"Governance Mechanisms to Address Conflict in Environmental Agreements: the Case of Transboundary Water Treaties"

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Working Document – Paper prepared for the Berlin Conference on Human Dimensions of Global Environmental Change 2010[1]

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1. Introduction

With the majority of the world's countries depending upon water originating outside of their national borders (Wolf et al., 1999) withdrawals from one country can drain life-giving water from a neighbouring country and as such become an apparent source of interstate conflict (Homer-Dixon, 1999; Toset et al., 2000). Since transboundary watersheds traverse political, legal and administrative boundaries, heterogeneous and sometimes conflicting national laws and regulations turn its governance into a challenge for policymakers, which is further aggravated by the fact that no state or supranational agency has authority over the other (Cooley et al., 2009).

In addition, water qualifies as a common-pool resource[2] that is partially excludable and rival, meaning that the consumption of one unit by one inevitably excludes simultaneous consumption of that unit by others (Hardin, 1968:19; Ostrom, 1990:30). This poses some unique collective action problems (Taylor, 1987:3), including issues related to congestion, overuse and depletion of the resource. Yet, while intensified and diversified demand will increase rivalry over shared waters (Yoffe et al., 1993; UNDP, 2006; Bernauer and Kalbhenn, 2010), growing pressure on the supply-side[3] is

[2] The term "common-pool resource" refers to a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use (Ostrom, 1990:30).

[3] Pressure is expected to intensify due to the fact that diverse demands (domestic, agricultural, industrial, recreational) must be met from constantly fluctuating resources, while unsustainable water management practices (Bernauer and Kalbhenn, 2010) changing environmental conditions (Eea, 2007; IPCC, 2007; IWMI, 2006; UNDP, 2006; TEC, 2007; World Bank, 2009) and new water uses and allocation patterns continuously challenge the existing water supply.

most likely to boost policymakers' incentives to formulate shared rules and agreements for such managing transboundary resources (Benvenisti, 2002:42).

Currently international agreements are the strongest existing tools available for individual states to manage common waters. The FAO index of water agreements indicates that countries in the past already resorted to treaties in an attempt to address uncertainty about the value and utilization of shared resources (Ohlsson, 1995; Vinogradov et al., 2003; Bernauer, 2002; Espey and Towfique, 2004; Bernauer & Kalbhenn, 2010). The agreements listed there may be either watercourse specific (e.g. the 1961 Columbia River Treaty) or an umbrella agreement regulating regional waters (e.g. 1992 Helsinki Convention on Transboundary Watercourses) (Vinogradov et al., 2003). But at the same new disputes are arising and new forms and arrangements for these agreements are becoming a necessity (Cooley et al., 2009). Transboundary agreements may form the basis for an initial watercourse regime, but conditions and priorities within a basin can change over time, creating a state of continuous uncertainty (UNEP, 2002). If treaties are inept to address these uncertainties and lack flexibility to accommodate changing preferences and incentives, issues of treaty implementation may become important obstacles to cooperation and might even force countries to deviate from an agreement after it is in place (Bhaduri, 2006), eventually stimulating the risk to conflict (IPCC, 2001; Bernauer & Kalbhenn, 2010).

It has been long recognized that mechanisms for conflict resolution are growingly important elements to water agreements because of their ability to address future uncertainty, enhance flexibility, enforce treaty commitments and mitigate potential disputes as resource availability changes (Smith, 2000; Fischhendler, 2004; Wolf, 2007). As early as 1931, Herbert Arthur Smith already identified the main problem presented by the development and exploitation of international water resources to be the establishment of authorities able to settle disputes (Smith, 1931:120)[4]. Yet, there is no general rule of law which can be applied to all disputes that may arise under an agreement (Smith, 1931:87) and although useful as a background for a number of transboundary water treaties, broad international guidelines such as the Helsinki and

[4] At that time, the interstate disputes that reached legal or negotiated settlements reflected mainly economic interests[4] while currently they concern issues of human subsistence and the provision of basic human needs and rights (Benvenisti, 2002: 179).

