons. Firstly, Angola was still fighting an internal war (Honorary Commissioner for Botswana at OKACOM, Int., 2012; G. Khwarae, Int., 2012 Honorary OBSC member for Namibia at OKACOM, Int., 2012). As a Honorary Commissioner for Namibia at OKACOM affirms, with a sparkle of sarcasm: "with Angola, a lot of that cooperation started before independence but it did not happen because of the civil war! We could not talk or else we'd get shot… We were at war with South Africa and theoretically at war with Angola but not with Botswana. But if I had arrived to Angola at that time, I would have died directly!" (Int., 2012). Secondly, at first sight, they did not have much to gain from such an agreement, being upstream, in an extremely difficult internal situation (ORI Member, Int., 2012). Indeed, Namibia wanted to extract water to address its water scarcity, Botswana wanted to protect its interests (the delta), but when they were invited by the other two riparians (Honorary Commissioner for Botswana at OKACOM, Int., 2012; K. Kalaote, Int., 2012), they took a bit of time to think before accepting this proposal and finally agreed for the following reasons: the first is that it was "natural" for them to accept (I. Pinheiro, Int., 2013; J. M. David, Int., 2013; A. G. M. Da Silva, Int., 2013). Indeed, they "have families in the three countries because before colonization, the borders were different and in Africa the concept of family is very large" (J. M. David, Int., 2013). I. Pinheiro confirmed by arguing, "at the entrance of the delta in Botswana, villagers are former Angolans, even the governor" (Int., 2013). Others declared that it was more a question of international legitimacy, in order not to be seen as a dangerous neighbor anymore, but rather as a country that, albeit internally torn by a civil war, is able to discuss and have diplomatic relations with its neighbors (Honorary Commissioner for Botswana at OKACOM, Int., 2012; NGO member, Botswana, Int., 2012). Despite a short period of hesitation, they "accepted to discuss after all, [they] did not want to look like animals, fighting internally and rejecting any external cooperation" (I. Pinheiro, Int., 2013). Also, some Namibians saw it as a continuity of the help of Angola during the Namibian struggle for independence, i.e. that Angola felt an obligation to participate to an initiative launched by a country they helped liberating (Honorary Commissioner for Namibia at OKACOM, Int., 2012). They also certainly saw the benefit of such an agreement: "international money could become available, studies could be done, and maybe it could help to develop Angola during their process of ending the war" (Honorary Commissioner for Namibia at OKACOM, Int., 2012). Plus, the person in

charge of the Okavango issue in Angola was the same as the commissioner at the Cunene's Permanent Joint Technical Commission (Da Silva), which "helped a lot" (Honorary Commissioner for Namibia at OKACOM, Int., 2012). Last but not least, for some Angolans Botswana was originally quite reluctant to discuss with Angola because of their difficult relations: at that time "Botswana was scared of Angola!" claimed I. Pinheiro, Int., 2013.

In the end, a historic meeting took place in Windhoek in June 1991. The three states agreed on a draft agreement written by a Honorary Commissioner for Namibia at OKACOM, which would eventually become the OKACOM Agreement three years later (Honorary Commissioner for Namibia at OKACOM, Int., 2012; OKACOM, 2014c)

2.3.8 The OKACOM agreement: a fragile balance

This introduction to the origins of the OKACOM shows that it is definitely a combination of specific factors, at a certain point in time, that led to the institutionalization of cooperation between the three states through the creation of the "Permanent Okavango River Basin Water Commission" (or OKACOM) on September 16, 1994.

Certainly the most important one was the *occurrence of a prolonged drought* in an already very dry region, where *water scarcity* is common. What launched the process of institutionalization of cooperation is *the independence of* one of the three countries, the one suffering the most from water scarcity: *Namibia*. Its strong desire to cooperate firstly with each of its neighbors (Turton and Earle, 2003: 8-9) and then with both of them together, drove the whole process that ultimately led to the creation of the OKACOM. The emergency of the situation resulting from the draught accelerated the process and enhanced Namibia's motivation to formalize and institutionalize relations with its neighbors, firstly through bilateral agreements, before inviting the three countries to work together on the ORB. *The existence of former* (colonial, or not) *agreements* also helped, because states already had relations on the matter before, but also because it provided a basis on which states could start cooperating. Another element that catalyzed the creation of OKACOM was Namibia's "hydraulic mission", materialized by its desire to *pursue developments on the river in order to extract some*

of its water as fast as possible through the completion of the Eastern Water Carrier Project in Rundu. This situation alarmed Botswana, for which any extraction of water from the river equals to a potential destruction of the delta. The latter thus accepted to discuss the creation of a platform of discussion (the JPWC) with Namibia in order to discuss with it before anything is done. *The motivation of Botswana* – which is in a downstream and thus delicate position on the basin – to achieve an agreement was then totally in its interest: protecting the delta and all that is linked to it, as we shall develop later. After Namibia announced its projects to Botswana, the latter "was much stronger to push that the agreement should be achieved" (Honorary Commissioner for Botswana at OKACOM, Int., 2012). Finally, Angola decided to accept the invitation of its neighbors for several reasons exposed above, but it was not an easy task and the balance between the three countries was already very fragile in 1994. Indeed, when the agreement was signed, Angola was still fighting its internal war, Namibia was still confronted to a huge drought and was very much in a rush to develop the Okavango waters, while Botswana, alarmed by Namibia's projects, was keen on obstructing the latter. Furthermore, Namibia informed both riparians at the first official meeting of the OKACOM that they would certainly proceed to the development of the Eastern National Water Carrier Project (Heyns, 1999). The least one can say is that the OKACOM agreement was signed on very fragile bases in 1994.

The following table summarizes the factors that contributed to the institutionalization of cooperation on the ORB through the 1994 Agreement introduced in this section, including the "exclusion or non-inclusion of Zimbabwe" issue. We add a column stating if they are strictly case-specific or not. By "case-specific", we mean that the factor is restricted to the case, and cannot be tested in a larger population of cases (i.e. the issue has not the potential of becoming an extra variable to our initial model). We should also note that some of the factors that we defined as case-specific could be, from an external point of view, considered as potentially generalizable to other cases, but if we chose to keep them as "case-specific", it is because of the specific role they had in the institutionalization of cooperation on the ORB exclusively; and the impossibility to trace the same factor – if existing – for all other TWRs under study.

Table 4.1: Summary-table – the origins of OKACOM

Factor	What it consists of	Case-specific?	Status
The exclusion or non-inclusion of Zimbabwe	The exclusion of one riparian state	No	Already operationalized in our initial model
Before 1990: the existence of former relations and agreements	the existence of former agreements	No	Already operationalized in our initial model
The independence of Namibia in 1990: the beginning of the process of institutionalization?	The independence of one riparian state	No	Potentially testable on a larger population of cases?
Dealing with Water Scarcity	Water scarcity	No	Already operationalized in our initial model
The creation of bilateral institutions: the beginning of the institutionalization of the Okavango River Basin's cooperative regime	The presence of former institutions of cooperation	No	Already operationalized in our initial model
Namibia's hydraulic mission: The Eastern Water Carrier Project	Projects of extracting water by one riparian	Yes	/
Botswana's reaction to the projects of Namibia	Tensions between riparians because of projects of extracting water by another riparian	Yes	/
1991-1994: Joining the three countries together	Creation of a multilateral institution for cooperation	No	Already operationalized in our initial model

For instance, the two factors considered here as case-specific (*Projects of extracting water by one riparian* and *Tensions between riparians because of projects of extracting water by another riparian*) because of: the uniqueness and fragility of the ORB (in other cases, such minor water extraction schemes would not have had the same repercussions); the specific timing of those two factors in the hydropolitical history of this particular basin; and of the impossibility to retrace all proposed projects – and the following debates and disagreements they embed – on all TWRs under study in this research. The only factor which is considered here as "potentially testable on a larger population of cases" is the *independence of one riparian state*, since the latter often coincides with the desire of the newly independent state to assert its independence with the completion of a hydraulic mission, for instance, thereby

potentially triggering conflict and/or cooperation with its riparian states. The five other factors were already tested in the first quantitative analysis (see chapter 3). For instance, the *existence of former agreements* is already taken into account in the calculation of the dependent variable.

We have now shown how the three states achieved to create the OKACOM. We will know focus on what happened between 1994 and 2007 (the end of the period of study), in order to answer the second part of the main research question: "when states do cooperate, what are the factors that hinder or improve cooperation?" "Why is cooperation more institutionalized in some cases than others?" During this period, the OKACOM has been either boosted or paralyzed by several factors. Most of them hampered the institutionalization of cooperation on the ORB. In the end, not much happened between the three countries until the mid-2000s. The next section introduces those results.

3 1994-2007: the OKACOM: a paralyzed institution

The subsection on the origins of OKACOM helped us understand the factors and dynamics that led to its creation. Understanding why states institutionalize their cooperation on TWRs is indeed the main research question here. However, one would have expected that the 1994 agreement be the first impulse for the development of new agreements, stronger basin institutions, in sum: for the consolidation of the ORB's cooperative regime. This process started only recently, at a very slow pace, but the OKACOM is nowadays still far from being a solid institution. Indeed, between 1994 and 2007, the OKACOM has been paralyzed by a number of factors that we introduce and explain below.

We have seen that the OKACOM, created in September 1994, started on very fragile bases. The fact that the agreement was signed did not mean that it was fully implemented. It took more than ten years for the OKACOM to collectively accept the idea that the organization needed an arm with the mandate to assist it in implementing its decisions, and proceed to its creation. Commissioners of the three countries have met during this period, roughly every year. They have discussed, advanced on a few

topics, mostly thanks to the aid of international donors rather than the governments themselves. But in the end, there have not been any tangible institutional progresses between 1994 and 2007. There are numerous and diverse explanations to this situation, such as the geopolitical history of the region, the persistent war in Angola, the issues of language and cultural differences, or the disparities in terms of motivation from central governments at the national level. As for the previous section, our interviews provided us with a lot of precious data on the matter. The state of the ORB during this period provides us with hypothetical new variables for our research purpose, some of which are case-specific, while others have the potential to be tested in our final model. But there are also other results of interests that we shall introduce here. This wavering period was key to strengthen the bases on which the OKACOM started, in order to work better now. It was a necessary step towards the institutionalization of cooperation between the three states.

We should note here that most of the issues discussed in this section are linked with one another. In order to facilitate the reading, we organized them in categories: sociopolitical and socioeconomic; sociocultural and interpersonal; environmental; and operational factors. For each category, we introduce a short summary-table including: the name of the issues; what they consist of; if they are strictly case-specific (like for the previous section: see table 4.1); and the factors to which they are linked.

3.1 Socio-economic and socio-political factors

This category includes factors at the regional and/or basin level of socioeconomic nature (disparity in the level of development of the riparians), sociopolitical nature (lack of motivation from central governments, no guidance from higher levels of decision-making) or both (war in Angola, conflicting interests)

3.1.1 The Angolan Civil War

We have already introduced contextual historical facts relative to the civil war in Angola, but one cannot exclude this issue as an important impediment to cooperation between the three riparian states at the OKACOM at the beginning (S. Ringrose, Int., 2012; Former OBSC member for Namibia at OKACOM, Int., 2012; L. Namene, Int.,

2012; HTF member for Namibia at OKACOM, Int., 2012, Swatuk, 2003b: 128, Kgathi et. al., 2006: 9). Angola signed the agreement in 1994, and even sent representatives at most OKACOM meetings since then. But between 1994 and the end of the second phase of the civil war in 2002, the Okavango region in Angola (the Cuando-Cubango region) was not more accessible than between 1975 and 1994 (Porto and Clover, 2003). No study could be completed, no data gathered, even less field researches. There were no security and communication systems. Until 2002, the region was the stronghold of Savimbi's UNITA rebel movement, so it was impossible for the Angolan government to promote and implement development plans for the region (Mbaiwa, 2004: 1321). In order to cooperate correctly, the three countries should have been able to travel safely in the region in order to observe how the Okavango system works on the field (E. Chonguiça, Int., 2012; L. Namene, Int., 2012).

Also, the province is best known in Angola as "the land at the end of the world", i.e. the furthest part of the country from the capital and economic area in the Northwestern part of the country (HTF member for Namibia at OKACOM, Int., 2012; J. Mendelsohn, Int., 2012). Because of its remoteness, the region has never been a priority for the Angolan government: "It's the last area of the country they're interested in, not in a negative sense, but one day they will want to develop that area too" (HTF member for Namibia at OKACOM, Int., 2012). That time arrived, but only later in the mid-2000s. Indeed, since 2002, a large number of refugees have returned to this area of the country, and the government has elaborated irrigation and hydropower projects for the development of the region (Wilk et. al., 2010: 99). However, despite this legitimate objective of Angola in favor of its population, the large number of remaining landmines in the area, a consequence of the war (obviously), still slows down the process nowadays (Wilk et. al., 2010: 9; Mendelsohn and El Obeid, 2004; J. Mendelsohn, Int., 2012; Mbaiwa, 2004: 1321).

Therefore, the war in Angola itself during this period had a huge impact on the poor level of cooperation at the OKACOM during the 1994-2007 period.

3.1.2 Disparity in the level of development of riparian states

The disparity in the development of riparian states implies they do not have the same level of technical, human, economic and political capacities to debate at the OKACOM, but also not the same priorities (see *conflicting interests*).

In brief, in 1994, Botswana was unquestionably the most developed country in the basin, with the highest GDP per capita, and with more political stability than Angola and Namibia (newly independent). As a consequence, Botswana had more means and capacities to defend its interests: "at the beginning the states still had their national priorities and […] they're countries with very different levels of economic development: Botswana and Namibia a little bit higher and even Botswana a bit higher than the two others with Namibia moderate and Angola behind" (G. Khwarae, Int., 2012). One can imagine that the inertia at the beginning of the OKACOM might also be explained by Botswana's ability to ensure that nothing would hamper the flow of the river thanks to its higher level of development, as detailed in the following issue "*conflicting interests*" and suggested by D.J.H. Phillips: "On the Okavango, […] the most developed or technically able of the three states, most people would consider is Botswana, the downstream party saying 'no you can't touch the river', […] who has a something like 8500 USDs GDP/cap, which is a lot bigger than it is in Namibia, and a lot bigger than in Angola, so it looks like it" (Int., 2012). Even though it might still be the case nowadays, Angola and Namibia have improved their economic condition, and both Botswana and Namibia are now considered middle-income countries (B. Meinier, Int., 2012). But at the beginning, it had an impact in obstructing the development of the OKACOM, notably through the influence it had on the *conflicting interests* of the riparian states.

3.1.3 Conflicting interests

We already saw that the three countries had different interests when signing the agreement, which was one of the reasons why we argued that its bases were very fragile. During the first ten years, those divergent interests polluted the relations between the three countries. In short, Namibia wanted to divert water for its population via the Rundu-Grootfontein portion of the Eastern Water Carrier Project (EWCP) project, among other projects; Botswana's interest lies in the pristine state of

the basin, i.e. limiting the implementation of any projects upstream; while Angola's centralized government in Luanda had not much interest in the region at that time (for the reasons exposed above). It is only later that Angola planned on paper some hydropower and irrigation scheme for the region, despite obvious obstacles (Scudder, 2008: 90). In 1994, what governed the three countries were their own nationalistic sovereignty problems (G. Khwarae, Int., 2012). There was no common vision as to how the Okavango should be managed (Scudder, 2008: 87). Most of the respondents saw "the issue of sovereignty and self-interest" (OBSC member for Botswana at OKACOM, Int., 2012), or "the abiding behavior of the region's state makers in defense of sovereignty and pursuit of narrow national interests" (Swatuk, 2003a: p. 897) as one of the major issues that OKACOM faced at the beginning (OBSC member for Botswana at OKACOM, Int., 2012). Nobody was talking in terms of basin, but rather affirmed "inside our boundaries, we have every right to do what we want" (OBSC member for Botswana at OKACOM, Int., 2012). The OKACOM was not a priority for the three countries when compared to their own interests (G. Khwarae, Int., 2012). As J. Mendelsohn argues, "the further north it is in the catchment the less value the water has to the country as a whole, to local people, water is more abandoned in the North than it is in the south and the three countries have made quite different uses of the Okavango" (Int., 2012).

Downstream Botswana is certainly the country for which the Okavango River (and especially the delta) is the most "important" of the three riparians (F. Witbooi, Int., 2012). The government is keen to preserve the delta because it means a lot for the country, its international reputation, but also economically since tourism is one of the major economic sector of Botswana's economy, along with mining activities and beef exports (CIA, 2013e; S. Ringrose, Int., 2012; G. Khwarae, Int., 2012; Water Resources Consultant in Botswana, Int., 2012; A. R. Tombale, Int., 2012; D.J.H. Phillips, Int., 2012; S. Motsumi, Int., 2012; C.K. Munikasu, Int., 2012). Plus the Okavango delta is the first and major destination of tourists in the country: "you get this huge concentration of tourism facilities in the Delta, which is jealously guarded by Botswana itself and by the vested interests of the people who run those facilities" (D.J.H. Phillips, Int., 2012). Their major interest is to preserve the delta as it has always been, in a most pristine state as possible (F. Witbooi, Int., 2012; A.R. Tombale, Int., 2012; ORI Member, Int., 2012; Former OBSC member for Namibia at

OKACOM, Int., 2012; B. Meinier, Int., 2012). They have absolutely no interest in their neighbors' project, only that they don't implement them. This certainly is opposite to the interests of Namibia of extracting water in order to face the drought in the 1990s. So, Botswana took the stand of the "environmental good guy" (Swatuk, 2003a: 904, Swatuk, 2003b: 128-130), claiming the importance of environmental protection in order to tie its upstream riparians into a regime of sustainable basin management (Swatuk, 2003a: 904). But this was just a façade; the two other riparian states knew that this stand taken by Botswana was very recent and a way to pursue its narrow self-interests for economic purposes. Indeed, before the agreement was signed, in 1990, Botswana faced huge demonstrations in Maun (at the entrance of the delta) against a dredging project and the building of a huge reservoir on the Boro River, one of the main rivers draining the delta. This construction was part of the Southern Okavango Integrated Water Development Project (SOIWD) endorsed by the government in the 1980s (Neme, 1997: 37-39). In brief[51], the government faced the protests of the local population of the delta in Maun, backed by several powerful NGOs such as the Kalahari Conservation Society (KCS), The International Union for the Conservation of Nature (IUCN) and Greenpeace International were against this project, fearing for the health of the delta and its numerous livelihoods (Neme, 1997: 37-39, G. Gabaake, Int., 2012). Despite attempts to delay the project and to produce feasibility studies in order to justify it, the government abandoned the project "as currently conceived" in May 1992. It was one of the largest internal crises of Botswana since its independence in 1966. Since 1992, Botswana is playing the card of the "green" riparian (Swatuk, 2003b: 128-130), protecting the delta for the reasons evoked before. But the two other riparians are not naïve and know that Botswana's interests lie in the protection of the delta mainly for economic reasons. The OKACOM is thus a platform for Botswana to support its "vested interest in making sure that the guys upstream were well behaved in terms of taking up water and not polluting" (S. Ringrose, Int., 2012). It helps Botswana "keeping an eye on what is happening upstream" so that it does not affect the delta (G. Khwarae, Int., 2012).

We already introduced Namibia's interests in the basin: extracting a small amount of water from the river around Rundu in order to supply water to the central areas of the country during this particularly dry period (Mbaiwa, 2004: 1320-21, DRFN, 2004:

[51] For detailed information, many publications exist on those events, such as Neme, 1997.

44). However, the drought finished soon after the agreement was signed, in 1995-1996. The pressure on Namibia decreased, and for the government of Namibia the completion of the EWCP became a backup plan for potential future water stresses (Turton et. al., 2003b). Since then, the priorities of Namibia still lie in an extraction of small amounts of water for the purpose of achieving food security in the poor areas of the country along the river through the development of the "Namibia irrigation scheme", which involves the building of a hydropower dam at the Popa Falls upstream from the panhandle, so as to provide reliable power supply to the main towns of the Kavango region such as Rundu[52] (S. Ringrose, Int., 2012; S. Motsumi, Int., 2012; DRFN, 2004). The objective for Namibia is to produce food in order to reduce its dependency on South Africa for food consumption (C.K. Munikasu, Int., 2012). So the problem of divergence of interests was and is still very important between Namibia and Botswana despite the end of the drought, since its stated intentions remain "to use the waters of the Okavango as part of a conjunctive use strategy that will ensure steady supplies of water and national development" (Swatuk, 2003a: 904). So, between the EWCP and its pipeline from Rundu to Windhoek (in case of emergency) in the 1990s and the irrigation scheme (Popa Falls dam) at the beginning of the 2000s, Namibia has clearly shown an interest in getting water from the river (Swatuk, 2003b: 128-130). But those projects were both slowed down by the OKACOM and especially Botswana (Scudder, 2008: 90). J. Mendelsohn summarizes very well the intentions of Namibia about the river: "for Namibia, it comes in on one side, and it goes out of it (Mohambo) on the other, and broadly the government sees it as a complete waste of water, i.e. why do we lose all this water? As a dry country, we should be using it all. So Namibia has its perspective, on maximizing its use, making a good deal of the use of the water" (Int., 2012).

In Angola, the civil war affected the Cuando-Cubango region in such a way that even going in this remote area was extremely complicated. Plus, "in the whole Portuguese time the region was called the land at the end of the Earth and it remains very much that way now" (J. Mendelsohn, Int., 2012). However, at the level of the OKACOM, despite their lack of activity compared to the other riparians, the Angolan representatives foresaw the end of the civil war and envisaged to build infrastructures in the region in order to address the difficulties of the local population through

[52] The Popa Falls Dam Project dates back to 2003.

agricultural projects and irrigation as soon as the war would be over (A.R. Tombale, Int., 2012; Former OBSC member for Namibia at OKACOM, Int., 2012; ORI Member, Int., 2012). More precisely, they used a feasibility study dating back to the beginning of the 1970s during the Portuguese era, which revealed a potential of irrigation of more than 50 000 ha and a hydropower potential of 350 MW on the river (Pinheiro et. al., 2003; Mbaiwa, 2004: 1320-21). It was enough to worry Botswana, which thereafter referred to Angola as "the sleeping giant" (Pinheiro et. al., 2003: 114), a common expression used in the Southern African region to define the country since the 1990s. The needs of Angola were legitimate though, with its population being the poorest of the basin (S. Motsumi, Int., 2012). The awakening of the "sleeping giant", if it acted blindly in its interests rather than in those of the basin, would definitely have severe consequences on the water availability for Namibia and Botswana (Mbaiwa, 2004: 1320-21). But the main idea behind the Angolans' view is that they did not want their downstream neighbors to limit their perspectives of future development, while they were still fighting internally (B. Meinier, Int., 2012). They wanted to keep their options open.

At the beginning of the process, the three states had (and still have) very different interests (Former OBSC member for Namibia at OKACOM, Int., 2012). This situation did not help the OKACOM to work well, on the contrary. The consideration of national sovereignty as more important than the interests of the basin as a whole severely hampered cooperation between the three countries, in particular between Botswana and Namibia (ORI Member, Int., 2012), since Angola was still lagging a bit behind, despite their participation to the meetings. During 2003 and 2004, Sharing Water organized a conflict-management workshop for the delegates of the three countries (Scudder, 2008: 98). The latter had a tremendously positive impact on this issue, particularly because after that "people started to talk about common interests and of the basin itself" (G. Gabaake, Int., 2012). Yet, Botswana's interests seem to be the ones that dominate, since nothing really happened on the basin since 1994.

3.1.4 A lack of motivation from central governments

There was also an obvious lack of motivation from central governments at the beginning: not really from most of the commissioners and delegates at the OKACOM itself, but rather at the level of central governments in the capitals, and across states

(Honorary Commissioner for Botswana at OKACOM, Int., 2012; A.R. Tombale, Int., 2012; I. Pinheiro, Int., 2013; Ashton and Neal, 2005: 171; Swatuk, 2003a: 901-902). What we mean by "lack of motivation from central governments" is the political motivation, from the central governments and the delegates at the OKACOM itself, to enforce the OKACOM agreement and to continue developing the cooperative regime between the three countries for the purpose of the sound management of the basin.

The first reason for this lack of motivation from central governments lies in the fear of losing national sovereignty for what relates to the each country's decisions toward their part of the basin, especially for Botswana and Namibia. We already discussed the fact that Angola's political move to join the OKACOM was more a question of legitimacy at the international level, rather than a real commitment due to a strong political stand taken by the central government of Angola. In any case, the civil war prevented Angola to do so, and maintaining the state of the Okavango River and delta is "about as far away from Angolan government policy-making circles as an issue can get" (Swatuk, 2003b: 130). For some interviewees, the central governments of both Namibia and Botswana also lacked of willingness to enforce the OKACOM agreement by fear of losing their respective decision-making power for what relates to their national sovereign objectives. Namibia's objectives at the beginning were very much self-centered, i.e. getting water from the river to the central areas of the country. In that sense, the lack of motivation from the central government of Namibia to ameliorate cooperation and build on the 1994 agreement was a consequence of its nationalistic priorities (Swatuk, 2003b: 130). It is also the case of Botswana, which, despite the failure of the SOIWD, had not abandoned it straightforwardly (Scudder, 2008: 89). But the will related to the delta is more of an economic one from the central government because of the jobs, profits, and the fact that the delta supports multiple sorts of livelihood in the delta, for many people (Swatuk, 2003b: 130). The motivation from central governments to grasp the OKACOM as a valuable political entity did not exist in Botswana at that time. To sum it up, the first question raised by central government officials when asked about their interest for the OKACOM was "what are we gaining from it?" (Honorary Commissioner for Botswana at OKACOM, Int., 2012), which reveals a lot about the real will of those countries to achieve something with the OKACOM. It directly links this issue to the previous one

(*conflicting interests*), since states mostly feared that the OKACOM would hamper them in their own sovereign projects.

When digging a little bit more on the reasons on which this issue was based, a lot of interviewees pointed at the lack of decentralization in Botswana, Namibia and Angola for what relates to political decisions on the ORB (T. Mpho, Int., 2012; J. Mendelsohn, Int., 2012; I. Pinheiro, Int., 2013). Indeed, the OKACOM is totally paralyzed because decisions are made in Windhoek, in Gaborone or in Luanda, which are located hundreds of kilometers away from the river (T. Mpho, Int., 2012). John Mendelsohn goes even further and argues:

> *"a big failure of the commission is the fact that it's made up of central government people, so all the commissioners are from Gaborone, Windhoek and Luanda, all of them are fat old men, all of them are these bureaucrats, you know, they're tired, you can see they're all senior people, with very little enthusiasm, and so you can well imagine when it comes to discussions at some OKACOM meetings, you know I know some of these people have never been near the Okavango, they don't know what they're talking about, the issues facing remote people living in Angola, etc. […] I've always been saddened by the fact that those people essentially live far from the river, that seems crazy… Why don't they have the governor of Cuando-Cubango (Angola), and the governor of Kubango (Namibia), and the government of Ngamiland (Botswana)… as the main members of that kind of thing?"* (Int., 2012).

Hence, both the fear of losing national sovereignty on the river, and the lack of decentralization of the three central governments toward the OKACOM were pointed at as key arguments explaining the lack of motivation from central governments at the OKACOM at the beginning, which hampered the development of the organization and its further institutionalization.

3.1.5 No guidance from higher levels of decision-making

At the regional level, the discussions for the creation of the OKACOM took place at the same time as the discussions and the signing of the "Southern African Development Community" (SADC) agreement. The SADC is an intergovernmental

organization, whose goal is the integration of fifteen southern African countries through the development of socio-economic and socio-political cooperation between the states involved (SADC, 2012b). The SADC was established in August 1992 in Windhoek, Namibia, after previous attempts such as the Southern African Development Coordination Conference (SADCC, in 1980)[53]. Three states joined later: South Africa (1994), Mauritius (1995) and the Democratic Republic of the Congo (1997)[54].

Without entering too much into the details, the first Protocol adopted by the SADC as an intergovernmental organization was the one on transboundary waters: "the Protocol on shared watercourse systems in the Southern African Development Community (SADC) region", signed at Johannesburg, in August 1995. Thus, one year after the signing of the OKACOM agreement. The protocol is legally binding and commits member states to the objectives and specific procedures stated within it (SADC, 2012a) In other words, it is a guideline for cooperation on transboundary waters, in the case of this particular protocol. Thus, "during this period there was no common ground to negotiate anything, but ever since the protocol came into force, the second protocol of 2000, it gave a platform to the three countries in terms of 'how' and 'what' you negotiate. Before that, there was nothing" (OBSC member for Botswana at OKACOM, Int., 2012). The 1995 Protocol was indeed revised in 2000 (SADC, 2012d) to update it to modern international water law, and more specifically to the "Convention on the Law of the Non-Navigational Uses of International Watercourses" voted at the United Nations' General Assembly on May 21, 1997 (UN, 1997). But before that, the OKACOM was on its own, without any "regional" or SADC guidance, at least until 2003 when the revised protocol came into force.

Another interesting point is that, if we get back to the regional context at that time: "As soon as transboundary water resources' management has been discussed in Southern Africa, the emphasis was put on the Zambezi river basin. However, the complex political situation in the Zambezi region since the 90s changed the whole process because there could not be an interstate agreement there… This is what pushed SADC member states to achieve the Shared Protocol on Watercourses Systems. Hence, the OKACOM became the first basin organization established in the region" (B. Meinier, Int., 2012). Thus, the OKACOM was some sort of guinea-pig

[53] For more information on former organizations with the same goal, see SADC, 2012b.
[54] For the full list of member states, see SADC, 2012c.

organization for the SADC. So, instead of guiding the OKACOM, it is the latter that guided the SADC in its development of the Shared Watercourses Protocol: a situation that certainly contributed to the inertia at the OKACOM during this period.

Table 4.2: Summary-table - "socioeconomic and sociopolitical factors"

Socioeconomic and socio-political factors			
This category includes issues at the regional and/or basin level of socioeconomic nature (Disparity in the level of development of the riparians), sociopolitical nature (Lack of motivation from central governments, No guidance from higher levels of decision-making) or both (war in Angola, Conflicting interests)			
Factor	**What it consists of**	**Case-specific?**	**Linked with**
The Angolan civil war	- No access to Angolan part of basin - No study, no field research possible	No	- Disparity in the level of development of the riparians - Conflicting interests - Lack of data - Lack of trust
Disparity in the level of development of the riparians	- Different levels of technical, human, economic and political capacities to discuss - Different priorities	No	- Conflicting interests - Lack of data - Lack of trust
Conflicting interests	- National sovereignty and interests more important than the basin's interests - No agreement possible	Yes	- Lack of motivation from central governments - Environmental constraints - The delta - The importance of individuals - Lack of trust
Lack of motivation from central governments	- Fear of losing national sovereignty on the river - Apathy from the central governments toward the OKACOM	Yes	- Conflicting interests - Lack of trust - Finances - The importance of individuals
No guidance from higher levels of decision-making	- The OKACOM was a "guinea pig" for the SADC	Yes	- Finances - Conflicting interests - Lack of trust - The importance of individuals

3.2 Socio-cultural and interpersonal factors

We also identified issues that affected interpersonal relations, mostly at the OKACOM (during meetings, for instance). Some of them are sociocultural, i.e. issues that relate more to a clash of culture between individuals (*language, institutional culture, legal disparities*), while others are purely interpersonal (*lack of trust, the importance in the choice of individuals*).

3.2.1 Language

The presence of a multitude of language on the basin did not help at the beginning. More precisely, at the political level, officials from Botswana and Namibia were used to cooperating in English, while Angolans spoke Portuguese exclusively. S. Ringrose affirmed: "language did not help. I think people underestimated the fact that language is a major variable, or major stumbling block" (Int., 2012). Several interviewees confirmed how hard it was at the beginning for the delegations to understand each other at the OKACOM (Water Resources Consultant in Botswana, Int., 2012; K. Kalaote, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012; L. Namene, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012; HTF member for Namibia at OKACOM, Int., 2012; F. Witbooi, Int., 2012; Former OBSC member for Namibia at OKACOM, Int., 2012; I. Pinheiro, Int., 2013; J. Velasco, Int., 2013; A.G.M. Da Silva, Int., 2013). This problem of communication between Portuguese-speaking Angolan government officials and their English-speaking counterparts took a lot of time to be solved.

At the very beginning there were only one commissioner with a little knowledge of English in the Angolan delegation (da Silva). They were charge of the translation. They were both commissioners and translators at the same time, a situation that heavily hampered discussions between the three riparians (K. Kalaote, Int., 2012). Indeed, it was complicated for them and took a lot of time, since everything said in Portuguese had to be translated in English, and vice-versa. Also, Portuguese embeds more vocabulary, a lot of synonyms, different words to add nuances to a notion, and a different phrasing: "sometimes when you phrase something in English it does not come up with the same meaning when translated in Portuguese" (Honorary

Commissioner for Namibia at OKACOM, Int., 2012; Former OBSC member for Namibia at OKACOM, Int., 2012). People would understand the same words differently and it could become "very tricky" (HTF member for Namibia at OKACOM, Int., 2012). A Honorary OBSC member for Namibia at OKACOM said "sometimes when you got the answer in English from the translator you realized that you did not have the answer to your question, so it took all day. And that's why the meetings last one week! […During which] you have to convince him to agree to something he does not even understand" (Int., 2012). Later, the first external interpreters hired by the OKACOM also took some time to learn the technical language associated with hydrology, geology, etc. (Honorary OBSC member for Namibia at OKACOM, Int., 2012). But, let alone the issue of mutual understanding at meetings, at the beginning governments themselves could not communicate properly so there was very little exchange of information (Water Resources Consultant in Botswana, Int., 2012). An excellent example was told by a Honorary Commissioner for Namibia at OKACOM in the form of an anecdote relating a typical misunderstanding at the OKACOM: "So we had this clear idea, we wanted a secretariat, with all details, very thoroughly done. And the response is NO for fucking no reason! They can't give a reason. Botswana immediately understood, it was Angola! Just one word: 'secretariat', we don't call our secret organizations 'secretariats', but they do! So the word secretariat was not the good term! That sort of terminology…" (Int., 2012).

Since the mid-2000s, communication between Angolans and their counterparts improved progressively because the OKACOM could hire better interpreters (Honorary Commissioner for Namibia at OKACOM, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012). At the same time, more and more Angolan representatives learned to speak English (I. Pinheiro, Int., 2013; J. Velasco, Int., 2013; A.G.M. Da Silva, Int., 2013), even though half of them still do not in 2013.

3.2.2 Difference in institutional culture

Another socio-cultural issue that hindered the OKACOM regime was the difference in institutional culture (L. Namene, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012) i.e. the cultural way to approach interstate issues and

meetings. We could sense that at the beginning, Angolans were on their side, and Namibia and Botswana on the other: "the culture was important. You will find that people of Portuguese culture are doing things another way, and we on our side Botswana and Namibia we are doing things a different way" (F. Witbooi, Int., 2012).

For instance, during the annual OKACOM weeks since 1994, the commissioners from Botswana and Namibia attended to the technical meetings the days before the commissioners' one, because they understood that they had to grasp the ins and outs of all decision they would take on the bases of the technical delegates' advices: "The commissioners from Namibia also participate in this discussions at the technical level. But they [the Angolans] were never there! You never saw Da Silva at the technical meetings! Those people were also supposed to participate to the technical ones! I always did it! That is where you gain time, and then you don't waste time at the commission. The technical people explain to the commissioner, a real asshole who does not give a shit, and did not attend the meeting, so he wastes time by asking petty questions that were already discussed in the technical committee…" as told by a Honorary Commissioner for Namibia at OKACOM (Int., 2012), in a flowery style.

There was also confusion when talking about hierarchy in the governmental structures. In Botswana and Namibia, a permanent secretary or a head of ministry is more or less the same (F. Witbooi, Int., 2012), but in Angola the names of the positions are different. So for example during the first Permanent State Secretaries meetings, the delegate sent by Angola was never the same, and sometimes did not even come from the correct state department, or was in a different governmental level often with less influence on matters than he was supposed to (Honorary Commissioner for Namibia at OKACOM, Int., 2012; F. Witbooi, Int., 2012). That hampered things because there was no follow-up.

Last but not least, "having the same mindset" was also very important: "we wanted to be proactive, progressive, innovative, but we never had any response from Angola. They were always amorphous, all the time. Botswana was better because they always fought for their case! Always asking about OKACOM, the delta, what we are doing, etc. why do we do this… Angola, never!" (Honorary Commissioner for Namibia at OKACOM, Int., 2012).

Like for the language issue, nowadays things are doing better since people started building the relationship and know each other and each other's cultures, be it institutional or relational (L. Namene, Int., 2012; E. Chonguiça, Int., 2012). But those initial differences, cumulated with the impossibility to communicate properly, definitely had an impact in hampering cooperation at the OKACOM level.

3.2.3 Legal disparities

The three states had extremely different legislations and regulations relative to their own waters at the beginning, i.e. influenced by the British colonial power or by the Portuguese one (I. Pinheiro, Int., 2013). Namibia and Botswana indeed had a very different legal system than Angola, which provoked delays (HTF member for Namibia at OKACOM, Int., 2012). Only a few interviewees raised this issue, however we were told how much those differences hampered cooperation at the beginning, since, as intertwined with the *language issue*, Angola seldom understood the same thing than the two other states: "it was also a big contributing factor towards the delay all these years, because you'll find that the commissioners on meetings have arguments for simple things (one word, for instance) which we understand in away in Botswana and Namibia, its meaning, and functions. The Angolans always understood something totally different and they were coming with arguments on the interpretation of the word, and you'll find that time will pass, the meeting will end, and you won't reach a conclusion…" (HTF member for Namibia at OKACOM, Int., 2012, talking about legal aspects relative to water at the OKACOM). Indeed, the legal terms used by Botswana and Namibia had not the same meaning for the Angolans.

The Angolan legislation was also much less restrictive than in both downstream riparian states (Water Resources Consultant in Botswana, Int., 2012). This lack of legislation in Angola worried Namibia very much in the beginning: "We've got a water act that says you're not allowed to pollute your waters especially international ones. There is a legal requirement for that in Namibia. But if upstream they don't have the same legislation in place or enforce it they can put the shit in the water and we get it" (Honorary Commissioner for Namibia at OKACOM, Int., 2012). It is only after a few years that three states started discussing this issue, especially when the SADC Shared Watercourses Systems Protocol was reviewed between 1997 and 2000 in order to comply with the modern International Water Law decided at the UN in

1997 (UN, 1997). Then only they thought of harmonizing their national laws to adapt to the new protocol for the management of international water systems (Honorary Commissioner for Namibia at OKACOM, Int., 2012), even though concretely there is still a lot to achieve.

3.2.4 Lack of trust

In terms of direct interpersonal relations, the least one can say is that there was absolutely no trust between the parties at the beginning. Hence, previous sections have already distilled many explanations that would explain why individuals at the OKACOM had trust issues with one another: *the Angolan civil war*, *conflicting interests*, l*ack of motivation from central governments*, *language*, *difference in institutional culture*. We will mostly focus here on the ones we have not induced yet, i.e. the interpersonal history of individuals at the OKACOM, and the need to achieve consensus.

There is a general agreement on the fact that people at the OKACOM did not trust each other in the 1990s, until they completed the conflict management workshops organized by Sharing Water in 2003 and 2004, which consisted in training the delegates in terms of negotiation, shared data management systems, and facilitation skills, among others (Scudder, 2008: 98; G. Khwarae, Int., 2012; G. Gabaake, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012; Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012). The explanation lies in the fact that the people sitting at the table at OKACOM were previously fighting each other during the war of independence of Namibia, as explained by an OBSC member for Namibia at OKACOM: “but now, you understand the historical background of the region? If you put somebody in the puzzle you use to fight against each other on the ring, even if on paper you have a good relation, it will not work.” (Int., 2012). Hence, “Before 1990, the South African government was running Namibia. So it means that with regards independence, the guys at the water affairs remained from before 1990 to after. People like the Honorary Commissioner for Namibia at OKACOM (Int., 2012) served in the former government of Namibia [under the control of South Africa], which both the government of Botswana and the government of Angola did not support in 1990. They were not in good relation, because both were fighting in favor of Namibian

independence! And these guys [the commissioners] were top government people. So if the commissioners from Namibia and from Angola, used to fight each other in the war, what do you expect? You understand now. So they had to build that trust among themselves. Even now they are talking about development, you know they fight, they pick it up, everything is very loaded" (OBSC member for Namibia at OKACOM, Int., 2012). This awkward situation was confirmed by a Honorary Commissioner for Namibia at OKACOM, who told us that at the beginning the Angolans did not trust them at all (the Namibians) because of the "old demons of mistrust, racial differences, we the whiteys, associated with the colonial power, were not no be trusted" (Int., 2012). Let alone this explanation does explain one of the main reasons why there was mistrust, it is also one of the main arguments of the following issue: *the importance of individuals*.

For most interviewees, this long time devoted to build trust was fastidious, although necessary (G. Khwarae, Int., 2012). They insisted on the fact that they needed to understand each other's needs, and the consequences of the implementation of the 1994 Agreement, notably in terms of access to the basin's resources (G. Khwarae, Int., 2012). They also argued that in the spirit of the SADC principles, decisions had to (they still have to) be taken via consensus exclusively (G. Khwarae, Int., 2012; B. Meinier, Int., 2012; A.R. Tombale, Int., 2012). But achieving consensus was not an easy task since the three countries had to feel they were equitably part of the process (E. Chonguiça, Int., 2012). Else, some thought that there would always be a two-against-one situation for all issues, and in the worst case with one state constantly isolated (ORI Member, Int., 2012). This is why they favored this mechanism despite its inherent delays: "when consensus has been reached, there's a higher level of commitment, so it's better to operate like this even though it often takes longer" (E. Chonguiça, Int., 2012). Only a few were very disappointed by the time lost because of trust issues: "you don't build trust for 14 years!" claimed (T. Mpho, Int., 2012). It took the intervention of Sharing Water's conflict management Programme, touched upon above, to improve relations between the delegates of the three countries at the OKACOM.

3.2.5 The importance in the choice of individuals

The choice of individuals in any organization is crucial for its shape, especially when it is an interstate organization. This is perfectly illustrated by the example introduced above explaining the former relations between the first commissioners of the OKACOM. They were fighting a war against each other not so long ago. But, as well said by a Honorary Commissioner for Namibia at OKACOM, in the case of an obstructing issue during discussions, "you can only manage it if you have amicable relationships and understanding" (Int., 2012)

However, "you can have good relations but it depends on who you put in the ring in terms of individuals" (OBSC member for Namibia at OKACOM, Int., 2012). Angola, for instance, found it difficult to negotiate with Namibia at the beginning because of the individuals they had to face: "Note that the relations were always respectful, but tensed and not easy at all…" (I. Pinheiro, Int., 2013). But despite all those issues of language, trust, and despite the time it took to go further in the institutionalization of cooperation notably through the creation of the OKASEC in 2007, there exists a general agreement that the choice of the first commissioners of the three countries was central in getting over those initial disagreements and even conflicts (J. Mendelsohn, Int., 2012; S. Ringrose, Int., 2012; G. Gabaake, Int., 2012; A.R. Tombale, Int., 2012; E. Chonguiça, Int., 2012;). The Honorary Commissioner for Namibia at OKACOM (Int., 2012) certainly was the one who gathered most of the attention for its role as the first commissioner of Namibia (E. Chonguiça, Int., 2012; J. Mendelsohn, Int., 2012; A.R. Tombale, Int., 2012; OBSC member for Botswana at OKACOM, Int., 2012; B. Meinier, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012); it is indeed acknowledged that his work gave the impulse to create the OKACOM and maintain it at the beginning along with his co-delegates from Botswana and Angola. The Honorary OBSC member for Namibia at OKACOM (Int., 2012) assisted him in this task. In Botswana, late Moremi Sekwale (A.R. Tombale, Int., 2012) and Dr Akolang Tombale (E. Chonguiça, Int., 2012) or the Honorary Commissioner for Botswana at OKACOM (OBSC member for Botswana at OKACOM, Int., 2012) played an important role, as well as Angola's commissioners da Silva and Pinheiro (E. Chonguiça, Int., 2012). The former director of the Okavango Research Institute Lars Ramberg (S. Ringrose, Int., 2012) encouraged the three countries, in particular Botswana, to join together. Most agree that they paved

the road to achieve what the OKACOM is today, and they deserve credit for being the main initial drivers of cooperation at OKACOM.

The role of these individuals was also to maintain the institutional memory of OKACOM as much as possible. This is why the former commissioners are always invited to participate to annual OKACOM meetings as "honorary commissioners", and their voice is very respected there. As induced by G. Gabaake, the stability of individuals involved is necessary: "it takes time to build relationships, and deal with conflicts, and the good thing about OKACOM is that commissioners have been there for a long time and know each other, and it's easier to solve problems because you can trust, you develop trust and learn how they work, think, etc." (Int., 2012). When people change too often, it is much harder to achieve continuity at the institutional level, and progress is always hampered by changes (Water Resources Consultant in Botswana, Int., 2012). Talking about Angola, a Honorary Commissioner for Namibia at OKACOM, Int., 2012 also argued that because it was the country with which it was the most difficult to communicate at the beginning, the fact that the two commissioners Pinheiro and da Silva stayed for a long time facilitated things greatly in keeping an institutional memory, especially because the third commissioner was changing all the time. An Honorary OBSC member for Namibia at OKACOM summarizes very well this idea: "What is very important is that the group of people more or less stayed the same for a very long period. With small changes, but the core did not changed. And it helped a lot to have an institutional memory. Else, you have to start all over from the beginning, with stupid questions, etc." (Int., 2012)

To conclude on this point, the choice of individuals initially hampered the relations at the OKACOM, but soon, and because the people were more or less the same, they progressively overpassed the barriers of *language*, of *the difference in institutional culture*, and of *trust*, among others, in order to improve cooperation significantly later in the 2000s.

Table 4.3: Summary-table - "Sociocultural and interpersonal" factors

Sociocultural and interpersonal factors			
Issues that affected interpersonal relations, at the OKACOM mostly. Some of them are mostly sociocultural, i.e. issues that relate more to a clash of culture between individuals (language, institutional culture, and legal disparities), while others are purely interpersonal (lack of trust, the importance in the choice of individuals).			
Factor	**What it consists of**	**Case-specific?**	**Linked with**
Language	- The presence of two different languages (English and Portuguese) - Isolates Angola - Hampers the pace of cooperation	No	- The importance in the choice of individuals - Lack of trust
Difference in Institutional culture	- Difference in the way delegations approach interstate issues and meetings	Yes	- Legal disparities - The importance in the choice of individuals - Lack of trust
Legal disparities	- Issues of interpretation - Different national obligations to treat international waters	No	- Disparity in the level of development of the riparians - The importance in the choice of individuals - Lack of trust
Lack of trust	- No trust between individuals who used to fight against each other - Difficulty to reach consensus	Yes	- The Angolan civil war - Conflicting interests, - Lack of motivation from central governments - Language - Difference in institutional culture - The importance in the choice of individuals
The importance of the choice of individuals	- Individuals make an organization - Important to maintain a minimum of institutional memory via the individuals in place	Yes	- Difference in institutional culture - Lack of trust - Conflicting interests - Language - Lack of motivation from central governments - Disparity in the level of development of the riparians

3.3 Environmental factors

The environmental uniqueness of the ORB has been an impediment to cooperation since the beginning. The complexity of the system makes it a constraint for the states to foster cooperation, notably because they cannot agree on what the system is, and how it lives. This category includes two major sections: *environmental constraints* and *the Okavango delta*.

3.3.1 Environmental constraints

We already saw that the river is extremely unique for several reasons: it is still very pristine; it is a complex system with an exceptional ecosystem and biodiversity; it is very fragile; and, most importantly, it does not flow into the sea but in the desert, creating the Okavango delta. As we are not specialists of the question, we shall not go into the details of the *environmental constraints* due to the hydrological and geological configuration of the basin. However, it was one of the points raised by some interviewees and in the literature on the matter.

The major environmental constraints of the ORB are drought, earthquakes, and environmental degradation (Scudder, 2008: 91). We already discussed the importance of droughts in the region, especially the one that affected the region in the end of the 1980s. We saw that it was one of the catalyzing events for the three states to join together through the impulse of Namibia. The main impact of earthquakes is that it influences the direction and volume of incoming flows (Scudder, 2008: 91). Plus, earthquakes affect the delta, which "is not a true Delta but an alluvial fan whose primarily origin and, to some extent, evolution has been controlled by regional earth movements and land subsidence" (Manley and Wright, 1996: 213). Many other factors such as human activities or even the movements of hippopotamuses can have an impact on this fragile ecosystem. Finally, during this period it was impossible to proceed to the construction of any project on the river because of the unknown impact of those on the flow of the river, on the sedimentation process, and thus on the delta and the biodiversity, amongst others. For instance, if we get back to the hydropower project of Namibia at the Popa falls in the Caprivi strip, it has not been completed partly because of the potential consequences of an impediment project on the blockage of sediments, which are one the key life-sustaining element of the basin: less

sediment flows implies damaged vegetation and increased depth of river channels, which both would have an impact on the economic and livelihood activities in the delta (Mbaiwa, 2004: 1320-1).

To sum it up, the three states could not agree at the beginning on the potential impacts of human activities on the river because of the environmental configuration of the latter. Everyone agrees that any impediment of the river would have severe consequences on the system (Gieske, 1996; Pallett, 1997; CSIR, 1997; Scudder et al., 1993; Ellery & McCarthy, 1994; McCarthy et. al., 1998: 117; McCarthy et. al., 2000) but no one agrees on the actual figures and thresholds for this to happen. This situation was seen as a constraint, especially for Namibia, which was keen to develop infrastructures on the basin in order to fight another environmental constraint typical of this basin: a drought. Obviously, this issue is by extension very related to the operative issue *lack of data,* since at the beginning there was an agreement on the fact that the Okavango is very particular, but not on what could be done or not on the basin because of a clear lack of data and information on how the system really works. This problem is still important nowadays.

3.3.2 The presence of an inner-delta

The delta itself was often introduced as some sort of constraint by the two upstream riparians. The OKACOM agreement in 1994 was signed in a tensed atmosphere in 1994 mostly because of Namibia's hurry to projects to divert a small amount of water through the EWCP, among others. This situation worried Botswana because of the potential impacts of those projects on the delta (Wilk et. al., 2009: 99). Since then, it crystallized all the attention at OKACOM. Originally the delta was an environmental issue, but it soon became the source of most geopolitical disagreements that ever occurred at the basin's OKACOM.

The combination of: Namibia's projects upstream (Thomas, 2003: 216); the fiasco of the SOIWD; and the enormous criticism from local and international environmental advocacy groups pushed Botswana to espouse an environmental-friendly policy toward the delta (see also socio-political and socio-economic issues: *conflicting interests*) – at least publicly (Ashton, 2000: 7). Therefore, Botswana adopted a strong position against any proposal to extract water from both the river and the delta

(Ramberg, 1997: 129). Botswana consequently listed the Okavango Delta as a "Ramsar site" under the Ramsar Convention on Wetlands of International Importance in 1997. The Convention promotes cooperation in the conservation of threatened wetlands (Ramsar, 1971). Of particular interest for the Convention are wetlands gathering an exceptional amount of biodiversity (Mbaiwa, 2004: 1325). Via the Convention, Botswana has the obligation of ensuring the conservation of the delta and all natural resources that compose it (Mbaiwa, 2004: 1325). On the basin, both Namibia and Botswana are part of the Ramsar Convention (Swatuk, 2003a: 898), while Angola is not (Ashton and Neal, 2003). This way, Botswana hoped to tie its upstream neighbors into a regime of sustainable development at its advantage, because in reality such a regime would protect its activities in the delta (Swatuk, 2003b: 134).

But this unilateral move from Botswana – some say as a response to Namibia's own unilateral projects (T. Mpho, Int., 2012) – was not to please Namibia, and to a lesser extent Angola. This attitude was indeed against the collective spirit of the commission (Swatuk, 2003b: 128-130; I. Pinheiro, Int., 2013; S. Motsumi, Int., 2012; OBSC member for Botswana at OKACOM, Int., 2012). A Honorary Commissioner for Namibia at OKACOM summarizes the situation at that time when he learnt about "the Ramsar issue": "If you look at the charter of the Ramsar, one thing that is clearly stated is that if it's an international system, then everybody must be consulted! Which has not been done, so we could have said: 'hey why didn't you consult with us! It's in the ruuules! Why did you act unilaterally? Now you come and try to explain yourself, but you're on thin ice, what the fuck you're doing in my office?" (Int., 2012). Angola was also "not happy at all" (I. Pinheiro, Int., 2013; OBSC member for Botswana at OKACOM, Int., 2012) about not being consulted first. Botswana defended itself by arguing that they understood Namibia's anger: "they were not happy that, you know, the work was done before they were informed, so really the way I see they really want to be informed right from the beginning so they can think about these things, so one party should not just drop a bomb on them…" (K. Kalaote, Int., 2012). Perfectly aware of the situation, when we asked the interviewee if it was a reaction to another "bomb dropping" from an upstream riparian, he answered "on the pipeline for example" (K. Kalaote, Int., 2012), pointing at the EWCP project. If the reactions toward the attitude of Botswana were all negative, the reactions about the

consequences of such move by Botswana were however diverse. Some thought of it as a strategic move from Botswana to constrain even more its riparians not to develop anything on the river (Ashton, 2000: 8; OBSC member for Botswana at OKACOM, Int., 2012; OBSC member for Namibia at OKACOM, Int., 2012), for others "it was just like a fart in a thunderstorm […] they [Botswana] may have thought that this is now a thing that would rock the boat, which would scare us. But in the commission I did not really have the impression that it was done to scare us of doing other things." (Honorary Commissioner for Namibia at OKACOM, Int., 2012).

In reality, the consequences were quite significant for the three riparians. To start with, even though the Ramsar Convention has no "teeth" (B. Meinier, Int., 2012), Namibia was bound to it because it is also a Ramsar member (Mbaiwa, 2004: 1325). They were thus stuck between fulfilling their interests and respecting their engagement in favor of conservation at the international level. Also, the failure of the Southern Okavango Integrated Water Development Project SOIWDP project in Botswana was mainly due to the involvement of international NGOs in favor of environmental protection and the conservation of biodiversity, and the consequent "bad press" given to Botswana at the national and the international levels: "pressure was from outside, with organizations like IUCN" (G. Gabaake, Int., 2012). S. Ringrose confirmed: "Anyway, it's like any government, as soon as you have the international press, you have to do something about it, and this does not look good (bad image, bad for tourism), especially for the image." (Int., 2012). So as soon as 1997, both Angola and Namibia faced the same issue than Botswana at the beginning of the 1990s. Botswana managed to turn a politically difficult situation in its favor. Even though Angola is not a Ramsar member, the definition of wetlands evolved in the Ramsar Convention in the 1990s to include even the furthest part of the water system that might have an impact on the other end of it, i.e. protecting the delta equals to protecting the whole ORB system (Swatuk, 2003a: 897). As stated by I. Pinheiro: "this unilateral decision is for the strategic benefit of Botswana who gains a lot thanks to tourism in the delta. However the delta cannot impinge us to develop upstream! We are absolutely not afraid of Botswana but they will cry like women… However we are afraid of the World Bank and Greenpeace and all those guys because they could give us bad press…" (Int., 2013). Even in Botswana some confirmed "being blacklisted [by Greenpeace, among others] is not good because those guys have a great PR, they

can destroy you" (OBSC member for Botswana at OKACOM, Int., 2012). So the danger for both upstream riparian lies in the international support gained by Botswana through this strategic move.