the Berlin rules tend to provide little specific guidance in case of dispute arousal and often lack enforceable principles to resolve conflicts between riparian states (Frederiksen, 1992; Benvenisti, 1996; Wolf, 1997; Bernauer, 2002; Brochmann & Gleditsch, 2006). Despite repeated demands for the development of more detailed conflict resolution procedures[5], little progress has been made so far (Cooley et al., 2009) and CRM in transboundary water agreements is either absent or unsophisticated (Goldenman, 1990; Fischhendler, 2004; Boockmann & Thurner 2006; Cooley et al., 2009). In their study of 1998 Hamner and Wolf found that 22 % of all scrutinised treaties[6] lacked any provision for conflict resolution, while 32 % of the treaties are either incomplete or uncertain as to the creation of dispute resolution mechanisms.

This gap between the demand for available CRM and their actual appearance in agreements brings us to the assumption that CRM-adoption comes at a significant cost. The more, since different mechanisms appear to be adopted in different circumstances we assume that costs may vary depending on external conditions. It is the transaction cost (TC) paradigm that is particularly functional as a framework for analysing what affects decision-making in the case of CRM, hence for examining how parties decide on the choice for a particular mechanism. This approach assumes that parties weigh the benefits and costs of entering an agreement and would therefore search for the appropriate structure and arrangements, which minimize the cost of their participation in the treaty (Boadu, 1998). The field of international relations has barely scratched the surface in testing the implications of the transaction costs approach to international cooperation and there are numerous environmental agreements of which the institutional characteristics have gone unstudied under this approach (Gilligan, 2003). In the context of international treaties transaction costs are composed of political costs and monitoring and enforcement costs, which will be discussed more in detail in the section 5 of this paper. In both cases parties will seek to adopt a CRM (or series of CRM) that addresses these two types of costs, while trying to maximize the benefits of the CRM adopted. Hence, the underlying assumption of our study is that conflict resolution mechanisms differ in both costs and effectiveness to address such costs. Throughout our study we examine what can bring

[5] Smith, 1931; Caldwell, 1984; Hayton & Utton, 1989; UNEP, 2002

[6] Hamner and Wolf examined the treaties present in the Transboundary Freshwater Database (TFDD), Oregon State University.

about these costs in reality. Based on a broad conceptual framework and a reading of the literature we therefore develop a series of hypotheses about how the TC-pattern is expected to influence the adoption of CRM. Data obtained from a large number of transboundary water treaties will eventually allow us to carry out a multivariate analysis and verify these expectancies.

Notwithstanding the fact that water is our case study, it is important to stress that the same regulatory problems apply to other transboundary and common-pool resources, such as forests, fisheries or clean air. Eventually policy-making issues are alike for all environmental resources "to which no single decision-making unit holds exclusive title" (Wijkman, 1982:512), which means they are the property of no one and accessible to everyone[7]. However, at the same time these resources are privately appropriable and subtractable (Ostrom, 1990:30), a characteristic that makes them especially vulnerable for human overuse or depletion (Benvenisti, 2002)[8]. Currently, a number of regimes and international agreements are in place to protect and govern the use of these resources while aiming to regulate conflicting demands of sovereign states (Young, 1989; Barrett, 2003). Yet, while such agreements are literally covering every transnational and environmental issue of our time, their norms and principles do not exist in a vacuum (Vogler, 1995). Every treaty is unique in the sense that it constitutes a specific remedy to a specific transborder externality, but all are designed and implemented under conditions of uncertainty and all share certain common features, of which conflict resolution is an essential one (Barrett, 2003). Through our understanding of what affects the use of conflict resolution in transboundary water agreements we therefore aim to draw valuable lessons regarding the challenges policy makers face in other fields of environmental policy as well.