But Angola and Namibia underline what they consider as "Botswana's hypocritical attitude", recalling that they "became green" because they had to, they had pressure from their own population in the delta and Maun, from the international press and NGOs, and consequently turned their coat by totally changing their attitude to conservationist interests (OBSC member for Namibia at OKACOM, Int., 2012; I. Pinheiro, Int., 2013). That way, the support from local and international environmental organizations strengthened Botswana's fragile position as a downstream end of the ORB. But, even in Botswana, some scientists point at the consequences of privileging the interests of international tour operators who repatriate their profits in their own countries, at the expense of local companies and investors, a situation that marginalizes the poor (through the exclusion of community-based tourism), and which fails to promote rural development (Kgathi et. al., 2005: 13). In other words, the position of Botswana is understandable, but fails to help its own population. So there is a paradox. Another paradox lies in the fact that Botswana itself is not very "green" in reality in the delta: "if you look at some of the touristic lodges in the delta they have something like 400-600 people working for them in the bushes without any sewage systems, and what happens of solid waste? And every fifteen minutes you got a small plane flying over you. The delta is such a commercialized thing already" (Honorary OBSC member for Namibia at OKACOM, Int., 2012). Also, and linked with the issue *environmental constraints* and the operative issue *lack of data*, there is no agreement on the possible impacts of any work upstream on the delta. The projected impacts evaluated by Ramberg (1997), on which the whole heated debated was based, were inaccurate and somewhat exaggerated for many authors (CSIR, 1997; Ashton, 2000). Even though these criticisms might be considered wrong, they illustrate the existing sensitivity around water extraction on the system (Ashton, 2000: 7). D.J.H. Phillips expressed some thoughts about this misguided argument with an open heart:

> *"You know, I'm the biggest conservationist that probably anybody's ever gonna meet, I don't believe in development for its own sake, but at the same time I think countries, especially downstream countries, are gonna*

> *make an argument to simply cannot touch a river in any way, then the base of the argument scientifically needs to be very strong… And I've never been convinced that Botswana's actually made that argument. They've produced a kind of green-tree-hugger argument and screamed and shouted to such a degree that the upstream states have said 'alright, you know, have it your way', but I haven't seen a scientific basis that at least convinces me as to what you can and can't do upstream'."* (Int., 2012)

Last but not least, some argue that this stance taken by Botswana would be counterproductive at some point, i.e. the Ramsar status of the delta's ecosystem might also constrain Botswana's own development of its water resources (Nicol, 2003: 182-3; Ashton, 2000: 8). Indeed, because the region is very prone to droughts, when Botswana will have to extract water in the future, it will not be able to do so in the delta. Indeed, "despite these very obvious "moral" advantages for Botswana, the pressing regional water scarcity problems continue to require solutions that are both socially acceptable and environmentally sustainable. Such solutions can seldom be derived or implemented by a single country" (Ashton, 2000: 8). However, by acting unilaterally, Botswana isolated itself from these solutions in the short-term, since its attitude crushed an already very fragile trust between the three countries (see *lack of trust*)

To conclude on this point, the presence of the delta tensed the relations between the three countries during the period under study. Initially a reaction to Namibia's projects, the Okavango Delta became the center of attention and disagreements at the OKACOM. Botswana strengthened its position through the involvement of the international conservation community, while isolating itself at the level of the OKACOM. As a last anecdote, which goes beyond the period under study, Botswana recently reiterated this unilateral attitude by developing a project to define the Okavango delta as a World Heritage Site under the aegis of the United Nations' Educational, Scientific and Cultural Organization (UNESCO). This "reinforces the strategy on which the Ramsar was based" (T. Mpho, Int., 2012). G. Gabaake confirms that such a move will "add more weight and more players in terms of defining what is the best use of the basin" (Int., 2012), which is again in favor of Botswana (OBSC member for Namibia at OKACOM, Int., 2012). In Namibia, some doubt of the

strategy used by Botswana since it will not really change anything, especially for Angola:

> *"if, people are a bit shortsighted, saying 'no we will protect us by declaring this a Ramsar Site, or this or whatever UNESCO World Heritage Site', then, well, Angola does not say much about that at the moment because they probably don't have any immediate development plans, but when it comes to the plans what will they do? What illusions should one have about that? Namibia is a bit "not affected" by that, the water we want to take is anyway minimal, so even if a state says the contrary, we are not going to dry out the delta, because we don't have the capacity, we don't have the potential to use so much water! There's no point in pumping the river dry, or to let water evaporate, but in Angola they have the potential to do that in terms of people, and economic means, and they sit upstream"* (HTF member for Namibia at OKACOM, Int., 2012).

Table 4.4: Summary-table - "environmental" factors

Environmental factors			
The environmental uniqueness of the ORB has been an impediment to cooperation since the beginning. The complexity of the system makes it a constraint for the states to foster cooperation, notably because they cannot agree on what the system is, and how it lives.			
Factor	**What it consists of**	**Case-specific?**	**Linked with**
Environmental constraints	- A very fragile ecosystem	Yes	- Lack of data - The delta
The delta	- A constraint for upstream riparians - A environmental issue that soon became very political and tense - Involvement of the international conservation community - Botswana's paradoxical attitude	Yes	- Environmental constraints - Lack of data - Conflicting interests - Lack of trust - Lack of motivation from central governments

3.4 Operational factors

What we refer to by "operational factors" are the problems encountered by the OKACOM in its day-to-day operations. Here, we focus on *the lack of data* available on the ORB, which obstructed the possibility to take sound decisions (and still does), and *finances*, since the OKACOM has always been in a very precarious financial situation. We also add a more recent factor which improved interstate cooperation: the presence of the OKASEC (the OKACOM's secretariat) since 2007.

3.4.1 Lack of data

The lack of data at the beginning "also explains why it took so much time" (S. Ringrose, Int., 2012) for the OKACOM to improve interstate cooperation (Kgathi et. al, 2005: 6, Water Resources Consultant in Botswana, Int., 2012). This issue can be divided into two main ideas: firstly, there was a lack of data because of the war in Angola, during which it was nearly impossible to proceed to data gathering because the region was inaccessible, both for political and economic reasons that we previously introduced; and secondly because no one would agree on the existing data.
As argued by (Mbaiwa, 2004: 1324): "accurate information is a key to conflict avoidance". This statement is very true in the case of the ORB. The war in Angola affected the already existing data gathering mechanisms in the Cubango Cuando region, which were inaccessible as the headquarters of the UNITA rebels led by Savimbi. During thirty years, the collection of data on the Angolan portion of the ORB was prevented by the war (Mbaiwa, 2004: 1321), and because around 95% of the water flows from Angola, the data gathered in the two downstream states was not of any use in the end (A.R. Tombale, Int., 2012). The lack of data and information about the river and its flow, in addition to the lack of capacity to collect, process, interpret and accept the data consequently led to the impossibility of generating viable policy options within the OKACOM (Turton, 2003). So this situation provoked disagreements and even conflicts at the commissioners' level, especially between Angola and Namibia, the latter being under acute water stress at that time (L. Namene, Int., 2012). Indeed the Angolans told Namibia that the Portuguese fled Angola with all the hydrological data of the country which was supposed to be shelved somewhere in Lisbon (Honorary Commissioner for Namibia at OKACOM,

Int., 2012; L. Namene, Int., 2012). Namibia's reaction at that time was very tensed, as explained by a Honorary Commissioner for Namibia at OKACOM: "They say that all those information are stuck in Lisbon… Portuguese took away all the papers. They left in such a hurry, in clothes only; they could not take any paper! Pinheiro the other day told me they haven't got any maps of the city of Luanda because the Portuguese took it to Lisbon and put all that in a container…. Nobody took any papers, you burned them you assholes you did not know what these papers were because you could not read! It was absolute bullshit" (Int., 2012). So the three states needed to start a process to find a formal way of collectively institutionalize hydrological data collection (A.R. Tombale, Int., 2012) before anyone could even touch the river (L. Namene, Int., 2012).

The main consequence of this lack of data and information on how the river and the basin actually work is that Namibia could not pursue its project to extract water from the basin. This situation played in favor of Botswana in the end, since the latter would have been against any water extraction of the river. The water was indeed unevenly distributed in favor of Botswana, since all water could flow downstream to the delta. There were disputes between Botswana and Namibia about figures, and at one stage Botswana said to Namibia: " "you are artificially changing your figures so that we would not see how much water you abstract" (HTF member for Namibia at OKACOM, Int., 2012). Thus there was no trust either for what related to the accuracy of the available data (Turton et. al., 2003b: 19). Botswana and Namibia could not agree on the thresholds, i.e. on the quantity of water that could be allocated to tourism here, or to irrigation there, for instance (S. Ringrose, Int., 2012). Anyway, "accurate accounts of water demands in each basin state are important because binding decisions on equitable water abstraction and sharing between member-states can be made only when that data is available" (Mbaiwa, 2004: 1320-21). Hence, one cannot take any fair decision as long as the three countries have not agreed on specific data and information that would describe best the flows of the river, it would just enhance conflicts (Honorary Commissioner for Namibia at OKACOM, Int., 2012).

Finally, this issue remains a problem at the OKACOM, despite numerous studies funded by international donors and the governments. The complexity of the hydrology of the basin does not help. But some things are getting better. For instance, Angola now has several stations to detect potential floods, and even if they do not always inform Namibia and Botswana, they sometimes do, which helps downstream

states to prepare to such climatic events (L. Namene, Int., 2012). However, they should be doing it all the time (HTF member for Namibia at OKACOM, Int., 2012). Another outcome of this situation was the *Environmental Protection and Sustainable Development of the Okavango River Basin* (EPSMO) project, funded by the Global Environmental Facility (GEF) in 2003, with the objective of creating a database of reliable information to be used in the Commission's decision-making processes (EPSMO, 2010). The EPSMO would later give rise to the *Strategic Action Programme*, a program of policy, legal and institutional reforms to meet and manage the increasing demands on the benefits of the river system (EPSMO, 2010), in parallel with the *Transboundary Diagnostic Analysis* (OKACOM, 2011), "a scientific and technical fact-finding analysis that seeks to identify the causal chains and root causes of problems affecting (or with the potential to affect) the integrity of the Okavango River Basin (EPSMO, 2010). The work done between 2005 and 2008 on the EPSMO project, which fed the SAP and the TDA, "really made OKACOM finally look like a serious entity as far as data gathering and scientific research information" (S. Ringrose, Int., 2012). In terms of data sharing, it is only in 2010 that the three states signed the *OKACOM Protocol on Hydrological Data Sharing for the Okavango River Basin*, (signed in Gaborone, Botswana on 26 May 2010) (OKACOM, 2010). However, this protocol has not been fully implemented yet, but "when it's done, we'll be able to solve those data problems" (L. Namene, Int., 2012).

In sum, if the situation is getting slowly better since very recently, until 2003 there was no agreement at all on existing data, but also on the methods to gather this data. Most of the data was also lacking, especially in the Angolan portion of the basin.

3.4.2 Financial issues

The financial stability of the OKACOM has been a problem since its creation (NGO member, Botswana, Int., 2012; I. Pinheiro, Int., 2013; Honorary Commissioner for Botswana at OKACOM, Int., 2012; S. Motsumi, Int., 2012; G. Gabaake, Int., 2012). The organization has been relying upon support from international partners, such as NGOs (Green Cross International), intergovernmental organizations (GEF: Global Environmental Facility) foreign national development agencies (USAID: United States Agency for International Development; Sida: Swedish international Development Cooperation Agency), or international organizations (the World Bank,

UNESCO). (G. Khwarae, Int., 2012; K. Kalaote, Int., 2012; I. Pinheiro, Int., 2013; Scudder, 2008: 97).

The situation during the period under study has been precarious for the OKACOM, which crucially lacked funding (OBSC member for Namibia at OKACOM, Int., 2012). The three countries were not willing to put money on the table in order to sustain the organization's institutional development, because they did not know "what they could gain from it" (Honorary Commissioner for Botswana at OKACOM, Int., 2012). Still, when they got together, their first common objective was to collect accurate data in order to discuss and deliberate on the potential use of the river. This is when OKACOM approached GEF for support (Pinheiro et. al., 2003: 115), which was "usually not funding projects around water"[55] (Honorary Commissioner for Botswana at OKACOM, Int., 2012), but they came and agreed to release development funds in order to elaborate the TDA (see OKACOM, 2011). Because of the combination of all the issues introduced in this study, what is now know as "the first version of the TDA" – the second one was completed later in 2011 – was not satisfactory enough to proceed to the next level. So the GEF, among other international donors, brought some money to sustain the commissioners' meetings, but was mostly interested in environmental protection of the delta for the conservation of biodiversity in particular. However, the perception of the riparian states – mostly Namibia – toward those activities was quite negative: "the states wanted to see infrastructure and not just fund theoretical environmental protection projects!" (Honorary Commissioner for Botswana at OKACOM, Int., 2012). Indeed, Namibia viewed this enduring focus on environmental issues exclusively as blocking its own projects of water extraction. Botswana, however, could only support those projects as long as they played a role in delaying any work upstream. But finding money for such purposes was not an easy task at that time (G. Gabaake, Int., 2012). Thus, the three states played the game of international donors for at least a decade, but could not complete their requirements, at least not in a satisfactory enough way, until the creation of the OKASEC in 2007.

When interviewees were asked about their perception on the reasons for such financial shortages that led to such inertia at the beginning, they gave three main responses: the process of cooperation needed time; there was a clear *lack of*

[55] At that time. Now international waters are one of the main focus of the organization (GEF).

motivation from central governments; and some argued that states were paying a lot. For the first argument, some respondents told us that an organization like the OKACOM needed to evolve slowly through a natural process that had to take place first for the states to be able to grasp the ins and outs of the organization itself: "sometimes if you make things too fast, people don't understand really what it is that they are doing, we struggled with it and jointly the three of us really came to a consciousness that implementation was not going quick enough and that we needed to capacitate ourselves to improve our implementation capacity" (G. Gabaake, Int., 2012) – i.e. to create the secretariat as an implementation platform. About the second argument, it was also linked with a fear of losing control – or sovereignty – of what happened on the ORB in favor of the OKACOM: "Had it come earlier, maybe it'd not have worked! Then people would have seen the organization as taking over the responsibility of the three countries and some people could be uncomfortable. For the secretariat it took time to eventually agree on what its responsibilities should be. Some were concerned that it [the secretariat] might take away lots of responsibility from the commission (G. Gabaake, Int., 2012). We sense this argument is very true, especially when one links it with the issues of *lack of trust*, *conflicting interests*, and the *lack of motivation from central governments*. Logically, states were reluctant to fund an unknown entity, far from the central governments, with unfamiliar environmental objectives and without any concrete outcomes planned (infrastructures). When adding the issue of trust and conflicting interests between individuals and states, among others, to the mix, this argument on the lack of motivation from central governments definitely makes sense (I. Pinheiro, Int., 2013). The states did not think they could gain anything from the OKACOM so they were not willing to fund it directly. Finally, some argued that governments already gave a lot to the OKACOM by "contributing substantially to fund the travels and the accommodations" of commissioners and delegates (K. Kalaote, Int., 2012). It is true, however not enough to be considered as efforts to really implement the OKACOM and pursue its institutionalization's process. On that matter, we agree with S. Motsumi, who argued: "it would be important for the countries to maybe take ownership and fully support the OKACOM" (Int., 2012).

Most protagonists working directly or indirectly with the OKACOM nowadays share this view of the financial situation of the OKACOM (Int., 2012; Honorary

Commissioner for Botswana at OKACOM, Int., 2012; K. Kalaote, Int., 2012; B. Meinier, Int., 2012; C.K. Munikasu, Int., 2012; F. Witbooi, Int., 2012; I. Pinheiro, Int., 2013). The organization is still not financially sustainable, which is an important constraint against the consolidation of the ORB regime. Without going into details here, the general situation of the OKACOM is quite good, it is an effective organization – thought not efficient yet – but financial issues are now more important than ever. The three central government just started to fund a small part of the OKACOM and OKASEC's expenses, along with international donors such as Sida[56] and USAID (through the Southern African Regional Environmental Programme – SAREP). But their unwillingness to capacitate the organization fully is proven by the fact that the three countries permanent seek cofounding from other partners (K. Kalaote, Int., 2012; C.K. Munikasu, Int., 2012). Indeed, they are still far from taking ownership of the organization for instance via funding the OKASEC (C.K. Munikasu, Int., 2012), and the progressive weariness on the part of international donors (B. Meinier, Int., 2012) threatens the short-term existence of the OKACOM. In 2012, during the annual OKACOM week, T. Mpho told us he heard a member of one of the three states saying out loud during discussions "why would the three states give any money?" (Int., 2012) while Sida and USAID were in the room, which might explain why Sida in particular is less willing to continue its cooperation with the OKACOM. At OKASEC, for instance, part of the staff had to be fired after only five years of existence. The *motivation from central governments* at the level of OKACOM exists, however it is not followed by the central governments, which do not see the organization as a priority (K. Kalaote, Int., 2012). Even some OKACOM delegates start to be fed-up with this situation: "It's not like we're talking about the whole country's budget!", claimed K. Kalaote (Int., 2012). T. Mpho, talking about Botswana, confirmed by asking, "where does all the money from tourism go?" (Int., 2012). Others view those recent financial issues as a "wake-up" call for the governments (F. Witbooi, Int., 2012; K. Kalaote, Int., 2012; A.R. Tombale, Int., 2012) to start rethink how they perceive the OKACOM. The final word about this issue goes to G. Khwarae, who affirmed: "I am aware that the countries have also agreed to contribute for sustaining the OKACOM which is a good thing but I think OKACOM has to bring another way of self-sustaining themselves, their way of raising funds so

[56] Swedish International Development Cooperation Agency. Representatives of the organization insist on keeping the name as "Sida" and not "SIDA"

that they are able to sustain the institution without necessarily relying on external funding" (Int., 2012). Table 4.5 below summarize the information gathered here for "operational" factors.

3.4.3 The presence of a secretariat

This research focuses on the 1945-2007 period. However, we should briefly note here that, since 2007 and the establishment of the OKASEC (the secretariat of the OKACOM), interstate cooperation has improved a lot at the OKACOM thanks to the follow-up and the daily work of the OKASEC in Maun, Botswana. The latter is however in a fragile position due to financial issues (see below: financial issues) which hinder its development, mostly because of the fatigue of the usual international donors in the face of the lack of motivation from the three states' central governments. However, one should not neglect the input of a secretariat, which generally improves the work of river basins' organizations, as confirmed by B. Meinier: "a good indicator of the degree of institutionalization of cooperation is the presence of a secretariat [which] facilitates the work of the organization at all levels. A secretariat assists riparian states' representatives in working more closely with one another than in any other "ad hoc" cooperative scheme" (Int., 2012). Hence, *the presence of a secretariat* could be added as a potential factor explaining why cooperation is more – or less – institutionalized on TWRs; and should also be tested in a larger population of cases.

Table 4.5: Summary-table for "operational" factors

Operational factors			
Issues that refer to the problems encountered by the OKACOM in its day-to-day operations			
Factor	**What it consists of**	**Case-specific?**	**Linked with**
Lack of data	- lack of data and information on the functioning of the basin - Hinders all projects	Yes	- Disparity in the level of development of the riparians - The Angolan civil war - Conflicting interests, - Environmental constraints - The delta
Finances	- No real investment from the central governments - Dependence on external funding and international donors - No ownership of the organization	Yes	- Lack of motivation from central governments - Lack of trust - Conflicting interests
The presence of a secretariat	- Has an intermediate role in joining the riparians together - Assumes the daily work of the river basin organization - Facilitates internal and external communications	No	- Lack of motivation from central governments

So, the inductive part of this chapter consisted of two main sections: in the first one we have shown how the three states achieved to create the OKACOM, through the identification of factors, events and interstate interactions that joined the riparians together; then we introduced what happened between 1994 and 2007 in relation to interstate cooperation. We saw that during this period, the OKACOM was "paralyzed" by a large amount of factors (or issues) of diverse nature that we attempted to sort in distinct categories both for clarity and research purposes: socioeconomic and/or sociopolitical; sociocultural and/or interpersonal; environmental and operational. Like for the previous section on "the origins of OKACOM", we identified a number of factors that are case-specific, i.e. that cannot be reproduced on any other basins, at least not in the same conditions and circumstances. We also presented others, which could definitely be tested in a larger

population of cases, a task that we will pursue in the next chapter. Those factors (*the disparity in the level of development of the riparians*, or *language*, among others) indeed have the potential be transformed into variables that could explain why cooperation on a basin is institutionalized (or not); or why is it more – or less – institutionalized than others; or even both, as we shall see in the conclusion of this chapter and explore in the following. We note here that those factors hampered cooperation in the case of the ORB, but if they could also improve cooperation in other cases. For instance, the presence of a single language on a basin could improve cooperation, contrarily to the case under study here.

Before going further into details on this inductive part of the chapter, in the next section we introduce an analysis of power relations on the ORB through the lens of the hydro-hegemony framework, through a deductive analytical approach. This final step complements the results of the last chapter and this one, by adding a qualitative view of power relations on the ORB.

4 A Hydro-Hegemony perspective of the ORB

"The Okavango Delta is more than beautiful; it provides a major source of income for the country, the delta communities and indeed the individual residents. It is hard to imagine Botswana without the Okavango Delta; indeed for many people Botswana is the Okavango Delta. We have the responsibility as the government and the people of Botswana, together with our development partners, to make sure that this amazing resource is utilized in a sustainable and responsible manner"

(Botswana Minister Jacob Nkate, WSSD, September 2002: in Jansen and Madzawamuse, 2003: 141)

One of the main hypotheses of this research is about power asymmetry as a variable influencing the institutionalization of cooperative regimes on TWRs, guided by the following questions: did power relations between riparian states play any role in the creation and development of the OKACOM? If yes, how? What are the underlying processes and mechanisms through which actors influence its institutionalization? The scientific legitimacy of those questions lies in the completion of case studies where the latter hypothesis is verified, such as the ones proposed by authors using the hydro-hegemony framework as a theoretical background (the Nile, Jordan, Tigris-Euphrates or Mekong rivers' basins, among others). However, we saw in Chapter 3, in the

literature-based quantitative analysis, that it is rather the opposite relationship that is confirmed, at least for the binary logistic regression, i.e.: in general, the odds for a basin to be institutionalized are significant when the latter is characterized by a low level of power asymmetry. Here, we wish to introduce, in a summarized fashion, a deductive analysis of power relations occurring on the ORB through the prism of the hydro-hegemony framework. We will not go into all theoretical assumptions included in the framework, but rather focus on specific *strategies and tactics* inherent to the exercise of hydro-hegemony that we have witnessed when analyzing interstate dynamics at the OKACOM. Indeed, the framework is extremely useful in order to put a name on some power-related factors and events that we identified during the field research. Let alone the fact that those results contribute to our research, they also open the door to further case-study investigations on power relations both at the level of the ORB, but also for all other multilateral basins. We will first situate the ORB in terms of power asymmetry, and then shortly introduce the theoretical assumptions of use here, before focusing on the results and their analysis.

4.1 No clear power asymmetry between riparian states

To start with, the ORB is very interesting because there barely exist any power asymmetry between the three states involved in the OKACOM (and, moreover, between the four states composing the basin). With a score of 0,26235 for the variable "Total Power Asymmetry" (0,25 being the score for "equal power" between four riparian states), one can only notice that if Angola dominates in terms of material power (0,39), and Zimbabwe in terms of ideational power (0,32) (relational and structural power are nearly equal), it is without comparison with other cases where one state dominates with scores between 0,66 and 0,77 for all dimensions of power, such as China on the Red/Song-Hong, for instance.

Despite this apparent symmetric situation, several events, situations or strategies used by the riparian states gave us clues about their profound interests and the way through which they use all power mechanisms at hand in order to place them as priorities and embed them in the development of the ORB regime. This is particularly the case of Botswana, considered by several individuals or researchers as the hegemon of the basin (D.J.H. Phillips, Int., 2012; Davidsen, 2006).

4.2 Introducing the HH framework

We touched upon the basic assumptions behind the HH theory in chapter 2, of which the most important is that the presence of a very powerful actor (or hegemon) on a TWR affects regional geostrategic relations, socioeconomic development, and the equity of the basin's regime in favor of the latter. In order to do so, the "hydro-hegemon" uses strategies, tactics and other resources that all refer to a certain type of compliance-producing mechanisms (CPMs) inspired by Lustick's works on hegemony (see table 4.6 below).

Table 4.6: Lustick's four types of hegemonic compliance-producing mechanisms

Type of compliance-producing mechanism	**Definition**
Coercive (type I)	The use of "sticks": simple coercion or the direct threat of coercion – Ability to mobilise military/security capacities
Utilitarian (type II)	The use of "carrots": bribes, incentives, trades of services - Ability to mobilise political/economic capacities
Normative agreement (type III)	Conscious beliefs that it is right to comply (treaties, rules, agreements, setting the agenda; determining the framework of debate…) – Ability to influence and to exert authority. Legitimacy of the hegemon and the order is necessary
Ideological hegemony (type IV)	Unconscious beliefs where compliance is not even questioned (diffusing ideas, values and interests; control and manipulation of information, through the mass media and through the processes of socialisation…) – Ability to impose ideas

Sources: built on Zeitoun, 2006: 80-82; Lustick, 2002

Those four types of CPMs imply different ways to exert power, defined in table 4.6. In short, the higher the figure, the less visible the form of power involved. Hence, "type I-coercive CPMs" imply the use of coercion as a mean to make riparian states comply with the hegemon's preferred order of things (*military force, covert actions, coercion-pressure; active stalling*); "type II-utilitarian CPMs" refer to the use of

carrots (rather than sticks) through *incentives*; "type III-normative-agreement CPMs" involve the ability to influence authority so that less powerful actors consciously believe that it is right to comply with the hegemon's preferred order of things through *treaties/agreements* or *securitization;* and "type IV-Ideological-hegemony CPMs" refer to the least visible forms of power, i.e. to *knowledge construction* and *discourse sanctioning*. In the case of the Okavango, we will see that Botswana, the so-called "hydro-hegemon", seems to employ less visible forms of power as a mean to achieve its interests (levels III and IV CPMs mostly). Those different tactics usually support a general strategy used by the hegemon, i.e. *resource capture* (mostly through type I-coercive CPMs and related tactics); *integration* (mostly type II CPMs); and *containment* (mostly type III and IV CPMs). An exhaustive list of strategies, tactics and other coercive resources, as well as their respective definitions, are introduced in Appendix 4.4.

In this section we will only focus on the ones used by Botswana in its strategy to maintain the status quo on the Okavango and its basin. As induced above (see: disparity in the level of development of the riparians), in 1994 Botswana definitely was the most economically advanced and politically stable of the four riparian states of the basin, with a much higher GDP per capita, among others. Botswana is not a "hydro-hegemon" as Egypt is on the Nile, or Israel on the Jordan, who enjoy huge power asymmetry toward their respective riparians, maintained and consolidated during decades. However, as a slightly more powerful state, Botswana used some of the typical hydro-hegemonic strategies and tactics at hand in order to maintain and consolidate its grasp on what happens on the basin. One major fact supports this argument: the Okavango river is still untouched, nearly twenty years after the beginning of interstate cooperation: a situation which goes in favor of the interests of Botswana. If some of the interviewees think that "you [we] give too much credit to Botswana's uncoordinated political strategy" (T. Mpho, Int., 2012), others argued that Botswana did everything in its power to hamper developments on the river since the beginning (Honorary Commissioner for Namibia at OKACOM, Int., 2012; Honorary OBSC member for Namibia at OKACOM, Int., 2012; D.J.H. Phillips, Int., 2012), or even that Botswana is undoubtedly the basin's hegemon (D.J.H. Phillips, Int., 2012).

4.3 A reading of the ORB through the lens of the Hydro-Hegemony framework

We now introduce our reading of the ORB' interstate power dynamic through the lens of the hydro-hegemony framework's strategies and tactics. We focus on the ones used by Botswana to maintain the status quo. Interestingly, most of them relate to what we defined in chapter 2 as "less visible forms of power", such as ideational power (here, levels III and IV CPMs: see table 4.6).

4.3.1 Botswana's main strategy: Containment

If Botswana were to be considered as a hydro-hegemon, its main strategy would be "containment", i.e. in that precise case the permanent control of the competitors' will to use the upstream waters of the ORB. Following this strategy, Botswana seeks to influence the other (supposedly weaker) riparians towards compliance with its preferred order of affairs. In short, the power dynamics on the ORB are fairly readable. As induced above, Botswana's main interest is to maintain the status quo, i.e. that neither upstream Angola nor midstream Namibia will proceed to any reduction of water flows and/or deterioration of water quality that might threaten the delta. Namibia, on the contrary, as a very dry country, wishes to use water from the Okavango in order to supply water to the inner part of the country. However, it has never been able to do so, both because of the issues introduced above (see: 1994-2007: a paralyzed institution), and of Botswana's permanent *containment* of such initiatives. Upstream Angola, on its side, has never been interested (yet) in using the Cuito and Kubango (the two main affluent rivers of the Okavango) waters for socio-economic purposes. The country has indeed a lot of other water resources (the Cunene and Zambezi, for instance), which are much closer to its main populated and socio-economic areas in the Northwest of the country. But Angola has often affirmed its wish to keep its options open for the future. Finally, Zimbabwe is totally absent of any debate related to the ORB. Its hydrological contribution to the basin is in general contested by the other riparian states, particularly Botswana.

Botswana's containment strategy is successful, thanks to a variety of Type I "Coercive", Type III "normative agreement" and Type IV' "ideological hegemony"

compliance-producing mechanisms (CPMs) operationalized through the following tactics: *active stalling* (I) *the signing of treaties/agreements* (III), *securitization* (III), *knowledge construction* (IV), and *sanctioned discourse* (IV); tactics supported by other coercive resources and the international context (*international support*, *financial mobilization*, *playing with the lack of teeth of International Water Law*, and *the exclusion of a riparian* (through the 1994 agreement – III Treaties)) . The following paragraphs illustrate the tactics used by Botswana.

4.3.2 Botswana's Main Tactics

4.3.2.1 I Active stalling (Type I "Coercive" CPM)

First and foremost, Botswana's attitude since the beginning has been characterized by its capacity to gain time at all levels and especially at OKACOM. Thanks to its active participation in meetings, Botswana has been capable of delaying a lot of decisions and projects, such as Namibian ones: the EWCP and the Popa Falls dam, for instance. Concerning the latter, a Water Resources Consultant in Botswana told us plainly that even before starting a joint Environmental Impact Assessment study (Botswana and Namibia together), "Botswana had already made up its mind long before the study started. In the end it was just to delay, gain time, you know" (Int., 2012). This attitude was somewhat logical from a country that does not want the river to be "touched", so "Botswana [they] do nothing because they just wait to see what happens" (Honorary Commissioner for Namibia at OKACOM, Int., 2012). An excellent example of this attitude came from the same respondent, when talking about the failure of the first Transboundary Diagnostics Analysis (TDA, 1996-1999). If Angola had "not done anything at all", Botswana delayed the work as much as possible until it was too late:

> *"We were so upset about this business, because it was the Namibian side, which made all the efforts to get this GEF [Global Environmental Facility] project off the ground and at the end of the day, the whole study [TDA] was not approved! At the last minute, all of a sudden Botswana said the drafts must be presented to a workshop or whatever before it could be approved and adopted. They would organize it! With nobody's money because it was part*

> *of the GEF budget. Basically they were suspicious of the work that was done, so Botswana had the idea to delay the thing and they also did not play the game because they should have consulted the commission before… You cant' arrive on the day when you have the final discussion of the final report and make those proposals so the all bloody thing fell. At the end of the day, we had to start all over again. That's why there was another TDA done later"* (Honorary Commissioner for Namibia at OKACOM, Int., 2012).

Last but not least, the listing of the basin as a Ramsar site was part of this tactic, since, as detailed above (see: the presence of an inner delta), this event both hampered the already poor trust between the riparians because of its unilateral nature, and added some impediments to any potential work upstream because of the public attention given to the protection of Ramsar sites at the international level. The recent idea to list the delta as a World Heritage Site is another way to reinforce this tactic (T. Mpho, Int., 2012). We shall note here that it is the only tactic (identified) that does not based on a type III- or IV-CPM, but rather a type I (i.e. coercion). It relies on the bargaining (type of) power of Botswana, and it "has been identified as one where traditional coercive resources are not required" (Zeitoun, 2006: 244).

4.3.2.2 III Treaties / agreements

The drafting and signing of a treaty favoring the hydro-hegemon is the preferred tactic when employing a *containment strategy* (Zeitoun, 2006). We already saw that most of the impulsion that led to the signing of the 1994 agreement by the three states came from Namibia. We argue that Botswana, on its side, signed it mostly in order to control the activities of its upstream riparians on the river, especially Namibia, as affirmed by S. Ringrose: "I think that's exactly why they signed the treaty: to keep an eye on what happens upstream" (Int., 2012). Indeed, most interviewees agreed with the fact that "Namibia might seem as the most proactive, but in the end it is Botswana getting what he wants" (HTF member for Namibia at OKACOM, Int., 2012). Since the beginning, Botswana has been able to contain all of their projects in order to ensure that the status quo is maintained, which is the main idea behind this strategy.

Another element that is linked with this strategy is the exclusion of Zimbabwe from the debate through the 1994 agreement. As argued by Zeitoun, the hydro-hegemon

can use of "weaknesses inherent to treaties that make them particularly well-suited for exploitation towards a negative outcome of hydro-hegemony, through the execution of a containment strategy" (2006: 247; see table 4.6). One of those weaknesses lies in the possibility to "rule out participation of a riparian not signatory to the treaty, thereby pre-empting the rights of the non-signatory states" (Zeitoun, 2006: 247; see appendix 4.4). We discussed the fact that the relationships between Botswana and Zimbabwe were very tense in 1994. It is still the case nowadays. Botswana was the only riparian state, which could gain from the exclusion – or non-inclusion – of Zimbabwe from the OKACOM since, for the latter, Zimbabwe represented: one more voice at the OKACOM with a potential power of decision on what happens to the delta; even though Zimbabwe does not contribute to it; and a threat to the political stability of the country and the region. Several interviewees confirmed that this exclusion (through the focus on the small basin and on active waters exclusively, etc.) might be explained by Botswana's unwillingness to cooperate with Zimbabwe (see: the exclusion – or non-inclusion – of Zimbabwe).

4.3.2.3 III Securitization

The three tactics of securitization, knowledge construction, and sanctioning the discourse are very much linked with one another and all relate to the delta. The whole process of securitization is based on "the making and unmaking of the politics of exceptionality", as brilliantly shown by Davidsen, who analyzed in depth how Botswana securitized all aspects of the "exceptional" Okavango delta in order to ensure that nothing happens to it and thus to maintain the status quo (see Davidsen, 2006: 95-109). Two main issues pushed Botswana to take this stand: the EWCP and Popa Falls projects in Namibia. We should also add the uncertainty for what relates to Angola's future development in the Cuando-Cubango region, which made Botswana take a defensive stand to protect "its" delta.

What is interesting is how much everyone in Botswana has proceeded to "securitize" the delta for diverse reasons that all aim at the same thing. The local communities living in the delta, for instance, wrote a letter in 1997 to the Namibian Government against the Eastern Water Carrier Project, arguing "we depend on the delta for almost everything. Without it, we would have to move or die… therefore; we request that no water be extracted from the Okavango River unless there is no other alternative"

(Davidsen, 2006: 96). By highlighting the "threat" created by Namibia with its project, the local communities used the both vital and emotional links they have with the delta, thereby affirming that any work upstream would be a question of life and death for the delta, and thus for them. NGOs such as the GEF also pointed at the imminent "threats" and the unilateralism of Namibia's actions, thereby accusing Namibia, putting it in the situation of "an enemy" of the delta, of its population, its biodiversity, etc. (GEF 2002: 29). Even medias – national and regional newspapers, in particular – pointed at the rushing atmosphere around the Eastern Water Carrier Project in Namibia due to the drought-related emergency situation at that time. The same events happened in 2003 when Namibia proposed to build the Popa Falls dam for hydropower just 50km upstream the Okavango delta: "the Namibian plans triggered doom-laden and widespread perceptions in Botswana as well as regionally and internationally that the project would lead to the destruction of the Okavango Delta" (Davidsen, 2006: 96). Again, the media (even in Namibia) and NGOs (this time, the International Rivers Network and the International Union for the Conservation of Nature) produced alarming documents (newsletters, articles, etc.) in order to put pressure on Namibia on the consequences of their actions for the "life" of thousands of people, and the economic security of the downstream riparians (Davidsen, 2006: 99-102)

Thus, actors in Botswana always remind how much the delta is vital for the economy, the tourism industry, the livelihoods of local communities, the protection of the unique biodiversity that it supports, and most importantly what the delta represents in terms of "national identity" (G. Khwarae, Int., 2012; NGO member, Botswana, Int., 2012). The latter is indeed crucial in the process of securitization, since defining the whole nation by its delta implies that the nation shall protect the delta – i.e. its "identity" – at all costs. This link between the resource and the state's identity evokes what has happened on the Nile for decades, with Egypt's identity being equated to the river Nile (Cascao, 2008; 2009; Waterbury, 2002; Carles, 2006;).

4.3.2.4 IV Knowledge construction

As argued by Zeitoun and Warner, "securitization facilitates politicians' ability to 'construct knowledge' around any water-related issue to fit other political interests." (2006: 448; see appendix 4.4). They are inseparable tactics and *knowledge*

construction sustains the discourse of *securitization* of Botswana by creating and supporting misguided popular beliefs on the consequences of any action upstream on the delta, which is not backed up by any scientific data.

Actors in Botswana based their link between the delta and the economic and social security of its people on the scientific uncertainty that characterizes the ORB system. We already saw that there was a clear lack of data at the ORB scale (see: lack of data), notably due to the absence of any data in Angola, and the permanent disagreements between the riparians for what relates to the accepted thresholds of water extraction. This ambiguity, reinforced by climatic uncertainty, gave Botswana an opportunity to choose the most alarmist discourse in its favor, thereby constructing knowledge about the – exaggerated – risks lying in the implementation of any work upstream. Hence, "the driving force of *knowledge construction* is a fear of death as the irresolute" (Davidsen, 2006: 98), this fear being both due to the fear of "the enemy" (Namibia, in this case) and the fear of uncertainty (climate, the future). The data used by Botswana to justify its stand was indeed based on erroneous perceptions of the downstream effects of the projected impacts of Namibian projects: an inaccurate over-estimation that served Botswana (Ashton, 2000: 7).

Another idea behind this *knowledge construction* tactic lies in the disproportionate media coverage of those issues relaying and thus legitimizing the security discourse of Botswana. The discursive power of the common discourse presented by the local communities, the NGOs and the media in favor of the protection of the delta both constructed the idea that environmental protection is "morally appealing" while Namibian projects are linked with an opposite idea relative to pollution and a diminution of water flows on the river (Davidsen, 2006: 99). All actors (mostly medias and NGOs) on "the side" of Botswana also did not hesitate to use a catastrophic and even violent discourse against Namibian projects. Terms such as "alarming threat", "irreversible changes", "the most serious threat the Okavango has faced this century", or "harming the delta", "eventual destruction of the delta", "death of the delta", "fear", "killing everybody living and relying on it", "water wars", and even "the rape of the delta" (in Davidsen, 2006: 100-1), all relayed by local medias and NGOs favored this process of *knowledge construction*, which seems to have been effective, since nothing has been implemented yet (neither the Eastern Water Carrier Project or the Popa Falls dam).

Finally, other issues could be considered as part of the *knowledge construction* tactic, such as the exclusion of Zimbabwe from the OKACOM (D.J.H. Phillips, Int., 2012), notably through the energy spent by Botswana so that the OKACOM would focus exclusively on active waters; or the listing of the delta as a Ramsar site of international importance – and more recently the idea to make it a World Heritage Site (T. Mpho, Int., 2012).

4.3.2.5 IV sanctioning the discourse.

Hence, this *securitization* and *knowledge construction* processes consequently resulted in a prevailing discourse heard above the others – the *sanctioned discourse* – which serves the powerful in veiling some aspects of riparian relations (inequitable distribution of the benefits of the river in favor of Botswana, or Namibia's need for food security) and emphasizing others (the fragility of the delta, or the importance of the OKACOM as a table of discussion to achieve a sustainable use of the basin (see appendix 4.4).

The sanctioned discourse could be summarized as such: 'the Okavango River Basin is, in the eyes of the world, roughly characterized by its delta. So is Botswana: the country, the nation, and its people. Because of its exceptionality; because of its life-sustaining character for thousands of people and animals; and because of its importance for Botswana as a whole, the delta must be protected at all costs'. Other discourses that would involve any divergent idea from this, such as works upstream (to divert water, etc.), or the fact that there exists an inequitable sharing of the ORB waters, for example, are systematically discarded behind the delta's vital importance for Botswana. This dominant discourse has helped Botswana veiling other aspects of the relations between the three riparians. We introduce four of them below.

Firstly, one should recall the fact that Botswana became "environmental-friendly" only after its own failure to pursue dredging works in the delta, facing the disagreements of both the local communities and international NGOs such as the IUCN. This "vested" green stand from Botswana can be explained both by its failure to push through its own SOIWP project and by the revenues of tourism in the delta (Swatuk, 2003b: 129). Because of the whole process of securitization and knowledge construction that followed this failure for more than a decade, Botswana has been able to progressively veil its former stand in favor of dredging the delta and emphasize

uniquely on the perception of all that Botswana is the only one wishing to protect the latter, as a permanent victim of upstream states' "threats" to dry it out (Swatuk, 2003b: 134). Secondly, in its own National Water Master Plan, whose main objective is to find water for the central and southern part of the country (Gaborone, mostly), the delta is never even evoked as a potential source of water for its own population. Botswana favors other waters – international waters – to achieve its objective, for instance by asking Lesotho, South Africa and Namibia to have access to some of the Orange River Basin's waters in the South, or to divert water from the Zambezi in the North in agreement with Zambia (Water Resources Consultant in Botswana, Int., 2012; HTF member for Namibia at OKACOM, Int., 2012). As a consequence, "everyone tells them: 'why don't you use the delta for those purposes'?" (Honorary Commissioner for Botswana at OKACOM, Int., 2012). Those projects are not done yet, most of them are still at the stage of completing feasibility studies, but they show how much Botswana totally sanctions the discourse on the delta by not envisaging to use water from there, thereby making it invisible for such purposes. Thirdly, a Honorary Commissioner for Namibia at OKACOM, Int., 2012 told us about the fact that since the 1980s, "Botswana pumps out water for irrigation and diverts some water for mining developments upstream from the inner delta although they don't want us to do it, they don't say it but I saw it from the air. The Dutch built the fucking thing!". All in all, the three countries pump a little bit of water at the local level, obviously, but Botswana's installations were never revealed publicly. Last but not least, because all the attention is given to the protection of the delta (the media, the international donors, and even at the OKACOM), for nearly twenty years now Botswana gets all the benefits from the basin. The latter are obviously shared inequitably. One might even say that they are not shared at all. Even though the idea of "shared-benefits" was recently touched upon at the OKACOM (J. Mendelsohn, Int., 2012), nothing happens in reality. And one can count on Botswana to continue its *containment* strategy and *active stalling* tactic to delay any such proposition.

4.3.3 Other coercive resources and international context

Finally, in this reading of the ORB through the lens of the Hydro-Hegemony framework, we argue that Botswana also used of what Zeitoun defines as "other

coercive resources" (in this case, *international support*, *financial mobilization*, and *human capital*) and "international context" (*the lack of teeth of International Water Law*).

To start with, on the ORB Botswana certainly has the favors of the global conservation society to back it up and give it "*international support*" to protect the delta and its biodiversity. During the whole process of knowledge construction and discourse sanctioning, international NGOs and organizations played the game of Botswana by defending the delta publicly and in the medias (ORI Member, Int., 2012; Honorary Commissioner for Botswana at OKACOM, Int., 2012; C.K. Munikasu, Int., 2012; D.J.H. Phillips, Int., 2012; J. M. David, Int., 2013). This situation added some pressure on the shoulders of Namibia in particular, which would be viewed as disrespectful of nature if it were to build anything consequent upstream, and it would certainly have some repercussions on its reputation (C.K. Munikasu, Int., 2012). As (Ashton, 2000: 8) argues, "it can be argued that this support from the local and international environmental lobby has greatly strengthened Botswana's otherwise unfavorable position as the lowest riparian state in an international river basin". D.J.H. Phillips goes even further by affirming that "Botswana has hidden behind the other voices and said 'oh there is the obvious answer, nothing can be done and you can't touch the river voilà! They sat in a hegemonic position hiding behind the international conservation community" (Int., 2012). Again, the Ramsar situation comes back to the table. As a Honorary Commissioner for Botswana at OKACOM said: "sometimes our colleagues upstream think that we are supported by int'l organizations. They were not happy that we made the Delta a Ramsar site, they knew that not only the Botswana government would fight for it, somebody outside will also fight for it" (Int., 2012). Also, Botswana's international support has always been linked with *financial mobilization* and *human capital*, since nearly all international projects from international organizations (GEF, IUCN, the SAREP of USAID, among others) on the basin are located in the delta (C.K. Munikasu, Int., 2012). The latter have invested a lot of money and human capital for nearly twenty years to efficiently help Botswana maintain the delta as a conservation area and to do studies in this aim. People in Botswana have worked along with delegates, researchers and technicians from those organizations, learning and improving their knowledge on the delta, which might have strengthen their argumentation at the OKACOM level in favor of their interests. Also, thanks to this mobilization of funds, since recently grants are given to

students in Botswana to go and study in European universities in order to improve their knowledge – and thus the *human capital* of Botswana – by completing PhD researches on the Okavango Delta (see TFO, 2014). On the Okavango, there has clearly always been a huge inequity in terms of financial mobilization and of the presence of international human capital in favor of Botswana.

Last but not least, in terms of international context, Botswana indirectly profited from *the lack of teeth of international water law* to defend its position as a downstream state of TWR. In particular, two major principles of the latter – which are included in the OKACOM agreement and the SADC protocol on Shared Watercourses Systems, inspired by the major IWL mechanisms (ILA, 1967; UN, 1997) – are contradictory: the principle of "obligation not to cause significant harm" (Article 7 in UN, 1997) versus the principles of "equitable and reasonable use and participation" (Article 7 in UN, 1997) (HTF member for Namibia at OKACOM, Int., 2012). In short, the first one implies that (generally upstream) states shall not pollute or extract water at a level that would impact (or harm) the state(s) downstream significantly. This is obviously the article on which Botswana would insist on the most. The second implies however that water should be shared equitably and reasonably, i.e. that everyone is entitled to extract some water as long as it is done in an equitable and reasonable way. This is all the weakness of the Convention, and it is illustrated perfectly at the level of the ORB. What does equitable and reasonable means? What does "no harm" means? Evidently, those decisions have to be taken by consensus between the riparian states. But in the case of the Okavango, since Botswana (backed up by *international support*) claims in its (*sanctioned*) *discourse* that no water can be extracted or polluted upstream at all, and that even one drop of water less could "significantly harm" the delta, and on the other hand Namibia argues for its sovereign right to use some of the water resources of the river in an equitable and reasonable way (L. Namene, Int., 2012; C.K. Munikasu, Int., 2012; HTF member for Namibia at OKACOM, Int.,), the situation is yet stuck in favor of Botswana, pleased to "*contain*" another issue. Hence, if in the end the claim of Botswana is respected, it is in part because of the flaws existing in the current international water law system, and its lack of teeth.

4.4 Conclusions

This brief overview of power relations on the ORB is of great interest for several reasons. Firstly, it shows us that the absence of obvious power asymmetry between riparian states does not mean that one cannot use of power-related mechanisms to achieve its interests, as Botswana on the ORB. Secondly, even a state that is not extremely powerful can resort to a variety of strategies and tactics usually employed by 'hydro-hegemons', i.e. actors that are much more powerful than their riparians, such as Israel on the Jordan or Turkey on the Tigris-Euphrates. Hence, the Hydro-Hegemony framework is not only useful to analyze cases of extreme power asymmetry, but also offers very interesting scientific tools in order to analyze any inter-riparian relation through the lens of power. This opens the door to further case-study investigations on power relations both at the level of the ORB, but also for any other TWRs, and not only exclusively the ones characterized by strong power asymmetry. Thirdly, we saw in the previous chapter that the odds for a basin to be institutionalized are higher when power relations between the riparians are symmetric. It is the case of the Okavango, at least for the 1994 agreement. However, the enduring containment of the development of the institutionalization of cooperation by Botswana also demonstrates that in reality, things are not so directly linked together: despite a relatively symmetric relation, the most powerful state of the basin succeeded in slowing down and even stopping the institutionalization process of cooperation on the OKACOM – at least in the case of the ORB. Fourthly, and linked to the latter, Botswana did so through the use of "less visible" forms of power. We already talked about the difficulty of operationalizing such concepts, because of their "less visible" aspect. It is indeed a very difficult task that we have tried to achieve as best as possible, but certainly in the case of the ORB the asymmetry between the three states in terms of ideational ("less visible") power might have been more obvious in 1994 than in 2007 (our year of reference for the operationalization of our variables). This is one of the limits of our research, hence this specific power-asymmetry analysis of the case of the ORB in this section.

5 Chapter Conclusions

The study of this deviant case taught us a lot on the institutionalization of cooperation on the Okavango River Basin, and provided new insights to be further tested in the next chapter. We will start by summarizing the results that concern the ORB case, before focusing on the lessons learned in this chapter for what relates to the literature on the subject, and the rest of this specific research. Finally, we will conclude by introducing what the next – and final – chapter will consist of. In this process, we will be guided by our main research questions, which we tested in this chapter using the ORB case.

5.1 The Okavango River Basin

Why did the Okavango River Basin's riparian states rather cooperate? What factors pushed them to do so at the beginning? Why did they institutionalize this cooperation by creating the OKACOM regime?

We saw in the first section that states started cooperating as a consequence of a series of events that led them to join together, including: *The existence of former* (bilateral) *agreements* and *the creation of bilateral institutions*; the *independence of Namibia* and *its rushing attitude to achieve its hydraulic mission* as well as *Botswana's reaction* to the latter; *the non-inclusion of one of the four riparians (Zimbabwe)*; as well as *the existence of acute water scarcity in the region* at that time, reinforced by a *prolonged drought*. Thus, the situation is very much case-specific, i.e. a combination of climatic, geopolitical, economic and political events, at this particular point in time. We add that some of those factors that led the states together have already been used in our first quantitative analysis (*the existence of former* (bilateral) *agreements*, *the creation of* (bilateral) *institutions*, and *the existence of acute water scarcity*). The triggering event to the creation of the OKACOM, "*the independence of one state* (Namibia)", could be a new variable that could be tested in the context of a larger population of cases (see below).

When they do cooperate, like on the ORB, what are the factors that hinder or improve cooperation? Why is cooperation more institutionalized in some cases than others?

The following section "the 1994-2007 period: a fragile equilibrium" showed that since the 1994 agreement, the institutionalization of cooperation between the three states was hindered by numerous factors of different nature (socioeconomic and sociopolitical; sociocultural and interpersonal; environmental; and operational). Most of these factors are linked with one another in some way, as detailed in the summary-table of each category. Socioeconomic and sociopolitical factors include: the *Angolan civil war*, which basically impinged Angola to be an active state at the OKACOM; the *disparity in the level of development of the riparians*, which implies that states have different levels of technical, human, economic and political capacities; hence diverse and often *conflicting interests*. Also, the *lack of motivation shown by central governments* for the project let riparians' representatives *without clear guidance from higher-levels of decision-making*. This lack of political backup certainly complicated interstate communication and coordination, thus hindering the development of OKACOM. Sociocultural and interpersonal factors affected the daily work at OKACOM. Riparian states' representatives could not easily understand each other because of *language* and *legal disparities'* issues, which gave rise to numerous misunderstanding and time loss. Also, the *difference in institutional culture* – or in "the way to do business" led to *trust issues* between the protagonists. It took some time –the appointment of interpreters during meetings, for instance – to improve communication and interpersonal issues at the OKACOM level. The environmental characteristics of the ORB are unique, and it creates tensions between the riparians. The *presence of the Okavango delta* polarizes debates between Botswana, downstream, wanting to protect the latter at all costs because of the considerable resources that it holds, and the upstream riparians who have other projects for the river, such as food security. The ORB does not lack of *environmental constraints*. Last but not least, purely operational factors hindered the further development of interstate cooperation: the *lack of data* (hence the impossibility to pursue projects without enough data on how the basin works); and the *lack of financial resources* for the daily operations of the OKACOM. The last factor is the *presence of a secretariat* to coordinate the administrative duties of the OKACOM. In the case of the ORB, the OKASEC (the OKACOM secretariat) was created in the mid-2000s and since then,

interstate cooperation has substantially improved. Again, some of those issues could be further tested in a large-N study, such as *the disparity in the level of development of the riparians* (a socioeconomic and sociopolitical issue) and *language* (intercultural and interpersonal issue).

Did power relations between riparian states play any role in the creation and development of the OKACOM? If yes, how? What are the underlying processes and mechanisms through which actors influence its institutionalization?

Thanks to the reading of the ORB through the lens of the hydro-hegemony framework theory, we were able to identify the most influent state of the basin (Botswana) and *the resources* (*strategies, tactics and other coercive resources*) used by the latter to ensure that the river is not touched by upstream riparians. Hence, *those processes and mechanisms,* used by Botswana in that particular case had the opposite effect of what we expected in the first place, i.e. to *slow the institutionalization of cooperation, and even to stall it completely, which was "the end"* (the objective) of the most powerful of the three states (at least until 2007): *Botswana*. This power-related analysis of the ORB taught us also: that the absence of obvious power asymmetry between riparian states does not mean that one cannot use of power-related mechanisms to achieve its interests; that even a state that is not extremely powerful can have access to a variety of strategies and tactics usually employed by 'hydro-hegemons'; and that despite a relatively symmetric relation, the "most powerful" state of the basin achieved to slow and even stop the institutionalization process of cooperation on the OKACOM, contrarily to the results of chapter 3 implying that the odds for a basin to be institutionalized are higher when power relations between the riparians are symmetric.

To conclude on this fascinating case study, the priority is to ensure the financial health of the OKACOM. Also, the organization should eventually be "tested" at some point (S. Ringrose, Int., 2012). Indeed, nothing happened on the river yet. The implementation of the Strategic Action Programme should be the next step toward this objective. One of the main ideas of the SAP is the completion of benefit-sharing mechanisms that would re-equilibrate the benefits between the three riparian states. We argue, along with some respondents (D.J.H. Phillips, Int., 2012; J. Mendelsohn, Int., 2012) that Botswana indeed must, or will have to, at some point in time, share the benefits of its gains in the delta with Namibia and Angola, so that their loss of not

using the river can be compensated somehow. For instance, several interviewees mentioned the development of a touristic zone not limited to the delta exclusively but which would include the Namibian part of the river and part of the Angolan one (D.J.H. Phillips, Int., 2012; J. Mendelsohn, Int., 2012; Mendelsohn and Obeid, 2004), especially if the tourists could easily move from one country to the other. Another way could be the simple payment from Botswana to the two other riparians, so that they leave the river untouched (D.J.H. Phillips, Int., 2012).

The ORB has proven to be a stimulating case, from which there is still a lot to learn. An important fact is that the three states were lucky enough to start cooperating while the river was still very pristine, which is a very rare opportunity that has to be further investigated. We also sense that there is still some information to dig on the absence of Zimbabwe in the whole process. Besides, the ORB is a very interesting case in terms of the interstate power relations, and there is certainly a lot to be studied on the matter. Yet, Angola, Namibia and Botswana have the future of the river in their hands.

5.2 Lessons learnt

The analysis of this specific case study proved extremely interesting in order to identify factors which have led the three states to working together, or which have improved – or hindered – interstate cooperation after the signing of the founding agreement in 1994. Here, we link the latter with both the academic literature on the subject, and the next chapter of this research.