The following sections will illustrate the methodology and conceptual framework of this study more in detail. Section 2 lines out the methodology of our research while section 3 offers a complete overview of the different CRM available. It mainly allows

[7] Therefore also often referred to as open-access resources (Ostrom, 1990:30)
[8] This is generally referred to the tragedy of the commons (Hardin, 1982)

us to distinguish four main categories for conflict resolution including negotiation, mediation, arbitration and adjudication. It also discusses their main characteristics and benefits. Section 4 captures the dependent variables in the form of CRM properties and variance. As with section 3, this part also concludes with a summarising table (table 1 and 2). The independent variables list a host of attributes, which are either related to the resource, the riparian or the treaty itself. They are further discussed from a transaction costs approach and presented as the indicators that influence the TC (section 5). The different costs include political costs and monitoring and enforcement costs while the indicators consist of a series of economic, political and physical variables. At the end of this section a conceptual model (figure 1) summarises the different cost types, the proxies to assess them and their expected influence on CRM-adoption. For a more detailed overview of the indicators used and how to measure them, we refer to the codebook in annex (1). Finally, section 7 and 8 will present and discuss the results of our multivariate regression, which will be based on all data obtained.

2. Methodology

To ascertain if and how transboundary water treaties address the risk to conflict, a **content analysis** of the available transboundary water treaties was undertaken. The unit of analysis is the treaty[9] for which the most comprehensive source is the recently expanded Transboundary Freshwater Dispute Database (TFDD), listing a total of 679 agreements. Treaty content will be read and analyzed, first for reference to conflict resolution, second for the type of mechanism used. We will also look at an additional number of dependent variables relating to the appearance of CRM in water treaties. In a first stage of our research we conducted a **pilot study**, based on the data of 100 randomly selected treaties, exclusively primary agreements of which substantial text is available and which are written or translated into English or French[10]. In order to group treaty texts according to lineage, primary agreements also include substitutes of former (primary) agreements, exchange of notes, conventions and protocols to agreements. The first agreement in the sample dates from 1857 while the last was

[9] Defined in accordance with the Vienna Convention of the Law of Treaties of 1969 as *"an international agreement concluded between states in written form and governed by international law, whether embodied in a single instrument of in two or more related instruments and whatever its particular designation"* (Vienna Convention, 1969, Art.2).
[10] With two or three exceptions of treaties in Italian and Dutch

signed in 2004. In correspondence with an earlier distinction of Hamner and Wolf (1998:158) we included only treaties that governed transboundary waters (aquifers, rivers or lakes) and considered water as "a scarce or consumable resource, a quantity to be managed or an ecosystem to be improved or maintained" (Hamner and Wolf, 1998:158). Hence, we left out treaties dealing navigation and fishery issues as well as broad conventions, such as the UN Convention on the Law of Non-navigational Uses of International Watercourses, which line out principles for water governance but do not apply these principles to actual water bodies.

After some practical adjustments, a **second stage** will allow us to review the remaining and available treaties in the TFDD. To facilitate statistical comparison over time, we will select an equal number of treaties for each period for the second part of this research (I still don't know whether this is necessary). The first period will start from 1850 and the last will end with the lat treaty registered. A 20-year interval will be used to distinguish between the different periods. The updated version of the database provides us with 303 agreements that match our criteria. However, two factors are expected to slender the quantity of our results. First, for several, mostly earlier treaties no data is available for our explanatory variables (indicators). This limitation implies that we will not be able to include every single treaty in our results. Second, few of the formulated hypotheses assume dyadic relations, which unavoidably excludes multilateral agreements from some of the results[11]. The following section will further illustrate the **conceptual framework** of this study.

3. The available CRM types and their potential benefits

The literature usually identifies four main types of conflict resolution ranging from soft law to hard law mechanisms (Wolf, 1997; Foley, 2007; Emerson et al., 2003). They include negotiation, mediation, arbitration and adjudication. Each of these mechanisms is characterized by a different **nature** and a distinct **role of a third party.** "Nature" implies that conflict resolution can be either *"competitive"* and rights-based or *"cooperative"* and interest-based. While the first one is rather adversarial while inducing win-lose scenarios, the latter tends to facilitate communication while generating win-win outcomes (Deutsch, 1983; Schellenberg,

[11] More details can be found in the codebook, annex 1.