Firstly, some "not case-specific" factors, which proved to have an influence on interstate cooperation, have already been identified in the literature as such: *the existence of former relations and agreements*; *water scarcity*; *militarized disputes*; *the level of riparian states' economic development* (Morrissette and Borer 2004; Lowi, 1993, 1999; Dinar et. al., 2011; Dinar, 2009; Tir and Ackerman, 2009; Stinnett and Tir, 2009; Kalbheen, 2011; Bernauer et. al., 2012; Chalecki, 2010; Amery 2002; Kehl, 2011: 220; Hamner, 2009; Elhance, 1999). Secondly, others were already tested in the literature-based quantitative analysis in Chapter 3, such as: *the exclusion of one riparian state, the presence of former institutions of cooperation, the creation of a institutions for cooperation*. The latter three were included when we operationalized

the dependent variable. One could also add here the *existence of former relations and agreements* and *water scarcity*. The first one was also included in the operationalization of the dependent variable, while the second was tested as a power-asymmetry argument. Thirdly, others are not discussed in the literature, or at least not in the major contributions on the subject: *the independence of a riparian state*, the issues of *language diversity* and *legal disparities*, and *the presence of a secretariat*. We shall test those factors – or variables – in the next chapter of the research, in the "literature- and case study-based quantitative analysis". The *independence of a riparian state*, *language diversity* and *legal disparities* shall be tested as new independent variables to our model, along with two other variables identified in the literature, but which we did not include in the quantitative analysis, either because they proved to be insignificant elsewhere (*militarized disputes*), or because of a different perspective of the variable itself (*the level of riparian states' economic development*). Dinar et. al. showed that the *militarized disputes* variable (we refer here to "the war in Angola" as an impending variable in the development of the OKACOM regime) is totally insignificant across several models focusing on bilateral interstate cooperation (2011). We chose not to include it in the literature-based quantitative analysis, but we will do so in the "literature- and case study-based quantitative analysis" on the basis of the ORB case analysis. The other variable (*the level of riparian states' economic development*; Stinnett and Tir, 2009) will not be tested as such, however. We acknowledged in this chapter that the existing *disparity in the level of development of the riparian states* had an impact on the quality of interstate cooperation. Thus, it is not the level of development per se that we will analyze in the next chapter, but rather the disparity of development between riparian states. Finally, the *presence of a secretariat* is an operational factor that we will not test as a new independent variable, unlike the five other variables identified here. Indeed, we will rather include it as part of the dependent variable, since *the presence of a secretariat* is the expression of a higher level of institutionalization of cooperation.

Thus, the final model, the "literature- and case study-based quantitative analysis", shall include five new independent variables (*the independence of a riparian state*, *language diversity*, *legal disparities*, the *disparity in the level of development of the riparian states*, and *the occurrence of war*) and modify the dependent variable through the inclusion of *the presence of a secretariat* in its operationalization.

The third step of this chapter was also instructive for what relates to power relations on the ORB. They show the usefulness of the hydro-hegemony framework theory in analyzing the influence of power asymmetry on the institutionalization of this specific TWR, as detailed above. Interestingly, despite the argument that this framework is adapted to the analysis of case studies where power asymmetry is very high – or hegemonic – (Zeitoun and Warner, 2006), this study has shown that even in situations where power asymmetry is quite low, the framework can be extremely useful, especially in order to focus on "less visible" forms of power, as induced above. We saw in chapter 3 that power asymmetry and power asymmetry arguments were central in the creation of interstate regimes on TWRs, but this chapter showed how those arguments could be manipulated to explain interstate cooperation (here, to explain why interstate cooperation has mostly been paralyzed for the last decades). So, having tested this framework on a basin, which did not have the main prerequisite (strong interstate power asymmetry), we can argue that the latter can be used in many other power configurations, even the ones where asymmetry is very low.

Finally, the case study analysis opens the debate to new variables for the next chapter, untested in the literature. Others have already been tested elsewhere and were not included in the first place for diverse methodological and theoretical reasons, but will be reinstated in the next chapter as new independent variables. The improvement of the dependent variable through the inclusion of the presence of a secretariat in its operationalization should also be seen as an improvement of the literature on the subject. Last but not least, the study of power relations using the Hydro-Hegemony framework theory looped the loop of our discussion on power as an important factor explaining the institutionalization of interstate cooperation on TWRs. Chapter 3 showed that power asymmetry (and power asymmetry arguments) were important, but this chapter completed the picture on this topic by helping us to grasp the reality of power relations on TWRs, which confirmed Luke's quote (mentioned elsewhere) that "power is most effective when least observable" (Lukes, 2005a: 1)

5.3 The way forward

The next chapter of this research will thus introduce the "literature- and case study-based quantitative analysis" based on both the literature (chapter 2 and 3) and the

findings brought up by the deviant case that is the ORB (chapter 4). It is the last step of our mixed model research design. This time, all variables do not stem from the literature exclusively, but also from the case study. We note that, some of the new variables were never tested in the literature in such configuration, using such method and/or working on this specific subject of research. Hence, we hope the final model we contribute to improving not only the initial quantitative model introduced in chapter 3, but also the larger academic debate on this subject. The second part of the next chapter presents the general conclusions of this research.

CHAPTER 5: LITERATURE AND CASE STUDY-BASED QUANTITATIVE ANALYSIS: THE FINAL MODEL

1 Introduction

The purpose of this chapter is to introduce and complete the final quantitative model, based both on the literature review and on the qualitative analysis of the Okavango river basin: the "literature- and case study-based quantitative analysis". It is divided in two parts.

The first part consists in the presentation of the final analytical model based on both: the review of the literature through which we identified "literature-based" variables (chapter 2) that were tested in chapter 3; and on the qualitative analysis of the Okavango River Basin's case (chapter 4). The objective of this second quantitative analysis is to loop the loop of the mix method research design of this study: to test both the variables identified in chapters 2 and 4 altogether, so as to explain why states cooperate – or not – on TWRs (binary logistic regression); and, when they do, why they cooperate more, or less (second regression). Indeed, in the last chapter we identified several factors or events, which will be tested here as complementary independent variables to the initial the model introduced in chapter 2 and tested in chapter 3. We also slightly modify the figures for the dependent variable: *the relative degree of institutionalization of international cooperative regimes on TWRs* on the basis of the results of chapter 4. We believe those modifications shall improve the initial model. In order to do so, we start with the presentation of both the new and the modified variables. We define each of them and show how they are operationalized for the regressions' purpose, so as to introduce the final analytical model.

In the second part of the chapter we introduce and proceed to both a binary logistic regression and a multiple linear regression, as in chapter 3. The first tests how well the model explains why states cooperate – or not – on TWRs; while the second tests how the latter explains why they cooperate more, or less. We will see that some of those results confirm the ones of chapter 3, while others are different. There is also an improvement in the quality of the model due to the inclusion of the new variables,

thereby justifying the choice to proceed to a mixed method design. The pertinence of the method will be discussed more in depth in the final conclusions of the research.

2 The final analytical model

During the field research, we had the opportunity to collect a huge amount of information and data, some of which is crucial for the improvement of our initial quantitative model. We identified five potential new (independent) variables and a necessary modification of the dependent variable for this specific purpose. Here, we firstly introduce the modifications made to the operationalization of the latter on the basis of the results of chapter 4. Secondly, we present the five new variables that we will test in the final model. We shall keep the same format of presentation as in chapter 3 for each variable, including a definition and a detailed presentation of their operationalization. Then, we proceed to both the binary logistic and the multiple linear regressions and analyze their respective results through the lens of our research questions. We also keep some space to conclude on this final analytical model.

We start the presentation of the final model with the modifications made to the dependent variable, before introducing the new independent variables. Some of the latter will only be used in the multiple linear regression (i.e. the regression composed only of the 56 cases (out of 80) for which cooperation exists and is institutionalized, and which aims at understanding why states cooperate more, or less, on TWRs. See chapter 3). Those variables were identified in the context of existing cooperation on the Okavango River Basin, so basically when states already cooperate. They should all be adapted to the purpose of the multiple linear regression which includes only TWRs where cooperation is already institutionalized. They either improved or hindered the institutionalization of the cooperative regime of the ORB – the OKACOM. For instance, this is the case of the variable *language*. The diversity of language spoken on the ORB has proven to impact negatively the process of cooperation between, on the one hand, Portuguese-speaking Angola and, on the other hand, English-speaking Botswana and Namibia. But some of those independent variables could also be tested in the binary logistic regression, which tests why states do cooperate – or not – on TWRs, as we shall see below. We start with the dependent variable.

2.1 Modification to the dependent variable: the relative degree of institutionalization of international regimes on TWRs

The complete definition and operationalization of our dependent variable (*relative degree of institutionalization of international regimes on TWRs*) can be found in chapter 3. In this second quantitative analysis, we keep the same period of analysis (1945-2007), the same source of data (the Transboundary Freshwater Dispute Database), and we are confronted to the same challenges, especially the validity of international agreements on TWRs (see appendix 3.2).

The modification of the dependent variable concerns its operationalization, more precisely the way we "score the degree of institutionalization of each treaty". Indeed, we wish to add another "bonus-point" to all agreements, which imply *the creation of a secretariat* as a supporting organization to TWRs' existing institutions. We saw in chapter 4, in the second section on "operational factors", that the presence of the OKASEC (the OKACOM's secretariat) since the mid-2000s has tremendously improved interstate communication and cooperation by supporting the daily administrative tasks of the commission. For instance, the OKASEC is responsible for implementing the decisions of the commission (the OKACOM), through the completion of diverse tasks, such as: administrative support; facilitating interstate communication and information sharing; managing finances or the translation of documents, etc. Hence, we test here if this situation cannot be generalized to all other cases. In this research, we consider that treaties including the creation of an organization managing a specific TWR, with a provision for the latter to be supported by a secretariat, are considered more institutionalized than ones which do not mention the presence of a secretariat. Here, the changes affects cases for which we already have computed a provision for the creation of an organization or commission in the treaty in chapter 3, i.e. mostly "organizations focusing on multiple issues" of degree-5 of institutionalization. The following table 5.1 introduces the updated list of criteria to evaluate the degree of institutionalization of treaties.

Table 5.1. Scoring treaties: modification of the dependent variable

Degree	Type of treaty	Score
1	Treaty implying "cooperation on one simple issue[57]"	1
2	Treaty implying "cooperation on multiple issues"	2
3	Treaty implying "joint management"	3
4	Treaty implying the creation of an organisation focusing on one simple issue	4
5	Treaty implying the creation of an organisation focusing on multiple issues	5
Bonus 1	The treaty implies "information exchange"	+1
Bonus 2	The treaty implies a "conflict resolution mechanism"	+1
Bonus 3	The treaty implies "fixed allocation of water quantity or quotas"	+1
Bonus 4	The treaty involves "all riparian states of the basin"	+1
Bonus 5	**The treaty implies "the creation of a secretariat"**	**+1**

We scanned all treaties under study again and modified the score of the dependent variable for 18 of them, on 14 basins (the Lempa, Schelde/Escaut, Elbe, Gambia, Oder, Okavango, Orange, Senegal, Mekong, Rhine, Niger, Nile and Danube Rivers' basins). The changes are not substantial (the scores for this variable do not change significantly), but they exist. The final data for the modified dependent variable is available in appendix 5.1.

We also identified five potential new variables for our model on the basis of our analysis of the ORB case-study: *The independence of (a) riparian(s) state*; *The occurrence of violent conflicts on a basin; the disparity in the level of development of riparian states*; *language diversity*; and *legal disparity).* The following paragraphs introduce each of those variables, the category in which we include them, and their respective operationalization in terms of (choice of) indicators, sources of data and calculation methods. Those five variables will be sorted in the "empirical arguments" group of variables, alongside the other groups "liberal peace arguments", "power asymmetry", and "power asymmetry arguments". Finally, we introduce a summary-table of all the variables included in the final model.

[57] As stated in chapter 3, issues include: navigation, fishing, economic development, joint management, territorial issues, flood control, water quantity, infrastructure development, technical cooperation, water quality, border issues, hydropower, and irrigation (OSU, 2009f)

2.2 The independence of (a) riparian(s) state(s)

The first variable under consideration here is the *independence of (a) riparian(s) state(s)*, i.e. the fact that a riparian state became independent during the period under study. By "independence" of a state, we mean the exercise self-government and sovereignty over its own territory. We saw in the case of the ORB that newly independent states such as Namibia often need to affirm their new status in order to legitimize their presence at the local, regional and/or international levels. As part of the process of industrialization, the completion of a hydraulic mission (Allan, 2001: 28-30) – the elaboration of water-related works in order to supply its population with water resources for larger socio-economic developmental purposes – is central. It generally leads to discussions between riparian states on the collective use of the water they share. Those discussions are the opportunity to develop cooperation with one another, like on the ORB where the independence of Namibia certainly was the triggering event for the three states to cooperate together. Of course, Namibia is by nature one of the driest countries on the planet and was living a particularly dry phase at that time, which are other factors that could explain the same inference, but we will test if similar situations could have had the same impact elsewhere.

Hence, we hypothesize that "Cooperation on a TWR with a larger proportion of official national independences during the period under study should be more institutionalized than another". Each official state(s)'s independence between 1945 and 2007 might have been a triggering event for new or reinforced cooperation on the basin(s) in which the newly independent state is part. We will thus test this variable in both our regressions, since we hypothesize that the independence of a state could be an explaining factor of both: why states cooperate, or not (it could be the triggering event of cooperation as on the ORB); and why riparian states which already cooperate reinforce (or not) their relations with the arrival of a newly independent state on a basin. In short: in the first case, we make the hypothesis that the official independence of a riparian state on a basin is a sufficient condition for the basin to show institutionalized cooperation; and in the second case we hypothesize that the higher the proportion of riparian states which became independent on a basin, the higher the *relative degree of institutionalization of cooperation* of the same basin.

The indicator chosen to operationalize this variable is the *proportion of states on a basin, which became independent during the period of study* (1945-2007). The

calculation method for this indicator is quite simple, as shown below with the example of the Okavango River Basin. The direct formula to calculate the value of the indicator for this variable reads as follows:

$$\text{<Independence>}_{\text{(basin X)}} = \frac{\text{Number of states, which became independent}_{\text{(basin X)}}}{\text{Total number of riparian states}_{\text{(basin X)}}}$$

The result is situated between 0 (minimum, no states became independent) and 1 (maximum, all riparian states of basin X became independent between 1945 and 2007). On the ORB, for instance, the four states became independent in the period between 1945 and 2007: Botswana (1966); Angola (1975); Zimbabwe (1980) and Namibia in 1990. Hence, the proportion of states, which became independent on the basin equals to "1", the maximum figure for this variable.

Table 5.2 below summarizes the information and data on the variable *independence of (a) riparian(s) state(s)*.

Table 5.2: summary-table - variable independence of (a) riparian(s) state(s)

Category	Variable	Indicator	Source of data
Empirical arguments (Sociopolitical / Socioeconomic)	The independence of (a) riparian state(s) (1945-2007)	The proportion of states on a basin, which became independent during the period of study	The CIA World Factbook (CIA, 2013a)

2.3 The occurrence of violent conflicts on a basin

The second variable that we add to the model is *the occurrence of violent conflicts on a basin.* We argue that an intra-state or an interstate violent conflict both: distract riparian states away from the management of its environmental resources to focus on urgent security issues at the national level; and affects inter-riparian relations (even if the conflict is internal to one riparian), as developed in the previous chapter.

We saw in Chapter 4 how much the Angolan civil war hindered interstate relations and communications to a level that totally impinged Angola to cooperate with its neighbours, despite a few intergovernmental contacts. The main issue was that no one

could access the Cuando-Cubango region in Angola, where lies the largest part – and the sources – of the ORB, thus no field study and research could be completed, no infrastructure could be built, and no monitoring could be expected from the Angolan governmental officers responsible for such matters. Indeed, the war happened mostly in this region. In the case of the ORB, what everyone calls "the Angolan civil war" was more "regional" and even "global" as one could think. It also involved South Africa (and former Namibia), and it was one of the main theatres of the – more global – Cold War between the "East" and the "West". But the most important factor that we keep in mind here is that the war happened on the Angolan territory (and in what would become later Namibia), which is a key criterion in our operationalization of this variable.

On the basis of this experience, we make the hypothesis that cooperation on TWRs is hindered when at least one riparian state on a basin is involved in a violent conflict on its own territory. Hence, here we only consider the occurrence of violent conflicts on one (or more) of the riparian's territory(ies): either an internal violent conflict (a civil war, for instance); or a one that involves two or more riparian states. Indeed, as long as a violent conflict occurs on a basin, we argue that cooperation (with the riparian(s) involved) cannot exist, or when it does, the latter hinders it, as illustrated on the ORB.

In order to operationalize this variable, we decided to use data from the "Correlates of War Project", which lists different types of wars for the period 1816-2007 – thus including the 1945-2007 period. A detailed list of the nine types of wars, shown in box 5.1 below, and their respective definitions can be found in the associated Codebook on the Project's website[58].

[58] See Sarkees, 2010.

Box 5.1: The nine types of wars identified by the Correlates of War Project

Traditional typology	Expanded typology
I. International wars	
A. Inter-state wars	I. Inter-state wars (war type 1)
B. Extra-systemic wars	II. Extra-state wars
(1) Colonial	A. Colonial--conflict with colony (war type 2)
(2) Imperial	B. Imperial--state vs. nonstate (war type 3)
	III. Intra-state wars
II. Civil wars	A. Civil wars
	1. for central control (war type 4)
	2. over local issues (war type 5)
	B. Regional internal (war type 6)
	C. Intercommunal (war type 7)
	IV. Non-state wars
	A. In nonstate territory (war type 8)
	B. Across state borders (war type 9)

Source: Sarkees, 2010: 10.

In short: "inter-state wars" are wars that take place between/among states (type 1); "extra-state wars" are wars between/among a state(s) and a non-state entity outside the borders of the state (such as a colonial war) (types 2, 3); "intra-state wars" take place within the recognized territory of a state (such as a civil war, for instance) (types 4, 5, 6, 7); while "non-state wars" are wars between or among non-state entities that either take place in a non-state territory (type 8) or across state borders (type 9) (Sarkees, 2010). Here, we will focus on "inter-state wars", "extra-state wars" and "intra-state wars" (i.e. war types 1 to 7) that take place within the territory of a riparian state under study during the period of analysis.

We identified 215 occurrences of "wars" during the 1945-2007 period; the territory on which the latter was fought (or was still being fought, on December 31, 2007); its length and the period (1992-1994, for instance). At the end, we have compiled the total duration, during which each state has been fighting a war between 1945 and 2007, giving us a data "per state": the number of years during which there has been a war on the territory of the state under study. Then, in order to transform this data into "per basin" data, we calculated the sum of war durations for each riparian state on a basin, and divided this total duration by the number of states on the basin, in order to have the closest indicator possible of the duration during which each basin has been at

war during our period of analysis. The following formula summarizes the calculation:

$$\langle War \rangle_{basin\ X} = \frac{\sum_{1->n} (\text{war(s) duration for riparian "n"})_{(basin\ X)}}{\text{Total Number of riparian states}_{(basin\ X)}}$$

For instance, on the Amur river basin (China, Russia, Mongolia), China experienced 14 years of war on its territory between 1945 and 2007, while Russia only 7 years and Mongolia none. The calculation is quite easy, since the total war duration of the three riparian states is 21 (14 + 7). Divided by the number of riparian states (3), the final figure for the variable *occurrence of violent conflicts* (on the Amur River Basin) is "7". We defined a few methodological criteria helped collecting the data for this variable[59].

Table 5.3 below summarizes the information and data on the variable *occurrence of violent conflicts* on a basin.

Table 5.3: Summary-table – variable *occurrence of violent conflicts*

Category	Variable	Indicator	Source of data
Empirical arguments (Sociopolitical and Socioeconomic)	The occurrence of violent conflicts on a basin	The average (averaged by the number of riparian states) duration of actual violent conflicts (or wars) which occurred on a basin	The Correlates of War Project (Sarkees and Wyman, 2010)

We will also test this variable in both regressions, since in our hypothesis we make the hypotheses that the occurrence of war both: can impinge states to cooperate; or can hinder already existing cooperation.

[59] Criteria for data collection of <War> : 1) A year started is a year counted (i.e. a war of 2 days is accounted for 1 year) ; 2) The states involved in a war outside their territory are not considered here since their own government can still continue working normally; 3) We only focus on the wars, the fights (see definitions on COW website). For instance, India and Pakistan are still at war in the Kashmir, we could consider that between 1947 (the first fights) and 2007, the two countries have been at war, but here we follow the COW Project's data and methodology. This methodological choice seems coherent since between those fights, Pakistan and India have been working together and cooperated; 4) when the war is on a border, we consider that both states are living the war; 5) When the war is on one state's territory, we consider only the state where the war happens; 6) When the war involves forces from different places in the world (War in Irak, for instance), we only consider the state where the war happens (Irak); 7) For wars occurring in Israel and involving Palestinians, we added "Palestine" as an impacted territory.

2.4 Disparity in the level of development of riparian states

We saw in chapter 4 that the high *level of disparity in the level the development of riparian states* had a negative impact between Angola, Namibia and Botswana at the beginning of their cooperation in the 1990s. Botswana, as the "most developed" state (at least in 1994) enjoyed more political stability than the two others, more financial means, human capacity, and organization skills to defend its interests (see chapter 4). Hence, we make the hypothesis here that the least *disparity in the level of development of riparian states,* the better the latter will be capable of cooperating and institutionalizing cooperation at the basin level.

The chosen indicator to operationalize this variable is the Human Development Index, which embeds both social and economic as composites: life expectancy (social), the level of education (social) and the GDP per capita (economic) (UNDP, 2010). We thus compiled the data for the 128 states under study in the year 2007. The data is again situated between 0 and 1 for this index, and more precisely the lowest figure in our case is Niger (with a HDI of 0,278), while the highest is Norway, with 0,952. In order to estimate this variable for each basin, we simply calculated the difference between the "least developed" and the "most developed" riparian states of the basin as an indicator of disparity.

For instance, on the Gambia River Basin, Gambia has the lowest HDI (0,342) and Senegal the highest (0,454). The difference between the two figures is of 0.112. Hence, for the Gambia River Basin, the estimate of *disparity in the level of development of riparian states* is of 0,112. After having compiled the data for the 80 basins under study, the lowest figure we calculated for this variable is the Moa river basin (0,011), and the figure goes up to 0,482 for Lake Chad.

Table 5.4 below summarizes the information and data on the variable *disparity in the level of development of riparian states*.

Table 5.4: summary-table – variable *disparity in the level of development of riparian states*

Category	Variable	Indicator	Source of data
Empirical arguments (Sociopolitical / Socioeconomic)	Disparity in the development of riparian states	The difference in the level of Human Development Index between most and the least developed riparian states	The United Nations Development Programme (UNDP, 2010)

We deducted the importance of this variable on the basis of our in-depth analysis of the ORB case (where the *disparity in the level of development of riparian states* was high, in 1994) at a period where the three states were already cooperating, and had already institutionalized this cooperation. However, here, we wish to test this variable also in basins where there is no institutionalization of cooperation in order to evaluate the influence of this variable: on the occurrence (or non-occurrence) of cooperation; not only on the institutionalization of already-existing cooperation. Thus, we test this variable in both regressions.

2.5 Language diversity

The fourth new variable is *language diversity*, or the occurrence of variety of official national languages on the same basin, which has proven to be a major stumbling block at the beginning of the process of cooperation on the ORB. Before hiring professional interpreters specialized in the English and Portuguese languages, communication at the level of the OKACOM was severely hindered by a constant incomprehension between the delegates and commissioners of Namibia and Botswana on the one hand, and Angola on the other. As developed in chapter 4, a lot of misunderstandings occurred because of a bad translation or a misinterpretation of one or a few keywords, which led to multiple disagreements at the commission level, thereby tremendously slowing the process of cooperation between the three states for more than a decade.

On the basis of the OKACOM situation, we make the hypothesis that a basin where the number of common languages needed for all riparians to understand each other is low, they might be more prone to effective cooperation than another where a multitude of languages are needed. Hence, the indicator we have chosen to operationalize the variable *language diversity* is "the concentration or dispersion of different languages (needed to understand each other) on the same basin". A basin characterized by a concentration of *language diversity* is a basin where fewer languages are needed for riparians to understand each other. A basin characterized by a dispersion of *language diversity* is in an opposite situation where more languages are needed.

To do so, we collected the list of official language(s) for each riparian state under study. We selected the languages needed on each of the eighty basins[60] and then calculated their concentration or dispersion as follows:

$$\text{<Language>}_{\text{basin X}} = \frac{\text{Number of riparian states}_{\text{(basin X)}}}{\text{Number of official languages (needed) spoken}_{\text{(basin X)}}}$$

A higher figure implies more concentration of the same language, i.e. hypothetically a better situation for the purpose of interstate cooperation, whereas a lower figure implies more dispersion, and hypothetically a less optimal situation for the same purpose. "1" is the lowest figure possible, since it would mean that each of the riparian states speak a different language, where dispersion is at its maximum. This is the case on the Dniester river basin, where the delegates from Ukraine (official language: Ukrainian), Poland (Polish) and Moldova (Romanian) speak three different languages, for three riparian states. We should note here that we assume that if two (or more) official languages are spoken in one state, the commissioners, technicians and other representatives sent by their respective governments speak all of them or, at least when possible, the government will deliberately chose delegates who speak a language that is spoken by one of the other riparians. For instance, on the Gash River Basin shared by Eritrea (official languages: Tigrinya, Arabic, English), Sudan (Arabic, English) and Ethiopia (Amharic), we assume that Eritrean and Sudanese representatives understand each other (either in English or in Arabic), and thus the "Number of official languages spoken" the Gash river basin is "2".

Table 5.5 below summarizes the information and data on the variable *language diversity*

[60] The number of official languages spoken is the lowest number of common languages spoken on the same basin, not all the official languages existing. The two criteria to decide how many languages are needed on a basin are, in order of importance: 1) the most common language of the basin 2) all other "exclusive" languages, i.e. states' unique official languages. For instance, on a three-states basin X where riparian 1 (officially) speaks language A, riparian 2 speaks languages A & B, and riparian 3 speaks language C, the figure for the variable <language> for basin X is "2". Indeed, riparians 1 and 2 can understand each other through language A, and riparian 3 exclusively speaks language C. So A, and C are the selected languages.

Table 5.5: summary-table – variable *language diversity*

Category	Variable	Indicator	Source of data
Empirical arguments (Sociocultural / Interpersonal)	Diversity of language spoken on a basin	The concentration or dispersion of language variety on a basin.	The CIA World Factbook (CIA, 2013 b)

This variable will be tested only in the second regression (multiple linear), since on the ORB the three states had to already cooperate to realize the importance of the language diversity as a huge hindering factor of inter-riparian states' cooperation. In other words, we sense that *language diversity* does not impinge states to cooperate, but can hinder the quality (and so the development) of cooperation.

2.6 Legal disparities

The fifth refers to what we label *legal disparity*, or "the difference in national legal systems*"*. Given the diversity of national legal systems existing in the world (civil law, common law, religious law, etc. see table 5.6 below), one could argue that less disparity in terms of legal systems on the same basin might make it easier for states to understand each other and thus cooperate better, contrarily to the ORB case where the Portuguese influence in the Angolan law system confused Namibia and Botswana, and vice-versa. More precisely, when states start cooperating together on water resources, they usually need to harmonize their respective national regulations and legislations in terms of water management, through the establishment of quotas of tolerated levels of pollution, or water extraction limits, for instance. Thus, the problems due to *legal disparity* happen when the states start talking "harmonization of national legislation and regulations", rather than when they discuss International Water Law, for which the rules are the same for all nations (even though other issues are raised in terms of International Water Law, but it is not the purpose of this research). Indeed, a system of law certainly influences the daily life of states at many levels, especially at the cultural one; hence cultural clashes due to different legal systems, like on the ORB, are frequent.

That being said, on the ORB, both Botswana and Namibia are ruled by a legal system of "mixed law", with a civil law system based on Roman-Dutch law with customary law influences (and even common law influences in the case of Botswana). On the

other hand, Angola's legal system is Civil Law based on Portuguese Civil law. As detailed in chapter 4, *legal disparity* on the ORB has tremendously slowed the process of formal cooperation between the Botswana-Namibia couple and Angola, along with the issue of *language diversity*, since precise vocabulary is crucial in the definition of rules, regulations, and law in general.

In order to operationalize the variable *legal disparity*, we collected information relative to the official legal systems of all riparian states involved in this study on the basis of the data and definitions proposed by the CIA World Factbook (CIA, 2013d). Like for the previous variable *language diversity*, we defined several criteria in order to define the number of common legal systems at the basin level[61]. Table 5.6 introduces the five main families of internationally recognized law systems, as well as the sub-systems encompassed by each of them.

Table 5.6: the five main types of legal systems and their respective sub-systems

National legal systems	
5 main types	**Sub-systems**
Civil law	Including French law, the Napoleonic Code, Roman law, Roman-Dutch law, and Spanish law
Common law	Including United State law
Customary law	
Mixed or pluralistic law	Consists of elements of some or all of the other main types of legal systems - civil, common, customary, and religious.
Religious law	Including Islamic law

Source: CIA, 2013d

[61] The criteria to define the number of common legal systems at the basin level read as follows: 1) Two states with Systems defined exclusively by either Civil Law or Common Law are considered the same systems 2) Same goes for Religious law if the same religion is involved (here, mostly Islamic law) 3) We never were confronted to two states with legal systems based exclusively on Customary Law in this study 4) In the cases of two or more states with Mixed law, we chose to proceed to case-by-case analyses, keeping in mind several criteria: a) If the details provided are the same for the two or more riparians, so same system: (example: 2 states have a mixed system of "Civil based on French system + Rel (Islamic)", then we argue the system is similar so only 1 system). b) A mixed system is NEVER considered the same as a Unique system, even if the bases are the same (for instance, a system exclusively based on Civil Law is not considered the same as a Mixed system (including Civil law and another such as Religious law). Even though one could argue that they have grounds to understand each other, which might be true depending on the case, we assume that both: a slight or a huge difference between the legal systems is the same for the purpose of this research, based on the assumption that the level of understanding between riparians cannot be equivalent to another basin where the systems are exactly the same; and that a supposedly small difference between two systems can reveal to be much more important than expected (as in the ORB case, where Botswana and Namibia had some grounds for understanding with Angola in terms of legal systems, but cooperation was still hindered). Any level of difference between system is thus sanctioned the same way here for the purpose of this research.

Full definitions of all legal systems can be found on the CIA World Factbook page dedicated to "legal systems" (CIA, 2013d). The calculation of the final figure for the variable *legal disparity* for each basin is similar to the one used for the variable *language diversity*, and reads as follows:

$$\langle Law \rangle_{basin\ X} = \frac{\text{Number of riparian states}_{(basin\ X)}}{\text{Number of existing official legal systems}_{(basin\ X)}}$$

Here also, a higher figure implies more concentration of the same legal systems, hypothetically a better situation for the purpose of interstate cooperation, whereas a lower figure implies more dispersion, and hypothetically a less optimal situation for the same purpose. Like for the variable *language diversity*, "1" is the lowest figure possible, since it would mean that each of the riparian states have a different legal system.

If we take again the Dniester river basin as an example, the three states sharing the basin (Poland, Moldova and Ukraine) do share the same legal system of Civil Law. Hence, the final figure for the variable *legal disparity* (Dniester river basin) is "3".

Table 5.7 below summarizes the information and data on the variable *legal disparity.*

Table 5.7: summary-table – variable *legal disparity*

Category	Variable	Indicator	Source of data
Empirical arguments (Sociocultural and Interpersonal)	Diversity of official national legal systems on a basin	The concentration or dispersion of the diversity of national legal systems on a basin.	The CIA World Factbook (CIA, 2013d)

For the same reasons as for the variable *language diversity*, this variable will be tested only in the second regression (multiple linear).

2.7 The complete list of independent variables

The five complementary variables described above complete the initial analytical model. Each of them is operationalized in order to test as best as possible if it has any influence on both: the occurrence; and the level of institutionalization of cooperation

on TWRs (except for the variables *language diversity* and *legal disparity*, which will be tested only in the second case, along with the initial variable *History of water cooperation*). The five variables are included in the "empirical arguments", but are shared between two categories of variables. The variables *independence of (a) riparian state(s), occurrence of violent conflicts* and *disparity in the level of development of riparian states* belong to the category "socioeconomic and sociopolitical factors; whereas the variables *language diversity* and *legal disparity* are considered as sociocultural and interpersonal factors. Table 5.8 below summarizes the final and complete list of independent variables, their respective indicators, and the source from which we have gathered the data to operationalize them.

Table 5.8: Final list of independent variables

Category	Variable Name	Indicator name	Source of data
Liberal peace arguments			
History of interstate diplomatic relations and cooperation	History of diplomatic relations	Diplomatic Links (1950-2005)	The Correlates of War Diplomatic Exchange data (Bayer, 2006)
	History of water cooperation	Period since first Treaty in 2007	International Freshwater Treaties Database (TFDD) (OSU, 2009c)
Economic relations	Economic Interdependence	Trade Interdependence in 2007	Correlates of War Project's Trade Data Set (Barbieri and Keshk, 2012)
Governance	riparian states' level of governance	Average level of governance by basin in 2007	The World Bank (World Bank. 2013a)
Power Asymmetry			
Relational-material power	Power Asymmetry	National Material Capabilities in 2007	Correlates of War Project National Material Capabilities (Singer, 1987)
		GDP per capita (current USD) in 2007	The World Bank (World Bank, 2013b)
Structural-material power	Power Asymmetry	GDP in 2007	The World Bank (World Bank, 2013c)
		Total Armed Forces, 2002-2008	Strategy Page (Strategy Page, 2009)

		Foreign Direct Investment Stock (Inward) in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
		Foreign Direct Investment Stock (Outward) in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
		International Reserves in 2007 (current USD)	The World Bank (World Bank, 2013d)
Relational-ideational power	Power Asymmetry	Number of foreign students in the country in 2007	United Nations Educational, Scientific and Cultural Organization (UNESCO, 2013)
		Values of creative goods exports, 2002-2010	United Nations Conference on Trade and Development (UNCTAD, 2013)
		Participation to International Organizations in 2007	The CIA World Factbook (CIA, 2009)
		Number of visitors entering the country in 2007	United Nations Conference on Trade and Development (UNCTAD, 2013)
Structural-ideational power	Power Asymmetry	Patent grants, 1995-2007	World Intellectual Property Organization (WIPO, 2012)
		Scientific and technical journal articles, in 2007	The World Bank (World Bank, 2013e)
		Education Index (Human Development Indicator, in 2007	United Nations Development Programme (UNDP, 2010)
Power Asymmetry Arguments			
Geography	Geographical configuration of the basin	Geographical position of the most powerful state	Various
Water Endowment	Water Scarcity (most powerful riparian)	Total renewable freshwater resources per capita (m3/cap/yr), 2003-2007	Food and Agriculture Organization of the United Nations (FAO, 2013)
	Water Stress (most powerful riparian)	Percentage of total actual renewable freshwater resources withdrawn (%), 2003-	Food and Agriculture Organization of the United Nations (FAO, 2013)

		2007	
	Water Dependence (most powerful riparian)	*Dependency Ratio* (%), i.e. percentage of total renewable water resources originating outside of the country, 2003-2007	Food and Agriculture Organization of the United Nations (FAO, 2013)
Governance	Level of governance (most powerful riparian)	Polity IV Index, in 2007	Polity IV Project (Marshall, 2011)
Empirical Arguments			
Sociopolitical/ Socioeconomic	Independence of (a) riparian state(s)	The proportion of states on a basin, which became independent (1945-2007)	The CIA World Factbook (CIA, 2013a)
Sociopolitical/ Socioeconomic	Occurrence of violent conflicts	The average (averaged by the number of riparian states) duration of actual violent conflicts (or wars) which occurred on a basin (1945-2007)	The Correlates of War Project (Sarkees and Wyman, 2010)
Sociopolitical/ Socioeconomic	Disparity in the level of development of riparian states	The difference in the level of Human Development Index between most and the least developed riparian states in 2007	United Nations Development Programme (UNDP, 2010)
Sociocultural/ Interpersonal	Language(s) diversity	The concentration or dispersion of language variety on a basin (2007)	The CIA World Factbook (CIA. 2013c)
Sociocultural/ Interpersonal	Legal disparity	The concentration or dispersion of the diversity of national legal systems on a basin (2007)	The CIA World Factbook (CIA. 2013d)

We have now introduced our final research model. We process it below via SPSS through the completion of both a binary and a linear regression, in order to evaluate the influence of the chosen variables, respectively on the existence of institutionalized cooperation (80 cases) and on the level of institutionalization of cooperation (56 cases). The final data and normalized data[62] for the (modified) dependent variable and for the five new independent variables can be found in appendices 5.1 and 5.2.

[62] Again, the dependent variable is categorical for the binary logistic regression, and normalized (logged) for the multiple linear one, as in chapter 3.

3 Final regressions and results: a two-steps analysis

Like in chapter 3, we will now proceed to two complementary regressions in order to evaluate our refined model based this time on both our analysis of the literature and of our case study. The first one is a *binary logistic regression*, including all 80 cases, with the dependent variable redefined as binary (cases not institutionalized = 0; cases institutionalized = 1), in order to detect which variables have an influence on the probability of a basin to be either institutionalized, or not[63]. The second one is a *multiple linear regression* including only the 56 institutionalized cases, in order to identify which variables have an influence on the tendency of a basin to be more, or less, institutionalized.

3.1 The binary logistic regression

We already have introduced the underlying assumptions behind the choice of a binary logistic regression in chapter 3. As a brief recall, one can use such regression when the data of the dependent variable is dichotomous – or categorical (either "yes", or "no", for instance). We do so in order to predict the categorical outcome (*the Modified Relative Degree of Institutionalization of Cooperation on TWRs*, computed in binary language) from the independent variables under study (which can be categorical or continuous predictor variables). Here, the two possible answers to the question "is cooperation on TWR 'X' or 'Y' institutionalized" are "yes" (1) or "no" (0). The following table introduces the summary of descriptive statistics of the model.

[63] We should recall here that we will not include the independent variables *History of water cooperation, Language(s) diversity* and *Legal Disparity* since they only have a meaning in cases where cooperation is already institutionalized (the multiple linear regression)

Table 5.9: Descriptive statistics of the model – Binary Logistic Regression

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
Relative Degree of Institutionalization (Dependent Variable)	80	0	1	,70	,052	,461	,213
Economic Interdependence	80	1,16	7,70	5,1665	,14087	1,26000	1,588
Riparian states' level of governance	80	,00	1,20	,6433	,02890	,25853	,067
History of diplomatic relations	76	,46000	1,00000	,8332777	,01849164	,16120642	,026
Power Asymmetry	75	,11784	,71834	,4453605	,01752093	,15173573	,023
Water Dependence (most powerful riparian)	74	,00	,37	,0969	,01182	,10165	,010
Water Stress (most pow. rip.)	74	0	1	,42	,058	,497	,247
Water Scarcity (most pow. rip.)	74	5,54985	10,92291	8,3263168	,14881679	1,28017043	1,639
Level of governance (most pow. rip.)	75	-7	10	3,31	,739	6,399	40,945
Geographical config. of the basin	75	0	2	1,13	,103	,890	,793
Independence of (a) riparian state(s)	80	,00	1,00	,5939	,03666	,32789	,108
Disparity in the level of development of riparian states	80	-2,09	-,63	-1,3686	,03751	,33551	,113
Occurrence of violent conflicts	80	,00	3,82	1,7998	,13168	1,17781	1,387
Valid N (listwise)	73						

Like in chapter 3, the most important information of this table, apart from the basic descriptive statistics of each variable, is the validity of 73 cases (out of 80). Some cases[64] were excluded by SPSS because of the lack of data for at least one variable. This is due to the limits of the data and data collection, as evoked before. The next step consists of analyzing the quality of the regression model, in order to evaluate how well the model can predict the outcome, i.e. the dependent variable (we note here that in the case of a binary logistic regression, the results of the regression introduce "odds" or "probabilities", rather than "directly readable results").

3.1.1 Model summary and quality

The following table – the classification table – shows data on the quality of the model itself. In short, this table shows how well the model predicts the outcome (here the institutionalization – or not – of cooperation between riparians of the same basin).

Table 5.10: classification table – Binary Logistic Regression

		Predicted by the model		
		Relative Degree of Institutionalization (Dependent Variable)		
Observed		0	1	Percentage Correct
Relative Degree of Institutionalization (Dependent Variable)	0	**14**	**5**	73,7%
	1	**4**	**50**	92,6 %
Overall Percentage				**87,7 %**
a. The cut value is ,500				

This classification table is basically the same as in chapter 3. The overall model has shown to be very successful in predicting the probabilities of each basin to be either institutionalized or not institutionalized. Indeed, 14 out of 19 basins (73,7%), which are not institutionalized, were predicted correctly. However, 5 of them where wrongly predicted as "institutionalized" on the basis of the data introduced in the model, although their score of institutionalization is "0". On the other hand, 50 out of 54 basins (92,6%), were correctly predicted by the model as "institutionalized", thus only four were wrongly predicted otherwise. The figure is much better for the

[64] Cases excluded by SPSS : Awash, Drin, Hari-Harirud. Juba-Shibeli, Lake Turkana, Lotagipi Swamp, Vardar

"institutionalized" basins. Overall, 87,7% of the cases were predicted correctly (64 out of 73 cases[65]), which is a significant score. Originally, when including only the constant in the model, the percentage of correctness was of 74% (54 out of 73 cases). The model can thus be considered as well shaped (even though it could still be improved) since, when we add the variables of our quantitative mode, 10 more TWRs – hence 13,3% of them – are well predicted.

We note here that there is absolutely no difference with the initial model, which we could define of equivalent quality when looking at this specific data. That being said, the next table shows the final results, where we witness a few differences.

3.1.2 Main results

The following table is a summary of the essential results made available for the reader. The full SPSS results for this regression can be found in Appendix 5.3.

Table 5.11: The binary logistic regression: main results

Variables in the Equation							
						95% C.I.for EXP(B)	
	B	S.E.	Wald	Sig.	Exp(B)	Lower	Upper
Independence of (a) riparian state(s)	2,743	2,361	1,349	,245	15,527	,152	1588,628
Disparity in the level of development of riparian states	1,376	2,460	,313	,576	3,959	,032	491,451
Power Asymmetry	-18,815	7,411	6,445	**,011**	,000	,000	,014
Water Dependence (most powerful riparian)	-22,400	9,182	5,951	**,015**	,000	,000	,012
Water Stress (most powerful riparian)	-14,938	5,681	6,915	**,009**	,000	,000	,022
Water Scarcity (most powerful riparian)	1,828	,949	3,711	,054	6,221	,969	39,945
Level of governance (most powerful riparian)	,925	,392	5,570	**,018**	2,522	1,170	5,436

[65] 7 cases were rejected by the model because of the lack of data for at least one variable, as induced above.

Economic Interdependence	,323	,620	,272	,602	1,382	,410	4,662
Geographical configuration of the basin			4,488	,106			
Geographical configuration of the basin: most powerful state downstream or midstream	3,407	1,686	4,085	**,043**	30,166	1,109	820,783
Geographical configuration of the basin: most powerful state upstream	-,158	1,492	,011	,916	,854	,046	15,895
Riparians' states level of governance	2,081	4,011	,269	,604	8,012	,003	20812,721
History of diplomatic relations	-5,847	6,498	,810	,368	,003	,000	982,036
Occurrence of violent conflicts	-,063	,657	,009	,924	,939	,259	3,404
Constant	6,781	8,001	,718	,397	880,917		

Note : R^2 = 0.990 (Hosmer & Lemeshow) ; 0.512 (Cox & Snell) ; 0.751 (Nagelkerke)
Note : Model χ^2 = 52,400
Note: *p < 0.05; **p < 0.01 and ***p < 0.001

This binary logistic regression was conducted to assess if the independent variables – or predictors – significantly predicted whether or not cooperation on a TWR is institutionalized. The "chi-square" of the model is of 52,400 (χ^2 = 52,400), with a significance of p (or Sig.) < 0,001. Without going into too much detail, those figures show that the model *significantly* predicts the outcome (the dependent variable), when all variables are included. There is not much change with the initial model, except that this one's quality is marginally improved by the inclusion of three new predictors (*independence of (a) riparian state(s)*; *disparity in the level of development of riparian states*; *and occurrence of violent conflicts)*. Indeed, with a chi-square (χ^2) of 52,40, the model's relevance in predicting outcomes is more significant than the

initial one (for which $\chi^2 = 50{,}69$). Also, the two values of "pseudo-R-squares"[66] (Cox & Snell; and Nagelkerke) are slightly higher than in the first model (0,512 > 0,501 for Cox & Snell; and 0,751 > 0,734 for Nagelkerke). Those two statistics show the "goodness-of-fit" of the model, and here it fits slightly better than the previous one. Even though those statistics have to be considered with caution, they can be used for comparing similar models like ours (UCLA, 2013: 5-7).

Last but not least, this minor improvement of the model left out one of the variables initially defined as "significant" in our previous model: the *water scarcity of the most powerful state.* Indeed, Table 5.11 also introduces the odds ratios for the regression, which suggest that: the odds of a basin to be institutionalized are increasingly greater as *the level of governance of the most powerful state* and *the riparian position of the most powerful state (downstream)* scores increase. On the contrary, the odds of a basin to be institutionalized are lesser as the scores of *power asymmetry*, *the water dependency ratio of the most powerful state,* and th*e water stress of the most powerful state* increase. Below, we discuss those results for each category of variables.

3.1.3 Discussion

The similarity of those results with chapter 3's is striking. The variables based on the fieldwork analysis – the "empirical arguments" – have been useful to slightly improve the model, but they did not have any real impact on the final results of the regression. Below we do not repeat the same analysis as in chapter 3 for the variables which for but rather summarize those findings and spot the light on other results, such as the statistical insignificance of one of the variables (which was significant in chapter 3), or the discussion on empirical arguments. We introduce those results by category of variables.

<u>On *power asymmetry*</u>

The initial hypothesis about power asymmetry - that the occurrence of a higher level of power asymmetry on a TWR implies that cooperation on the latter be more

[66] There is no equivalent of R-Square statistic (informing the proportion of variance explained by the predictors) in logistic regressions, those two are the two statistics called "pseudo-R-squares", commonly accepted as the closest equivalent to a R-Square statistic in a linear model. (UCLA, 2013: 5-7)

institutionalized – is again contradicted by those results. The odds for the *relative degree of institutionalization of cooperative regimes on TWRs* to be positive increase when the level of *power asymmetry* occurring on the same TWRs decreases. So, the hypothesized relation between the two variables is opposite to the model's final result. So, the regression contradicts the hypothesis that *power asymmetry* is a sufficient condition for the institutionalization of TWRs regimes. It rather confirms the initial results introduced in chapter 3. Indeed, on the basis of our final model, if the relation between *power asymmetry* and the dependent variable is significant (0,011*,), it is however negative. Thus, for every one-unit increase in the score of the dependent variable, we expect a -18,815 decrease in the log-odds of the latter. Those figures are very close to the ones of chapter 3 (Sig = 0,01**; *B* = -16,932). In other words, the odds of a basin to be institutionalized are smaller as *power asymmetry* occurring on the basin increases.

As developed in chapter 3, this result contradicts: our hypothesis for this variable (hence the attempt to generalize the hypothesis of hydro-hegemony researchers); hence the arguments of realist authors on the matter (who argue the same despite a different conceptualization of power between our research and realist assumptions); and the idea that power asymmetry has nothing to do with cooperation, as shown by several researchers on TWRs (Stinnett and Tir, 2009; Dinar et. al., 2011). More details are available in chapter 3.

Finally, this result is quite unique, because it neither shows that power asymmetry positively influences the outcome (our hypothesis, and realist arguments, despite different theoretical assumptions), or that power asymmetry has nothing to do with it. Plus, other *power asymmetry arguments* tend to corroborate the idea that even if *power asymmetry* does not directly influence the institutionalization of cooperation on TWRs; other variables linked with the presence of a "most powerful state" in their conception do have an influence, as shown below.

<u>On *power asymmetry arguments*</u>

The same goes for two out of the three water endowment/power-asymmetry arguments (*water dependenc*e and *water stress of the most powerful state* of the basin), for which our hypotheses has proven wrong since the odds for cooperation to

be institutionalized increase as *water stress* and/or *water dependence of the most powerful state* of the basin decreases. However, we hypothesized that that a basin hegemon living under w*ater scarcity* (in all its forms: *water dependence*, *water scarcity*, and *water stress*) would influence inter-riparian states relations in favor of the development of cooperative schemes in order to ensure that its water allocation needs be secured.

The relation between *the water dependency ratio of the most powerful state* and the dependent variable is significant (0,015*) but negative. For every one-unit increase in *the water dependency ratio of the most powerful state*, we expect a 22,400 decrease in the log-odds of the dependent variable. Those figures are again very close to the ones of chapter 3 (Sig: 0,016*; *B* = -21,51). The same assessment can be made for the variable *water stress of the most powerful state*, the most statistically significant of all variables in the model (0,009**). In this case, one unit is one "category", since this variable is operationalized here as a categorical (binary) variable. Thus, if the most powerful state on a basin starts to suffer from water stress, and thus passes from category "0" (no water stress, data < 20%) to category "1" (water stress, data > 20%), we expect a -14,938 decrease in the log-odds of the dependent variable (the figures for chapter 3's logistic regression were: Sig: 0,005**; *B* = -12,604). Thus, the two hypotheses related to those three variables are again proven wrong by this final model, since the odds for cooperation to be institutionalized increase as *water stress* and/or *dependence of the most powerful* state of the basin decreases. The discussion on those results is again more developed in chapter 3. Yet, in a nutshell, those results contradict most of the studies on TWRs, which show that water scarcity (in the form of stress and dependence) is a catalyst for the development of cooperative regimes on TWRs when high (Stinnett and Tir, 2009; Tir and Ackerman) or moderate (Dinar et. al., 2011). It also shows that the case studies of the hydro-hegemony framework, for which water stress and dependence are very high and cooperation is very much institutionalized, as on the Jordan and the Nile rivers' basins, cannot be generalized to other basins (Eissa, 2008; Cascao, 2008, 2009; Carles, 2006; Selby, 2003a, 2003b; Zeitoun, 2008; Zeitoun and Warner, 2006).

Interestingly, the variable *water scarcity of the most powerful state* – which is the part of the general concept of water scarcity discussed in the literature that focuses on "natural" scarcity (i.e. the availability of water per capita without including the impact

of human activities, like for water stress) – was statistically significant in the previous model (0,043*). The redefinition of the model excluded this variable from the results (now its significance level is of 0,054, which is close to 0,05, but still too much). This is the only major change, in terms of results, between the two steps of the binary logistic regressions. This result is not so surprising, since the statistical significance of the latter in the previous model was very close to the border between significance and insignificance (0,05). Here, the quality of the model has improved thanks to the presence of additional variables, as evoked above. The exclusion of this variable from the results can thus partially be explained by the improvement of the model since the results are supposed to be more precise when the quality of the model is higher. This variable, which was already close to be statistically insignificant in the previous model, was reevaluated by the model more accurately in the final model as not significant (enough) to be considered as influencing the development of international regimes on multilateral TWRs. This also denies – differently, this time – the hypothesis made by most authors that (natural) *water scarcity* is either a catalyst for peace (in the neoliberal institutionalist view) or for conflicts (realist accounts of the issue), detailed in chapters 2 and 3.

Finally, in terms of water endowment variables, one could argue that if the "most powerful state" of any TWR under study, does not suffer from any *water stress* (human impact on water availability) or *water dependence* (on waters external to the state), the odds that cooperation on this basin be institutionalized are high. However, if the latter suffers (or not) from water scarcity (natural scarcity), the odds for the basin to be institutionalized (or not) – are statistically insignificant. In other words, the presence or absence of *water scarcity* (as we defined it here) for the most powerful riparian states has no influence on the odds for the latter to be institutionalized (or not).

The results for the two last power-asymmetry arguments (the *level of governance of the most powerful state of the basin*, and the *geographical configuration of the basin)* however confirm our hypotheses, like in chapter 3. Both do have a significantly positive relation with the dependent variable.

The variable *level of governance of the most powerful state* happens to be positively linked with the dependent variable (sig: 0,018*). It is the only variable for which the statistical significance improved a lot between the two regressions (first regression:

sig: 0,042*). Indeed, it was statistically significant approximately at the same level than the variable *water scarcity of the most powerful state* discussed just above (0,043*). Interestingly, the improvement of the model reinforced the significance of the former, while the latter became statistically insignificant. That being said, the variable *level of governance of the most powerful state* is a combination of power asymmetry-related and liberal-peace arguments: it implies that the odds for a basin to be institutionalized are higher when the most powerful state of the basin has a higher level of governance (at best, it is a stable democracy). Thus, the higher the *polity index* of the most powerful state of the basin, the more the odds for cooperation on the basin to be institutionalized are high. If the most powerful state is, for instance, a democracy, chances that the basin's cooperation be institutionalized are much higher than if it were an autocracy, for instance. In other words, a powerful state will be more inclined to participate to cooperative schemes when it is a democracy rather than an autocracy. This result: confirms the liberal hypothesis that democracies be more inclined to cooperate with other states on those issues (Elhance, 1999: 18; Kahlbeen, 2011); confirms the importance of mixing power asymmetry variables with liberal-peace ones, hence to give a chance to mix theories together, as we have attempted to do in this research; and reinforces our hypothesis that the most powerful state of a basin acts as a leader when its level of governance is high, especially if it is situated downstream (or midstream), as shown by the second variable (*geographical position of the most powerful state*). Indeed, the results show that when the most powerful state of the basin is located downstream (or midstream, i.e. not upstream), the odds for the development of cooperative regimes on the same basin increase. The *geographical position of the most powerful state*, when downstream (or midstream), is significantly linked with the dependent variable (0,043*) –like in chapter 3 (sig: 0,042*). This also confirms our hypothesis for this specific variable. The rationale behind this it is that the powerful tends to use all available power resources at hand in order to convince its riparians that they need to cooperate, in order to secure its own water allocation, which is – or can be – threatened by the fact that it does not directly control the flows of the resource, as argued by other authors (Le Prestre, 2005: 402; Lowi, 1993: 10). This result also denies contributions, which affirm that fewer treaties are signed on basins characterized by upstream-downstream configuration (Song & Whittington, 2004, studying diverse configurations of bilateral rivers).

On *liberal peace arguments*

Like in chapter 3, none of the other independent variables labeled as liberal peace arguments – do have any significance on the odds of a basin to be institutionalized or not (*economic interdependence among riparian states; history of diplomatic relations between riparian states*; and *average level of governance on the basin*). Those results are discussed more extensively in chapter 3. However, in a nutshell, they: put into question the neoliberal institutionalist arguments about the influence of those variables on the creation of international regimes on TWRs; confirm the importance of mixing the theoretical insights of diverse schools of thought and sources in the development of variables, since the latter provide quite original results, such as the statistical insignificance of liberal assumptions, and the significance of power asymmetry arguments, even though not always as hypothesized; and both confirms some and denies other contributions from the literature. For instance, Stinnett and Tir also showed that the *riparian states' level of governance* was statistically insignificant so as to explain cooperation (2009), while Dinar et. al. see the opposite hypothesized inference (that this variable explains cooperation) denied here (2011). The latter, along with others (MacQuarrie and Wolf, 2013: 181; Sigman, 2004; Russett and Oneal 2001; Dinar, 2009: 128) also showed the same inference for the variable *history of diplomatic relations*, which is also denied here. However, the *history of diplomatic relations* does not influence the dependent variable: neither positively, nor negatively. Last but not least, numerous contributions also showed that *economic interdependence* has a positive relationship with the dependent variable (Dinar et. al., 2011; Stinnett and Tir, 2009; Tir & Ackerman, 2009; Kalbheen, 2011; Espey & Towfique, 2004), and see their assumptions denied here too.