1996; Brown&Marriot, 1999; Liebman, 2000; Goldberg, 2003; Spangler, 2003). The **role of a third party** implies the intervention of mediators, joint commissions, arbitrators or judicial courts in the process. Along the line of Oran Young's study (1972), we distinguish between *"passive and informal"* third parties, with limited intervening power and *"active and formal"* third parties, with the authority to issue formal statements or impose solutions.

A first type of conflict resolution is **negotiation**, a process through which disputants voluntarily work out an agreement between themselves, while aiming to satisfy the interests of each of the factions involved (McCool, 1993; Schellenberg, 1996). Negotiation can be direct between parties *(consultation)* or representative through agents or experts *(joint commission)* [12] but it never assumes a third party (Merills, 1984; Stewart, 1989). Consultation is often an ad hoc procedure, but it can also be adopted as a conflict resolution tool in a watercourse agreement (Wouters et al., 2005). River basin organizations may also have conflict resolution mandates (De Stefano et al., 2010), yet, in case a commission takes up a negotiation role it usually does not dispose of any formal decision-making power, for in so having, it would be assuming an arbitral function (Probst, 1989).

The adoption of soft law mechanisms such as negotiation and mediation into agreements is less costly than integrating hard law rules and regulations, which require much more ex ante bargaining of details (Abbot and Snidal, 2000). Yet, while negotiation is often the preferred type of CRM when states try to resolve international conflict, including those over transboundary water resources (Wouters et al., 2005), in many cases the treaty does not specify in which form negotiation should occur. For example, the 1994 peace treaty between Israel and Jordan refers to negotiation in case a dispute would arise about the application or interpretation of the treaty terms, but fails to specify its operational form. Others, such as the 1989 agreement between the U.S and Canada concerning water supply and flood control in the Souris River Basin, specifically refer to consultation procedures.

The assumption of negotiation being a low-cost mechanism is mainly due to its limited sovereignty costs (Abbot and Snidal, 2000), yet, this type of CRM may not

[12] An example of this from of negotiation is provided by the 1959 agreement between the former USSR, Norway and Finland on the regulation of Lake Inari (by means of a hydro-electric power station and dam). This agreement refers any disputes that would arise between the different riparians to a mixed commission, composed of 6 members (2 representatives per state).

always be the most cost-effective way of resolving disputes. For example, one party may deny that a conflict exists, advance unreasonable claims or drag its feet, eventually inducing a high bargaining cost of the entire conflict resolution process (Wouters et al., 2005). In such cases third-party involvement may be a better solution. This was the case in a dispute between India and Pakistan over the implementation of the Baglihar Hydropower Project, for which construction began in 1999. Pakistan had objected several features of the project, stating that it violated the terms of the Indus Water Treaty (IWT), to which both countries are party. India refused the objections. The Permanent Indus Commission, set up under the IWT with the mandate to settle differences between the two riparians in the framework of the treaty, was not able to resolve the crisis, ultimately forcing Pakistan to invoke the treaty provision to approach the World Bank as a mediator[13]. In conclusion, if negotiations fail or if the parties are unable to enter into negotiations altogether, other means of conflict resolution are available, and all are based on third-party involvement (Wouters et al., 2005). The issue of importance here is the actual provision of such additional mechanisms by the treaty (if parties failed to incorporate alternative CRM in the treaty, they might be more easily forced to treaty violation or renegotiation).

The second mechanism we identify is **mediation**, which prescribes the intervention of an independent third party. Mediation is cooperative in the sense that disputants as well as third parties try to look for common grounds and compromising solutions together (Young, 1972; Stewart, 1998; Liebman, 2000). According to the authority disputants wish to delegate to a third party, we distinguish two operational forms of mediation; the practice of *good offices*, which is hardly interventionist and merely offers the disputants a temporary and alternative gateway for communication (Merills, 1984), and *conciliation*, which is semi-institutionalised and is a step towards more active third-party participation. The latter generally (but not always) assumes the assignment of long-term experts or commissions whose intervention is required every time a dispute arises (Probst, 1989, Wouters et al., 2005). The 1975 agreement between Iran and Iraq on the use of frontier watercourses provides for the good offices of a friendly third state in case of dispute while the Columbia River Treaty of 1961 refers them to an International Joint Commission for decision. Just as