On *empirical arguments*

The same goes for the empirical arguments' variables that we added to the initial model on the basis of our field research on the Okavango River Basin. Empirical arguments (*the independence of (a) riparian state(s), the occurrence of violent conflicts on a basin, the disparity in the development of riparian states*) are also statistically insignificant in this binary logistic regression. The model also rejects their respective hypotheses. Their inclusion in the model seems to have slightly improved

the latter, but none of them significantly affects the odds of the TWRs under study to see their cooperative schemes institutionalized. Thus they were useful, but not statistically significant. The only thing one could add here about those three variables is that other academic contributions were right not to envisage them as potential variables explaining the existence of cooperative schemes on TWRs. Indeed, the final model proves their respective statistical insignificance, at least for multilateral TWRs.

Thus, the positive outcome of including those variables into the model is that they seem to have improved the latter: its quality, and its results, which are reinforced in this regression when compared to chapter 3's. Last but not least, they do have a larger impact on the multiple linear regression model, as we shall see below.

Finally, the evolution of the regressions between chapter 3 and 5 are more obvious in the multiple linear regression, as we shall see below. Before that, the following table 5.12[67] introduces a summary-table of expectations and findings for the binary logistic regression.

[67] In bold: the variables which are statistically significant in the model.

Table 5.12: Summary of expectations and findings – Binary logistic regression (80 cases)

Variable	Expected impact on the odds of cooperation on TWRs to be institutionalized	Expectation supported?
Empirical arguments		
Independence of (a) riparian state(s)	Positive when more occurrences	No
Occurrence of violent conflicts	Positive when more occurrences	No
Disparity in the level of development of riparian states	Positive when smaller	No
Liberal Peace Arguments		
History of diplomatic relations	Positive when more relations	No
Economic Interdependence	Positive when more interdependence	No
Riparians' states level of governance	Positive when higher	No
Power Asymmetry and Power Asymmetry arguments		
Power Asymmetry	**Positive when higher**	**No, opposite**
Geographical configuration of the basin	**Positive when downstream**	**YES**
Water Scarcity (most powerful riparian)	Positive when more scarcity	No
Water Stress (most powerful riparian)	**Positive when more stress**	**No, opposite**
Water Dependence (most powerful riparian)	**Positive when more dependence**	**No, opposite**
Level of governance (most powerful riparian)	**Positive when higher**	**YES**

In the end, one might expect that a basin characterized by the following features be institutionalized: the presence of a "hegemon" (or most powerful state), which power asymmetry over the basin is low (or moderate); with a high level of governance (a stable democracy, at best); located downstream (anywhere else than exclusively upstream); and which does not – or only very moderately – suffer from water stress and/or water dependence.

This binary logistic regression showed us the importance of several variables as influencing the odds for a basin to be institutionalized, or not. But its main features lie in: its confirmatory character (confirming most results of chapter 3); the refinement of

the model in terms of quality; the exclusion of one statistically significant variable in chapter 3; and the insignificance of the new variables categorized as "empirical arguments". The second step is a multiple linear regression of the 56 basins for which cooperation is indeed institutionalized, and looks for variables that might have an influence on the score of our dependent variable. We use the same independent variables (with three complementary ones) as predictors and operate a multiple linear regression.

3.2 The multiple linear regression

This second step of our quantitative analysis consists of a multiple linear regression in order to test the influence of some variables not on the existence, this time, bur rather on the level of *relative degree of institutionalization of TWRs cooperative regimes* – the (modified) dependent variable. We focus on the 56 cases, which are characterized by a positive *relative degree of institutionalization*, i.e. for which cooperation is – more or less – institutionalized. As evoked previously, we carry on with the same variables used for the binary logistic regression, although here the dependent variable is linear (and not binary) and has been modified on the basis of the Okavango case study analysis. We also add the predictors "period since first treaty" as an operationalization of the variable *history of water cooperation* (category: History of interstate diplomatic relations and cooperation); as well as the two predictors "concentration or dispersion of language variety on a basin" and "concentration or dispersion of the diversity of national legal systems on a basin", respectively predictors of the variables *language diversity* and *legal disparity*, both from the category "empirical arguments" based on our field research analysis[68].

We firstly introduce the descriptive statistics of our final model in table 5.13 below.

[68] The definition and operationalization of those three variables, and the justification for including them only in the second step of our quantitative analysis can be found in chapter 3, pp. XX-XX (<Period>) and chapter 5, respectively pp. XX-XX and pp. XX-XX for <Language> and <Law>.

Table 5.13: Descriptive statistics of the model – Multiple linear regression:

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Stat	Stat	Stat	Stat	Std. Error	Stat	Stat
Relative Degree of Institutionalization (Dependent Variable)	56	-,40	3,46	1,9250	,10147	,75932	,577
Independence of (a) riparian state(s)	56	,00	1,00	,5518	,04510	,33747	,114
Disparity in the level of development of riparian states	56	-2,07	-,63	-1,3418	,04718	,35308	,125
Occurrence of violent conflicts	56	,00	3,70	1,7186	,14922	1,11667	1,247
Language(s) diversity	56	,00	,68	,3066	,02998	,22438	,050
Legal Disparity	56	,00	1,53	,6837	,04427	,33131	,110
Power Asymmetry	56	,12	,71	,4281	,02008	,15024	,023
History of water cooperation	56	3	62	36,59	2,583	19,329	373,592
Water Dependence (most powerful riparian)	55	,00	,37	,0968	,01367	,10136	,010
Water Stress (most powerful riparian)	55	,00	1,00	,4909	,06803	,50452	,255
Water Scarcity (most powerful riparian)	55	5,55	10,92	8,1695	,17418	1,29178	1,669
Riparians' states level of governance	56	,00	,95	,5034	,03056	,22872	,052
Level of governance (most powerful riparian)	56	-7	10	4,20	,855	6,397	40,924
History of diplomatic relations	54	,46	1,00	,8237	,02431	,17862	,032
Economic interdependence	56	1,05	5,40	3,2485	,12655	,94699	,897
Geographical configuration of the basin	56	0	3	1,25	,131	,977	,955
Valid N (listwise)	54						

Like for the binary logistic regression, some cases[69] were excluded by SPSS because of the lack of data for at least one variable. We are left with 54 out of the 56 original cases. The next step consists of analyzing the quality of the regression model, in order to evaluate how well the model can predict the outcome, i.e. the dependent variable, this time with more "directly readable" results, not odds and probabilities.

3.2.1 Model Summary and Quality

Table 5.14 below introduces the final model summary of the final model. The latter is extremely successful in terms of how it predicts the observed data, with an R of 0,803. R^2 is of 0,644, which is an excellent figure for a very good model. The adjusted-R^2 is of 0,504. The R^2 and adjusted-R^2 both show the "goodness-of-fit" of the model. Here, the model can be considered as very well shaped.

Table 5.14: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,803[a]	,644	,504	,53553	1,926

When comparing those figures with the first multiple linear regression based exclusively on the literature (Chapter 3), we can argue that there has been consequent improvements in terms of quality between the two models. The final model is more accurate and more complete, as shown by its R (0,803 > 0,721), R^2 (0,644 > 0,519) and adjusted-R^2 (0,504 > 0,407) figures. The most important score for this type of regressions is R^2, which shows the amount of variation in the outcome (dependent) variable that is accounted for by the model. Here, the difference is 12,5% between the two models (R^2 = 64,4% for the final model, against 51,9% for the previous one). We should recall that 51,9% was already a good figure. Now that we witnessed that our method seems to bear its fruits, let us introduce the final results shown in the next table 5.15.

[69] Cases excluded by SPSS: Drin, Vardar.

3.2.2 Main results

Table 5.15 below introduces the main results of the multiple linear regression. The full SPSS results can be found in Appendix 5.4.

Table 5.15: The multiple linear regression: main results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1,296	1,142		1,135	,264
Independence of (a) riparian state(s)	,001	,343	,000	,003	,998
Disparity in the level of development of riparian states	1,185	,362	,555	3,274	**,002**
Occurrence of violent conflicts	-,160	,121	-,232	-1,322	,194
Language(s) diversity	,550	,426	,162	1,292	,204
Legal Disparity	-,151	,344	-,066	-,438	,664
Power Asymmetry	1,380	,693	,277	1,992	,054
History of water cooperation	,009	,005	,234	1,802	,080
Water Dependence (most powerful riparian)	-,722	1,089	-,097	-,663	,511
Water Stress (most powerful riparian)	,173	,338	,115	,510	,613
Water Scarcity (most powerful riparian)	,081	,122	,138	,660	,513
Riparians' states level of governance	,333	,644	,102	,516	,609
Level of governance (most powerful riparian)	,002	,021	,014	,080	,937
History of diplomatic relations	-1,319	,749	-,310	-1,762	,086
Economic interdependence	,518	,144	,655	3,593	**,001**
Geographical configuration of the basin	,055	,090	,071	,616	,542

a. Dependent Variable: Relative Degree of Institutionalization
b. Note: *p < 0.05; **p < 0.01 and ***p < 0.001

The analysis of the coefficients is more straightforward that for the binary logistic regression (which shows probabilities of occurrence). They directly show which

variable significantly predicts the dependent variable. Two variables do have an influence on *the relative degree of institutionalization of cooperation on TWRs*. The first one is *economic interdependence*, operationalized by "trade interdependence", which was already significant in chapter 3. However, *the history of diplomatic links between riparian states* is no more considered as significantly (enough) influencing the dependent variable. It is supplanted here by the new "empirical argument" variable *disparity in the level of development of riparian states*. Below we will concisely discuss those final results by category of independent variables.

3.2.3 Discussion

The results are, like for the binary logistic regression, very close to the ones of the first multiple linear regression introduced in chapter 3. Again, here we shall not repeat the whole analysis, but rather summarize those confirmatory results and keep some space for the new ones (the exclusion of *the history of diplomatic links between riparian states* from the significant results; and the statistical significance of a new variable – *disparity in the level of development of riparian states*).

On *power asymmetry*

The variable *power asymmetry* is statistically insignificant so as to explain the higher or lower *relative degree of institutionalization of TWRs*. Contrarily to the binary logistic regression, where the result was opposite to the hypothesis; here the model simply does not consider *power asymmetry* as a variable enhancing (or hindering) *the relative degree of institutionalization of regimes on TWRs*. We already highlighted in chapter 3 how much noteworthy is the fact that most of them were significant in terms of *odds for the basins to be institutionalized (or not)* in the binary logistic regression, while none of them is significant for what relates to *the relative degree of institutionalization* of those basins. In sum, *power asymmetry* has an influence in explaining the occurrence of institutionalization, but not on its level. In terms of literature, this result confirms the results of some studies, which argue that power asymmetry does not influence the development of cooperative schemes on TWRs (Dinar et. al., 2011; Stinnett and Tir, 2009). It however contradicts our hypotheses, hence the ones of realist thinkers of international relations and critical authors of the hydro-hegemony framework theory, who argued like us (that the higher the power

asymmetry on a basin, the higher the level of interstate cooperation), despite a different conceptualization of power.

On *Power-asymmetry arguments*

The results for power asymmetry arguments' variables also confirm the previous results of Chapter 3. None of them significantly predicts the *relative degree of institutionalization* of the basins under study. Neither *water stress, scarcity,* and *dependence of the most powerful state* (water endowment variables), nor the *geographical configuration of the river,* nor the *level of governance of the most powerful state of the basin* significantly influence the dependent variable. In sum, they have an influence in explaining the occurrence of institutionalization (negatively for the water endowment variables, positively for the two others) but not on its level. The discussion is more detailed in chapter 3, notably by linking them with the contributions from the literature. For instance, several authors showed or argued that the presence of the most powerful state downstream on a TWR tends to influence the institutionalization of cooperation on the latter, since the powerful does not control the flow of the resource, so it has to formalize agreements with its neighbors to ensure that water allocation schemes mirror the distribution of power on the basin (Le Prestre, 2005: 402; Lowi, 1993: 10). Like us, those authors are proven wrong with this regression.

On *Liberal peace arguments*

One of the results for liberal peace arguments confirms chapter 3's, while another contradicts them. On the one hand, the level of *economic interdependence* significantly predicts the dependent variable (0,001**), in a positive way. This suggests that the higher the level of *economic interdependence* on a TWR resource, the more cooperation on the latter is institutionalized. The statistical significance of this variable is reinforced when compared to the first regression (sig: 0,009*). Hence, the level of economic interdependence between riparian states is very significant as an influential factor for cooperation on a basin to be more institutionalized than another. Thus, we confirm what we already affirmed in chapter 3: neoliberal institutionalist authors are proven right for this variable. Several studies that followed this liberal argument in the conceptualization of their quantitative analyses also proved the same

inference (Espey & Towfique, 2004; Kalbheen, 2011; Dinar et. al., 2011; Stinnett and Tir, 2009; Tir & Ackerman, 2009). Hence, as already induced in chapter 3, the level of trust between economically interdependent states makes them less unwilling to delegate their authority and more prone to accept further institutionalization of existing cooperation with the same states (Gartzke et. al., 2001; Stinnett and Tir, 2009: 246; Tir & Ackerman, 2009: 628-9; Oneal and Ray, 1997). If we were surprised by the absence of liberal arguments in explaining the occurrence of institutionalized cooperation on TWRs, our hypothesis here is confirmed for what relates to the influence of this variable so as to explain the *relative degree of institutionalization of this cooperation*. The only – exclusively – economic argument of this category is also the only one for which our hypothesis is confirmed (see table 5.16 below).

On the other hand, the surprising result of the first regression (the – negative – significance of the variable *history of diplomatic links between riparian states*) is annihilated by the refinement of the model. Like for the variable *water scarcity of the most powerful state* in the binary logistic regression, the variable *history of diplomatic links between riparian states* was statistically significant (even though negatively) in explaining the degree of institutionalization on TWRs when tested in the literature-based quantitative analysis; but the improvement in the quality of the model has refined it, and excluded this variable as statistically significant. We were surprised, in chapter 3, that this variable was negatively significant (i.e. that the presence of riparian states with long-lasting diplomatic relations on a basin does not guarantee a higher institutionalization of the latter), which contradicted a basic liberal assumption of international relations. The fact that it is disproved here by an improvement of the model certainly confirms that our initial model for the multiple linear regression was incomplete.

The other two variables of this category (*history of water cooperation* and the *level of governance among riparian states*) still do not significantly predict the dependent variable. Hence, the only liberal peace argument, which influences the *relative degree of institutionalization of TWRs*, is the only purely economic one. As developed in chapter 3, the denial of the hypothesis on *riparian states' level of governance* as a prominent variable explaining the levels of cooperation occurring between riparian states both contradicts the arguments of Dinar et. al. (2011) on the matter, but also confirms the inference proposed by Stinnett and Tir (2009) that the type of regimes on

a basin is statistically insignificant in explaining the level of cooperation. The argument of the latter lies in the idea that commitments made by democracies are more trustworthy than those made by autocracies; hence more democratic regimes need strong institutions to be able to cooperate with autocracies (Drezner, 2003; Stinnett and Tir, 2009: 246). Concerning the variable *history of water cooperation*, we made the hypothesis that states which already cooperate on TWRs shall be more keen to enhance the institutionalization of this cooperation in the long term. However, this hypothesis was proven wrong in both multiple linear regression. We made the assumption, in chapter 3, that the trust built by states when they have been working together for a long time makes that they do not necessitate further formalization of their cooperation because they already trust each other.

On *empirical arguments*

Last but not least, out of the five new variables added to the initial model, one only significantly influences the dependent variable: the *disparity in the development of riparian states* (positive relation). That is, the higher the *disparity in the level of development of riparian states*, the more cooperation on the latter is institutionalized. Like for *power asymmetry* in the binary logistic regression, we expected the opposite inference between this variable and the dependent one, i.e. that if the difference was small between the most and the least developed riparians, then it would catalyze interstate cooperation, whereas here it is if the difference is higher that states tend to institutionalize their cooperation on TWRs. But, when one looks closer at the data, some of the cases that are the most institutionalized gather riparians with very diverse levels of development, such as the few ones including South Africa as the most developed riparian (Limpopo, Incomati, Maputo, with Mozambique and Swaziland), or the Danube (Germany vs. Moldova), the Aral Sea (Kazakhstan vs. Afghanistan) and the Niger (Algeria vs. Niger) basins. In order to explain this result, we make the assumption that the presence of one or several more "developed" states (in terms of Human Development Index) with "less developed" ones increases the potential for cooperation on the basin to be more institutionalized because the more "developed" states need formal institutions to trust less developed states to follow the regimes' norms, rules and principles. We refer to the idea evoked above between autocracies and democracies. We make the parallel analysis with situations where more

developed and less developed states work together: because they do not have the same economic, social, and human capacities, there is a need for a strong common structure (or institution) to ensure that agreements be enforced properly despite the difference in the development of participating states. Nevertheless, this result endorses our choice of method, i.e. to complement the literature review with a deviant case-study analysis in order to improve the model. Indeed, the refinement of the model with the inclusion of the new variables has shown to improve the initial one, and thus the liability of the results presented here. Plus, the presence of one of the "empirical arguments" as statistically significant confirms this statement.

The four other empirical arguments (*the independence of (a) riparian state(s), the occurrence of violent conflicts, language diversity* and *legal disparity*) are statistically insignificant. The only variable, which has already been discussed in the literature, was *the occurrence of violent conflicts*, labeled in Dinar et. al. as "militarized disputes" (2011). We had not included it in the first regression because it was proven statistically insignificant in the latter, but we eventually chose to include it after the analysis of the ORB case where the war in Angola (a violent conflict) definitely hindered interstate cooperation for a long time. This regression confirmed the results of Dinar et. al. (2011) in the case of multilateral TWRs (since the latter focused on bilateral basins exclusively), proving that *the occurrence of violent conflicts* (or non-occurrence) has nothing to do with the *relative degree of institutionalization of interstate cooperative schemes on TWRs*.

The following table 5.16[70] shows the summary of expectations and findings for this regression.

[70] In bold: the variables which are statistically significant in the model.

Table 5.16: Summary of expectations and findings – Multiple linear regression (56 cases)

Variable	Expected impact on the institutionalization of cooperation on TWRs	Expectation supported?
Liberal Peace Arguments		
History of diplomatic relations	Positive when more relations	No
History of water cooperation	Positive when longer period	No
Economic Interdependence	**Positive when more interdependence**	**YES**
Riparians' states level of governance	Positive when higher	No
Power Asymmetry and power-asymmetry arguments		
Power Asymmetry	Positive when more relations	No
Geographical configuration of the basin	Positive when downstream	No
Water Scarcity (most powerful riparian)	Positive when more scarcity	No
Water Stress (most powerful riparian)	Positive when more stress	No
Water Dependence (most powerful riparian)	Positive when more dependence	No
Level of governance (most powerful riparian)	Positive when higher	No
Empirical arguments		
Independence of (a) riparian state(s)	Positive when more occurrences	No
Occurrence of violent conflicts	Positive when more occurrences	No
Disparity in the level of development of riparian states	**Positive when smaller**	**NO, opposite**
Language(s) diversity	Positive when smaller	No
Legal Disparity	Positive when smaller	No

On the basis of those results, one could argue that both: a high level of *economic interdependence* between riparian states on a basin is a sufficient condition for it to be highly institutionalized; and a high *disparity in the level of development of riparian states* is another sufficient condition for the same outcome. In other words, one might expect that a TWR characterized by the following features be more institutionalized

than others: a high level of *economic interdependence* between riparian states and *high disparity in the level of development among them.*

The following conclusion briefly concludes this chapter by both summarizing it and recalling its function within the greater methodological scope of this research.

4 Conclusions

This chapter was the last of the three-steps mixed method research design: the "literature- and case study-based quantitative analysis". The objective of the chapter was to test the new "empirical" variables identified in the in-depth analysis of the ORB case in chapter 4 along with the variables tested in the literature-based quantitative analysis in chapter 3. Like in chapter 3, we tested all those variables in two different regressions in order to answer best the research questions of this study.

We started this chapter with the redefinition of the dependent variable on the basis of the analysis of the Okavango River Basin, which suggested that, *the relative degree of institutionalization of cooperative regimes on TWRs* is more important when the latter includes a secretariat in order to manage the daily works of river basins' commissions or organization. We thus modified the data in the operationalization of this variable.

Then, we defined and operationalized the five "new" variables based on the results of the previous chapter: *the independence of (a) riparian state(s), the occurrence of violent conflicts, language diversity* and *legal disparity*, and *the disparity in the level of development of riparian states*. We categorized those variables as "empirical arguments", i.e. based on the empirical analysis of the ORB. This category completes the picture, along with *power asymmetry*, *power asymmetry arguments*, and *liberal peace arguments*. Like in chapter 3, the operationalization part consisted in creating a link between theory and measurement through a methodical choice of indicator for each variable. Hence, the data used in this chapter was quantitative, but was collected on the basis of qualitative information gathered during interviews (in chapter 3, the process was the same, the qualitative information came out from the literature exclusively).

Then, we proceeded to two complementary regressions: a binary logistic regression (so as to test the variables in the model in order to identify which ones enhance or hinder the probability of states to cooperate on TWRs) and a multiple linear

regression (including only the 56 "institutionalized" cases, i.e. where cooperation already exists, in order to test the variables in the model in order to identify which ones influence the *relative degree of institutionalization of interstate cooperation on TWRs)*. The results gathered from the completion of those two regressions are very instructive, as discussed above. We sum them up below while answering to the main research questions.

Why do states rather cooperate on transboundary water resources? (sub-question: what are the concepts and/or variables that enlighten best what shapes international regimes over TNRs?)

This question refers to the reasons why states start cooperating on TWRs, hence to the binary logistic regression. The results of the latter showed that the odds of a basin's cooperative regime to be institutionalized are higher if the latter is characterized by the following features: the presence of a "hegemon" (or most powerful state), which *power asymmetry* over the basin is low (or moderate); with a *high level of governance* (a stable democracy, at best); *located downstream* (or midstream); and which does not – or only very moderately – suffer from *water stress* and/or *water dependence*. Hence, only *power asymmetry* and *power asymmetry arguments'* variables seem to explain the creation of international regimes on TWRs. Thus, the following variables enlighten best the odds of riparian states to shape international regimes on TWRs: *power asymmetry*; *water dependence* and *water stress of the most powerful state*; the *level of governance of the most powerful state*; and the *geographical configuration of the basin*, with the most powerful state located anywhere but upstream.

Interestingly, the quality of the model was slightly improved by the inclusion of the empirical arguments' variables, but in the end it mostly confirmed the results of the first binary logistic regression (see chapter 3), except for one variable (*water scarcity of the most powerful state*) which is no more significant (enough) to be considered as having an influence on the outcome. Hence, the literature seems to grasp quite well the debates on cooperation over TWRs. But the improvement of the model also showed that the field research was useful in order to refine and confirm those results, and to disprove one of them.

Why is cooperation more institutionalized in some cases than others? What factors can explain it? What does the literature tell us about potential – necessary or sufficient – conditions that could enhance the probability for states to maintain and consolidate international regimes on the matter?

Those questions were answered via the multiple linear regression. Two variables have shown to be very significant in explaining the *relative degree of institutionalization of cooperation occurring on TWRs*: *economic interdependence* and the *disparity in the level of development of riparian states.* The first one suggests that when riparian states of the same basin are economically interdependent, they tend to be more prone to further institutionalize interstate cooperation, certainly because they already trust each other at the economic level. The second, which significance is opposite to what we initially hypothesized for this variable, suggests that a higher disparity in the level of development between the riparian states – based on the Human Development Index of the latter – also implies that cooperation on the basin they share be more institutionalized than in cases where the disparity is smaller. We argue that it is because the most "developed" state(s) of the basin need strong institutions to engage with states with less economic and social capacities. Hence, on the basis of those results, one could argue that both: a high level of *economic interdependence* between riparian states on a basin is a sufficient condition for it to be highly institutionalized; and a high *disparity in the level of development of riparian states* is another sufficient condition for the same outcome. In other words, one might expect that a TWR characterized by the following features be more institutionalized than others: a high level of *economic interdependence* between riparian states and *high disparity in the level of development among them.*

The relation between *economic interdependence*, the *disparity in the level of development of riparian states*, and *the relative degree of institutionalization of cooperative regimes on TWRs* (simply put: the level of cooperation) also raises questions for further research on those issues: is cooperation on water a catalyst of interstate peace through economic interdependence? If yes, why is it when there is strong disparity in the level of development of riparian states that such cooperation occurs? Is water a political link between less developed and more developed states to cooperate further on other (economic?) issues? Or is economic interdependence a prerequisite to the consolidation of international regimes on TWRs? This relation will be touched upon again in the general conclusions of the research.

Does the existence of asymmetric power relations between riparian states catalyze the development of institutionalized regimes?

As induced in chapter 3, the existence of asymmetric power relations between riparian states does not catalyze the development of institutionalized regimes, but rather the opposite. However, the binary logistic regression showed that *power asymmetry* has a role to play in the process of creation of international regimes on TWRs. The latter must however be low, i.e., contrarily to what we hypothesized; a lower *power asymmetry* between riparian states increases the odds for this institutionalization process to start. Plus, all other *power asymmetry arguments* do have a role to play too (see the discussion following the binary logistic regression), which shows the importance of the role of the most powerful state in this process. So, on the basis of this literature- and case study- based quantitative analysis, one cannot answer positively to this last question, but *power asymmetry* has an indirect role to play in the development of international regimes on TWRs (when *power asymmetry* is low, when the most powerful state exercises a *high level of governance*; is *located downstream* (or midstream); and does not – or only very moderately – suffer from *water stress* and/or *water dependence*).

Before focusing on the general conclusions of the research, we should add a few words about the methodological choices at the heart of this study. Indeed, those results seem to justify the use of a mixed-method research design. We saw in chapter 3 that the arguments proposed by the literature were very helpful to preliminarily answer the research questions. The quality of the initial quantitative model is quite suitable to achieve our goals, as proven by the similarities between the initial and the final models. One of the objectives of proceeding to a field research in chapter 4 was to improve this initial model by including other factors (or variables) grasped by an extensive analysis of interviews and complementary documents related to this specific case. We saw in this chapter that this objective was fulfilled: even if the results of the binary logistic regressions were similar, the quality of the second was slightly better and refined the results to confirm the importance of most of the variables, and to deny another. Also, the improvement of the model between the first and the second multiple linear regression was even more important. It also confirmed the weight of one key variable, removed another from the results, and proved the statistical significance of one of the variables based on the empirical analysis of the ORB case.

Hence, those improvements, both in the quality of the model and in the results themselves, confirm that our (original, in the case of this subject of research) choice of pursuing a mixed method research design was pertinent. We shall discuss more on the methodology in the general conclusions of the research.

CHAPITRE 6 – GENERAL CONCLUSIONS

We started this research so as to actively participate to the public and academic debate on cooperation and/or conflicts over the common goods of the Earth. The latter is notably divided by the different standpoints on the role and the responsibility of human activities in the exponential degradation and depletion of the environment during the last decades. But, whosever responsibility is at stake, the problem continues to aggravate every minute, and the impact of those issues is more and more felt in every corner of the planet, at all levels. Resource scarcity, overexploitation, increasing competition of resources, population growth, the increasing number of environmental migrants, among others, are all factors that fuel the catastrophist discourse arguing that the propensity for upcoming conflicts and even wars over resources is imminent; which is the major view at the level of the media and public debates. Hence, the origins of this research lie in the relentless strengthening of this catastrophist discourse in the public sphere, and in a desire to understand the ins and outs of such pessimism about the outcomes of environmental issues at the global level, via the study of a specific type of common goods: "transboundary natural resources" (TNRs); the object of this study.

Defining TNRs as common goods spots the light on the distribution of the benefits, which can cause great tensions between protagonists. It is those tensions that are of interest in this research, keeping in mind that various other issues act as catalysts of tensions over common goods, such as the social needs for life and socioeconomic development; the existing schemes of resource allocation; the distribution of benefits; the legitimacy of existing international norms, agreements, treaties or regimes; or the presence of negative externalities, among others. However, the trends regarding conflicts on TNRs show that occurrences of cooperation largely overwhelm occurrences of conflicts. This paradox caught our researcher's eye to a point where we decided to dedicate this research on testing the veracity of the catastrophist claims through the in-depth analysis of interstate cooperation on TNRs through the lenses of the fields of *International Relations*, *International Political Economy*, *Political Ecology* and *Hydropolitics*. Hence, the central subject of this research was "cooperation and conflict over transboundary natural resources", more precisely over

transboundary water resources, the "resource-case study" on which we concentrated our analysis.

In short, the academic debate on this specific subject of research has long been polarized between two main discourses: one which promotes the idea – evoked above, and relayed in the media and the public sphere – that natural resources will be at the heart of the next conflicts and wars; and the other which sees cooperation as the most probable outcome of tensions on such resources. The first approach is based on neo-Malthusian geopolitical arguments based on a realist view of international relations, which argues that a long-lasting population growth will eventually lead to conflicts over limited natural resources. "Cornucopians" are more optimistic about the outcomes of issues related to environmental resources. Influenced by a neoliberal-institutionalist perspective of international relations, they consider tensions over resources as opportunities to achieve mutual benefits through cooperation. The progressive institutionalization of such cooperative schemes ultimately becomes a catalyst factor for enhanced collaboration in other sectors. Those two opposite perspective therefore became mainstream and dominated the debates until recently, when other contributions from authors of radical/postmodern, critical, or sustainable development schools of thought, among others, added some nuance to the debate notably through completion of various analyses of case studies. In general, the empirical studies show that cooperation overwhelms conflict on natural resources. We stand with the third family of researchers. Thanks to the contributions of non-mainstream authors, who paved the way for a deeper examination of the underlying factors that explain why states cooperate or enter into conflicts on such resources, spotted the light on theoretical and empirical gaps that we contributed to fill through an in-depth analysis of the case of transboundary water resources (TWRs) in this research. TWRs perfectly fit this academic debate, since the issues of cooperation and conflicts on TWRs reflect the broader ones of TNRs. Indeed, the debate on TWRs is also caught between a conflict-oriented theoretical discourse and a cooperation-oriented empirical reality, which is basically the research puzzle of this study.

Indeed, riparian states tend to institutionalize cooperation on those resources through the creation, development and consolidation of international – or interstate – regimes; while the general discourse on TWRs points at the high probability of water conflicts – and even water wars – in the next decades. On the basis of this puzzle, the main

research question of this research was: “Why do states rather cooperate over transboundary water resources?” and sub-questions: “when they do, what are the factors that hamper or improve cooperation?” In other words, “why is cooperation more institutionalized in some cases than others? What factors can explain it?”; “What pushes them to institutionalize interstate cooperation, hence to create, maintain and often consolidate international regimes on the matter?” Those are the central question(s) and sub-questions of this investigation on cooperation and conflicts over TWRs.

We proposed three major innovations in this research in order to contribute to the academic discussion on those issues. Firstly, we focused exclusively on multilateral – shared by at least three states – in order to fill this gap and enhance the general knowledge on those cases, which are usually analyzed separately (as specific case studies) or by comparing two or a few cases. The second originality of the research is based on its main hypothesis: that the existence of power asymmetric relations between riparian states catalyzes the institutionalization of cooperation on the resource they share. The innovation does not lie in the study of power relations per se, but rather on the definition, conceptualization and, in particular the operationalization of power (and power asymmetry and hegemony) as a multi-dimensional concept mixing different strands of the literature together, from realism to radical and critical perspectives of international relations. Last but not least, another major originality of this research is the use of a mixed-method research design, involving both deductive and inductive analytical approaches in order to grasp as best as possible the ins and outs of the reasons why states cooperate rather than fight over TWRs. This type of method certainly lacks in studies on similar subjects of research. Below, we recall the whole methodological process, step-by-step (i.e. chapter by chapter), before focusing on a summary of the key results of the research.

The first step of this mixed-method research design, available in chapter 2, consisted in an in-depth analysis of the literature on cooperation and conflicts over TNRs and TWRs in order to introduce both the literature review and the theoretical framework of the research. In the review of the literature, we were able to identify factors that could explain why states cooperate – rather than fight – on TWRs, organized in three

different categories: liberal peace arguments; power asymmetry; and power asymmetry arguments. The major innovation that we bring to the academic debate at this point of the research is a holistic definition of power (and power asymmetry) as a multi-dimensional and complex concept, by mixing different approaches, with a strong influence of radical authors such as contributors to the hydro-hegemony framework, which has been a tremendous source of inspiration for all what relates to power, power asymmetry and hegemony.

The following chapter 3 introduced what we labeled here the "literature-based quantitative analysis", which tested the theoretical framework introduced in chapter 2 in a quantitative analysis of all multilateral rivers and lakes' basins on Earth. We thus proceeded to the operationalization of all variables identified in the literature through the methodical choice of indicators for each of them. The data obtained after the operationalization of all variables permitted to proceed to two different regressions, in order to answer the main research question from two different – but complementary – angles: a binary logistic regression (including the 80 multilateral TWRs under study), so as to answer why states do cooperate – or not – on TWRs; and a multiple linear regression (including only the 56 cases where cooperation exists and is institutionalized), so as to answer why states cooperate more – or less – on TWRs. We thus tested the literature following a deductive analytical approach in order to achieve the intermediary results of this research. The latter are "intermediary" since they come halfway in the research, and in the methodological process.

Indeed, those results provided us with an overview of the lacks and weaknesses of the theory with regards to conflict and cooperation on TWRs. Hence, the next step of the methodological process consists of the qualitative analysis of a "deviant" – i.e. not explained by the model – case study. We showed the method used to select the Okavango River Basin at the end of chapter 3 (the ORB was the only case that was considered as "deviant" both in the binary logistic and the multiple linear regressions). Chapter 4 consisted of a qualitative analysis of the ORB, which embraced both inductive and deductive approaches. The inductive part aimed at exploring this case in order to both: improve the initial model by attempting to identify new explanations (or variables) to our research question via an in-depth qualitative analysis of the ins and outs of cooperation and conflict over this specific transboundary resource; and contribute to improving the general knowledge of the interstate politics of the Okavango River Basin and the region, with a particular focus

on power relations. In order to complete this task, we used qualitative data collected both through an extensive review of the academic literature (and other secondary resources) on the ORB; complemented by nearly thirty semi-structured interviews with involved (or formerly involved) actors of transboundary cooperation on the basin. We proceeded to a fully inductive analytical approach in the two first part of this chapter. In a nutshell, the first aimed at introducing the case, and understanding why riparian states started cooperating on the ORB in 1994; whereas the second focused on the period post-1994, so as to identify factors that could explain why states cooperate more – or less – on TWRs. This division of the analysis in two sections was made on purpose in order to recall the two regressions introduced in chapter 3; which are two different and complementary ways to answer the main research question (and its sub-questions). We identified numerous explanations, especially five factors that would be tested further in the next – and last – step of the research, as well as complementary information that modified our operationalization of the dependent variable of the research. Some of those explanations are very specific to the deviant case, while others have the potential to be tested in a large-N quantitative analysis in the form of variables, in order to test if they could be applicable to other cases by adding them the initial quantitative model. The inductive character of those two sections was justified by the fact that we aimed at building theory on the basis of this case, whereas the last part of the chapter was purely deductive. In the latter, we examined our results and field experience thanks to the analytical tools proposed by the "Hydro-Hegemony Framework Theory", in order to grasp best the power relations at stake in this specific case. The objective was to understand the profound power relations – especially less studied, and less visible, forms of power in this type of context, such as the power of ideas – so as to test further, in a qualitative manner this time, our main hypothesis which argued that power asymmetry influences the development of international regimes on transboundary water resources. We saw how much Botswana's influence on the basin has hindered interstate cooperation to fulfill the latter's interest: maintaining the status quo.

Last but not least, in the final step of the research (chapter 5) we improved the initial model introduced in chapter 3 (the literature-based quantitative analysis). In chapter 4, we identified facts, events and factors that could explain why the riparian states cooperate on this particular transboundary resource, and why cooperation is sometimes hindered or enhanced. On the basis of those results, we added five new

variables to the initial model (categorized as "empirical arguments"), and we modified the operationalization of the dependent variable. We then proceeded to the same method used in chapter 3: we described how we define and operationalize those new variables; added them to the initial model; and completed both a binary logistic and a multiple linear regression, following the same rationale. We labeled this final analysis the "literature- and case study- based quantitative analysis", the last step of the mixed-method research design. We saw that: some results induced in chapter 3 were confirmed; others were denied; new results of interests came out of those last regressions; and, most importantly, the quality of the model improved between chapters 3 and 5.

To summarize, we started this research with a qualitative analysis of the literature in order to pursue a "literature-based quantitative analysis" through the operationalization of the qualitative information gathered into quantitative data that we process in two complementary regressions. The latter provided us with initial results, which we aimed at improving through the systematic study of the deviant case. The information gathered – or the data collected – in this qualitative analysis helped us improving our initial model, but also provided other results of interests, particularly for the political scientists interested in the interstate dynamics of the Okavango River Basin. Finally, we tested the improved model through the completion of the last sequence of our methodological approach: the "literature- and case study analysis- quantitative analysis".

We now introduce a summary of the main results of this research. We first recall the results for each final regression, which answer the main research question and sub-questions, before discussing their consequences on further research.

The following table (also available in chapter 5) summarizes the results of the binary logistic regression, which answers to the question: "why do states rather cooperate on TWRs?" The table [71] summarizes the variables under study, their respective hypotheses and the confirmation or denial of the latter by the final analytical model.

[71] In bold: the variables which are statistically significant in the model.

Table 6.1: Summary of expectations and findings – Binary logistic regression (80 cases)

Variable	Expected impact on the odds of cooperation on TWRs to be institutionalized (Hypothesis)	Expectation (hypothesis) supported?
Empirical arguments		
Independence of (a) riparian state(s)	Positive when more occurrences	No
Occurrence of violent conflicts	Positive when more occurrences	No
Disparity in the level of development of riparian states	Positive when smaller	No
Liberal Peace Arguments		
History of diplomatic relations	Positive when more relations	No
Economic Interdependence	Positive when more interdependence	No
Riparians' states level of governance	Positive when higher	No
Power Asymmetry and Power Asymmetry arguments		
Power Asymmetry	**Positive when higher**	**No, opposite**
Geographical configuration of the basin	**Positive when downstream**	**YES**
Water Scarcity (most powerful riparian)	Positive when more scarcity	No
Water Stress (most powerful riparian)	**Positive when more stress**	**No, opposite**
Water Dependence (most powerful riparian)	**Positive when more dependence**	**No, opposite**
Level of governance (most powerful riparian)	**Positive when higher**	**YES**

This table shows that both "empirical arguments" and "liberal peace arguments" have no influence in explaining why states start cooperating (and institutionalize their cooperation) on TWRs. Rather, five out of the six power asymmetry and power asymmetry arguments are statistically significant so as to explain this inference. Among them, two variables saw their respective hypotheses confirmed by the model (the *geographical configuration of the basin*, implying that if the most powerful state is located downstream, midstream, or both down- and upstream, then the odds for the basin to be institutionalized are higher; and the *level of governance of the most*

powerful riparian, implying the same inference that if the latter's level of governance is higher, at best if it is a democracy). The three others are statistically significant, but in the opposite way as we expected. Hence, the result on *power asymmetry* suggests that the lower the level of power asymmetry on a basin; the higher the odds for cooperation on the latter to be institutionalized. The two power asymmetry arguments *water stress (most powerful riparian)* and *water dependence (most powerful riparian)* follow the same inference: if the most powerful riparian does not suffer (or only a little) from either *water stress* (scarcity induced by human consumption) or *water dependence* (dependence on waters external to the borders of the country), the odds for cooperation on the latter to be institutionalized are higher.

In sum, one might expect a basin characterized by the following features be institutionalized: the presence of a "hegemon" (or most powerful state), which power asymmetry over the basin is low (or moderate); with a high level of governance (a stable democracy, at best); located downstream (or both downstream and upstream at the same time); and which does not – or only very moderately – suffer from water stress and/or water dependence.

Next, the following table (also available in chapter 5) summarizes the results of the multiple linear regression, which answers the sub-questions: "when riparian states do cooperate, what are the factors that hamper or improve cooperation?" In other words, "why is cooperation more institutionalized in some cases than others? What factors can explain it?" The table summarizes the variables under study, their respective hypotheses and the confirmation or denial of the latter by the final analytical model.

Table 6.2: Summary of expectations and findings – Multiple linear regression (56 cases)

Variable	Expected impact on the institutionalization of cooperation on TWRs (Hypothesis)	Expectation (hypothesis) supported?
Liberal Peace Arguments		
History of diplomatic relations	Positive when more relations	No
History of water cooperation	Positive when longer period	No
Economic Interdependence	Positive when more interdependence	**YES**
Riparians' states level of governance	Positive when higher	No
Power Asymmetry and power-asymmetry arguments		
Power Asymmetry	Positive when more relations	No
Geographical configuration of the basin	Positive when downstream	No
Water Scarcity (most powerful riparian)	Positive when more scarcity	No
Water Stress (most powerful riparian)	Positive when more stress	No
Water Dependence (most powerful riparian)	Positive when more dependence	No
Level of governance (most powerful riparian)	Positive when higher	No
Empirical arguments		
Independence of (a) riparian state(s)	Positive when more occurrences	No
Occurrence of violent conflicts	Positive when more occurrences	No
Disparity in the level of development of riparian states	Positive when smaller	**NO, opposite**
Language(s) diversity	Positive when smaller	No
Legal Disparity	Positive when smaller	No

Interestingly, the results of the multiple linear regression are very different. This time, none of the *power asymmetry arguments* and *power asymmetry* do have an influence on the degree of institutionalization of interstate cooperation. However, one liberal peace argument (*Economic Interdependence*) and one empirical argument (*Disparity in the level of development of riparian states*, even though the result is opposite to the hypothesis) have a role to play. Indeed, those results suggest that both: a high level of *trade interdependence* between riparian states on a basin is a sufficient condition for it

to be highly institutionalized; and a high *disparity in the level of development of riparian states* is another sufficient condition for the same outcome. In other words, one might expect that a TWR characterized by the following features be more institutionalized than others: a high level of *trade interdependence* between riparian states and *high disparity in the level of development among them.*

Those final results open the debate for further research on the links between water cooperation, economic interdependence and the level of development of riparian states. Indeed, the relation between *economic interdependence*, the *disparity in the level of development of riparian states*, and *the relative degree of institutionalization of cooperative regimes on TWRs* raises questions on the potential causal inferences between those variables, notably on the typically liberal argument stating that water is a catalyst for peace: is cooperation on water a catalyst of interstate peace through economic interdependence? If yes, why is there strong disparity in the level of development of riparian states that such cooperation occurs? Is water a political link between less developed and more developed states to cooperate further on other (e.g. economic?) issues? Or is economic interdependence a prerequisite to the consolidation of international regimes on TWRs? Those questions, raised by the final results of this research, should be further analyzed in researches on similar issues.

Those were the main quantitative results achieved at the end of the methodological process of this research. But, in the qualitative analysis of chapter 4, we also identified key results of interest for political scientists, hydropolitical researchers and experts of this specific case study that are summarized below, following the research questions (adapted to this specific case):

Why did the Okavango River Basin's riparian states rather cooperate? What factors pushed them to do so at the beginning? Why did they institutionalize this cooperation by creating the OKACOM regime?

We saw in the first section that Namibia, Botswana and Angola started cooperating as a consequence of a combination of climatic, geopolitical, economic and political events, at this particular point in time (end 1980s – beginning 1990s), including: *The existence of former* (bilateral) *agreements* and *the creation of bilateral institutions*; the *independence of Namibia* and *its rushing attitude to achieve its hydraulic mission* as well as *Botswana's reaction* to the latter; *the non-inclusion of one of the four riparians (Zimbabwe)*; as well as *the existence of acute water scarcity in the region* at

that time, reinforced by a *prolonged drought*. All those factors led the three states to create the OKACOM regime through the signing of the "1994 agreement between the governments of the Republic of Angola, the Republic of Botswana, and the Republic of Namibia on the Establishment of a Permanent Okavango River Basin Water Commission".

When they do cooperate, like on the ORB, what are the factors that hinder or improve cooperation? Why is cooperation more institutionalized in some cases than others?
We also showed that since the 1994 agreement (until 2007), the institutionalization of cooperation between the three states was hindered by numerous factors of different nature (socioeconomic and sociopolitical; sociocultural and interpersonal; environmental; and operational). Socioeconomic and sociopolitical factors include: the *Angolan civil war*, which basically impinged Angola to be an active state at the OKACOM; the *disparity in the level of development of the riparians*, which implies that states have different levels of technical, human, economic and political capacities; hence diverse and often *conflicting interests*. Also, the *lack of motivation shown by central governments* for the project let riparians' representatives *without clear guidance from higher-levels of decision-making*. This lack of political backup certainly complicated interstate communication and coordination, hence hindering the development of OKACOM. Sociocultural and interpersonal factors affected the daily work at OKACOM. Riparian states' representatives could not easily understand each other because of *language* and *legal disparities'* issues, which gave rise to numerous misunderstanding and time loss. Also, the *difference in institutional culture* – or in "the way to do business" led to *trust issues* between the protagonists. It took some time to improve communication and interpersonal issues at the OKACOM level, notably via the appointment of interpreters during meetings, for instance. The environmental characteristics of the ORB are unique, and this situation created tensions between the riparians. The *presence of the Okavango delta* polarized debates between Botswana, downstream, wanting to protect the latter at all costs because of the amazing resources that it embeds, and the upstream riparians who had other projects for the river, such as food security. The ORB does not lack of other *environmental constraints*, such as the presence of a unique and fragile biodiversity in the basin, and especially the delta. Last but not least, purely operational factors hindered the further development of interstate cooperation: the *lack of data* (hence the

impossibility to pursue projects without enough data on how the basin works); and the *lack of financial resources* for the daily operations of the OKACOM. The last factor is the *presence of a secretariat* to coordinate the administrative duties of the OKACOM. In the case of the ORB, the OKASEC (the OKACOM secretariat) was created in the mid-2000s and since then, interstate cooperation has substantially improved.

Did power relations between riparian states play any role in the creation and development of the OKACOM? If yes, how? What are the underlying processes and mechanisms through which actors influence its institutionalization?

Last but not least, thanks to the reading of the ORB through the lens of the hydro-hegemony framework theory, we were able to identify the most influent state of the basin (Botswana) and *the resources* (*strategies, tactics and other coercive resources*) used by the latter to ensure that the river is not touched by upstream riparians. Hence, *those processes and mechanisms*, used by Botswana in that particular case had the opposite effect of what we expected in the first place, i.e. to *slow the institutionalization of cooperation, and even to stall it completely*, in other words "maintain the status quo", which was the objective of the most powerful of the three states (at least until 2007): *Botswana*. In order to do so, Botswana completed what we referred to – with the help of the hydro-hegemony framework theory – as a "containment strategy", in order to control the demands of its co-riparians, especially on extracting water from the river. This strategy was supported by several tactics, such as *active stalling* (gaining time in negotiations); *the signing of treaties/agreements* (so as to show some involvement and not appear as a stumbling block to further cooperation), *securitization* (declare the Okavango delta a national identity, hence a national security issue), *knowledge construction* (creating and relaying information on the consequences on the delta of any extraction from the river upstream; and on the borders of the basin), and *sanctioned discourse* (endorsing the securitization discourse and knowledge construction as the ultimate truth, at all levels). Most of those (efficient) tactics lie in the power of ideas. Other coercive resources and the international context supported those tactics, such as: *international support*, mostly from the lobby of international conservation; *financial mobilization* (the capacity to obtain international funds for the conservation of the delta and all what it contains); *playing with the lack of teeth of International Water Law* (arguing

for the "no harm" principle, against the focus of upstream riparian states on the principle of "equitable and reasonable use"); and *the exclusion of a riparian* (Zimbabwe, excluded via its non-inclusion in the 1994 agreement). In sum, Botswana's strategic and careful use of those power-related mechanisms achieved to hinder the institutionalization of cooperation on the basin in order to fulfill its interests in maintaining the status quo in its favor.

Despite this situation, since 2007 and the establishment of the permanent secretariat of the OKACOM, interstate cooperation improved tremendously. But there are still some issues, such as financial ones. The main priority indeed lies in ensuring the financial health of the organization. Also, it should eventually be "tested" at some point. Indeed, nothing happened on the river yet. The implementation of the Strategic Action Plan of 2011 should be the next step toward this objective. One of the main ideas of the Strategic Action Plan is the completion of benefit-sharing mechanisms that would re-equilibrate the benefits between the three riparian states. Botswana indeed will have to, at some point in time, share the benefits of its gains in the delta with Namibia and Angola, so that their loss of not using the river can be compensated somehow. There are many ideas on the table to achieve such outcomes. Finally, the ORB has proven to be a stimulating case, from which there is still a lot to learn. An important fact is that the three states were lucky enough to start cooperating while the river was still very pristine, which is a very rare opportunity that needs to be further investigated. We also sense that there is still some information to dig on the absence of Zimbabwe in the whole cooperation process. Besides, the ORB is a very interesting case in terms of the interstate power relations, and there is certainly a lot to be studied on the matter, as developed below. Yet, Angola, Namibia and Botswana have the future of the river in their hands.

We also briefly conclude on the results concerning the main hypothesis of the research on power asymmetry. We saw in the quantitative analysis that power asymmetry and power asymmetry arguments do have a role to play in the *creation* of international regimes on TWRs (binary logistic regression), but not on its maintenance and consolidation (multiple linear regression). Even though our main hypothesis on power asymmetry was proven wrong – the results of the binary logistic regression show that less (instead of more, in our hypothesis) power asymmetry

increases the odds of a basin to be institutionalized – the presence of power asymmetry arguments as explanatory factors for the development of international regimes shows the pertinence of operationalizing such variables usually evoked in the literature in the qualitative study of specific cases, rather than quantitative analyses. Indeed, the qualitative analysis of the ORB confirmed the results of quantitative analysis: power played a role in the definition of the rules, norms and practices of the OKACOM. The ORB case proved that: the absence of obvious power asymmetry between riparian states does not mean that one cannot use of power-related mechanisms to achieve its interests; even a state that is not extremely powerful (a hegemon) can have access to a variety of strategies and tactics usually employed by 'hydro-hegemons'; and despite a relatively symmetric relation, the "most powerful" state of the basin achieved to slow and even block the institutionalization process of cooperation on the OKACOM.

Those results on power and power asymmetry open the door to further research on their role in the development of international regimes, not only on TWRs, or TNRs, but in general. They also show the usefulness of the hydro-hegemony framework theory in analyzing the influence of power asymmetry on the institutionalization TWRs. In particular, there is room for improvement in the theorization of the power asymmetry arguments, i.e. on a specific analysis of *how* those variables influence the creation of cooperative regimes on TWRs. Also, despite the argument that the hydro-hegemony framework is adapted to the analysis of case studies where power asymmetry is very high – or hegemonic – this study has shown that even in situations where power asymmetry is quite low, the framework can be extremely useful, especially in order to focus on "less visible" forms of power. We saw in chapter 3, and confirmed in chapter 5, that power asymmetry and power asymmetry arguments were central in the creation of interstate regimes on TWRs. Chapter 4 showed how those arguments could be manipulated to explain interstate cooperation (here, to explain why interstate cooperation has mostly been paralyzed for the last decades). So, having tested this framework on a basin, which did not have the main prerequisite (strong interstate power asymmetry), we can argue that the latter can be used in many other power configurations, even the ones where asymmetry is very low, which opens the door to the development of this framework to a larger panel of basins, but also to its adaptation to other types of resources.

Last but not least, the methods used in this research have proven extremely accurate to achieve our research objectives, for several reasons. To start with, the improvements witnessed in the quality of the analytical model between chapters 3 and 5 certainly justify having recourse to a complementary qualitative approach as a complement of quantitative ones. Also, the confirmation of several results of chapter 3 (the literature-based quantitative analysis) in chapter 5 (based on both the literature and the case study) proved that the literature is pertinent for what relates to the debates on cooperation over TWR, despite a few lacks that we identified and with which we completed the literature-based model with new variables. Then, one of the objectives of proceeding to a field research in chapter 4 was to improve this initial model by including other factors (or variables) grasped by an extensive analysis of interviews and complementary documents related to this specific case. Hence, one of the variables spotted during the field research has proven statistically significant in the refinement of the model (the *disparity in the level of development of riparian states*; even though the hypothesis relative to this variable was inverted compared to our expectations). So, in addition to improving the quality of the model, we also improved the results of the latter thanks to the qualitative analysis of the ORB. Finally, mixing different strands of the literature (notably realist, critical and radical views of international relations) in the elaboration of the theoretical framework permitted to achieve original results, such as the ones relative to power asymmetry and power asymmetry arguments. In the end, the mixed-method research design used in this research offered another perspective to the debate on cooperation over TWRs. We recommend researchers who study common goods such as TWRs and TNRs to proceed to similar research designs – including both qualitative and quantitative inquiries; qualitative and quantitative data collection and analyses; and deductive and inductive analytical approaches – in order to further contribute to the general knowledge on those issues.

In the end, this research does not argue in favor of the catastrophist point of view relayed by the mass medias, policy makers and some scientists; neither does it promote starry-eyed optimism about the future of those resources.

Yes, population growth, combined with water scarcity and poverty, will obviously put more pressure on resources. But this study has shown that even on a basin characterized by recent conflictive interstate relations, water scarcity and rampant

poverty, riparians chose to create an institution to manage the resource collectively and cooperatively, rather than fight over water. In general too, there are more occurrences of peaceful than conflictive events on multilateral TWRs. Plus, cooperation is often institutionalized into well-established regimes embracing more or less strong principles, norms, and rules that dictate riparian states behavior towards shared resources.

Yes, empirical data tends to support the Cornucopian perspective. But, the occurrence of cooperation does not imply the absence of conflicts, as illustrated by the in-depth analysis of the Okavango River Basin case. Chapter 4 has shown that conflict and cooperation over transboundary water resources are intertwined. Since Namibia pushed Botswana and Angola to institutionalize interstate cooperation at the basin level in 1994, Botswana spent most of its energy to maintain the status quo on the river because of the presence of the unique and invaluable delta in its territory.

So, the ORB case perfectly illustrates why our standpoint on those issues lies in the grey area, in-between black or white predictions, along with other critical contributions to the debate. With all due regard to the contributions of neo-Malthusian and Cornucopian perspectives of the debate, we argue, on the basis of this research, that there is no deterministic answer to assess the future of TWRs (and, in general, transboundary natural resources).

This research however suggests that one of the key concept explaining why states cooperate, or not, and why cooperation can be hindered or enhanced, is power; but not as traditionally conceptualized in most of the literature, i.e. based on realist assumptions of power as material (economic and military) resources exclusively. Power shall be rather apprehended rather multidimensional: as a web of intertwined material, ideational, relational and structural resources. The dynamics of power relations as defined in this study have shown to influence the creation of transboundary water resources cooperative regimes (mostly through the effect of what we referred to as "power asymmetry arguments" in this study). They have also proven pertinent in explaining their development, especially "less visible forms of power", such as in the case of the Okavango River Basin. Hence, we suggest that further research should investigate both conflict and cooperation at the same time through the lens of a multi-dimensional conceptualization of power relations as a central explanatory factor to the occurrence of cooperation, conflicts and, most importantly, underlying conflicts at the heart of cooperative schemes. In particular, one should

look closer at the mechanisms that could explain *how* the "power asymmetry arguments" defined in this research affect the development of international regimes on TWRs. The research also suggests that there is a link between interstate cooperation over water, economic interdependence and the level of development of riparian states so as to explain the degree of institutionalization of existing cooperation over TWRs. Neo-liberal institutionalist perspectives should be a pertinent starting point since the theoretical links between economic interdependence, water cooperation and peace, are traditional liberal arguments.

We sense that a profound analysis of those links, together with power relations as defined in this research, should provide relevant insights towards a better understanding of the reasons why states rather cooperate than enter into conflicts over transboundary natural resources and international common goods in general. Such complementary contribution to this research and to other critical studies could provide additional arguments in favor of a more nuanced discourse than the dominant, catastrophist one relayed in public medias and policy makers.

Meanwhile, we shall follow Mark Twain's advice, and finally drink that whisky, after all.