[13] The provision to resort to a "Neutral Expert", Article IX,

negotiation, this is a soft law mechanism, which does not foresee in binding solutions, which carries a lower sovereignty cost than other hard law CRM and of which the operational form is often left unspecified[14]. Yet, while sovereignty costs might be low, monetary costs entailed by some forms of mediation can induce a rise of the TC: as many international disputes arise from disagreements on facts, conciliation procedures such as fact-finding missions and expert commissions are specifically designed to produce a rapid and impartial finding of disputed facts. These procedures can be costly in terms of money (full time assignment of experts or commission members) but it will frequently resolve a conflict before any binding processes are necessary (Wouters et al., 2005), thereby avoiding a sharp rise of the sovereignty costs.

Yet, also experienced diplomats and mediators know that even institutionalised best efforts to contain disagreement may eventually fail (Hayton & Utton, 1989), creating the need for more rigorous and formal conflict resolution procedures such as arbitration and adjudication. **Arbitration** is fundamentally competitive and rights-based since a third party directly determines the winner and loser in relation to the rights and wrongs of a dispute. A decision issued by an arbitrational tribunal can be binding if the parties agreed to this. The process contains some of the same elements as adjudication but while the latter takes place in an established court, arbitration is a more flexible procedure where the parties themselves to set up the machinery for handling a dispute or a series of disputes (Merills, 1984; Stewart, 1998, Goldberg et al., 2003). Many of the present day watercourse agreements provide for arbitration as a means of dispute settlement (Wouters et al., 2005), either as an optional mechanism, as a compulsory one (the 1929 Nile treaty or the 1988 Rhine Convention) or as an alternative in case other mechanisms fail (the 1994 Israeli-Jordanian peace treaty). Yet, traditionally, binding settlement procedures are to be resorted to after all other means of dispute resolution have failed (Wouters et al., 2005), mainly because it leaves the parties with little intervening authority in the resolution process while forcing a high sovereignty cost upon them. From the moment hard law mechanisms such as arbitration are in place, they might be useful to decrease ex-post costs, but their adoption is more costly than soft law CRM, especially in terms of (ex-ante)

[14] For example, the 1978 treaty of the River Gambia merely states that disputes between the riparians should be addressed by mediation, without specifying its from.

bargaining (Abbot and Snidal, 2000).

Finally, **adjudication** or litigation indicates a process where a dispute is settled in court, according to legal statutes and with advocates presenting evidence on behalf of the parties (Liebman, 2000). It differs from other means of conflict resolution in that neither the court nor its rules and procedures are under the discretion of the conflicting states (Wouters et al., 2005). It is a hard law mechanism, which is ultimately adversarial and rights-based and the decisions of courts are usually binding to the parties to the dispute (Stewart, 1998; Spangler, 2003; Chatterjee and Lefcovitch, 2008). States can agree by treaty to delegate decision-making power to *domestic courts*, or refer them upon consensus to the *International Court of Justice (ICJ)*, the more common practice in the field. While both types of court decisions can be binding, although in the case of the ICJ, no enforcement mechanisms exist to back up the court's decisions (Wolf, 1997). The fact that disputant parties have practically no say in the conflict resolution process imposes a serious infringement on sovereignty (Wouters et al., 2005). Therefore, states often only go to the ICJ when they can accept the ICJ's decision (Pae, 2006). But also the level of confidentiality diminishes considerably when parties are subdued to adjudication (Wouters et al., 2005). This is the reason why environmental treaties are rarely scrutinised by the court of justice or why some treaties only list it as the last possible option, when all other means of dispute resolution have failed. The 1978 treaty on the River Gambia is one of those, stating that only as a last resort states shall seek assistance of the International Court of Justice. Besides the high sovereignty costs, arbitration and adjudication are also regarded as more expensive and time-consuming than other methods of conflict resolution (Wouters et al., 2005). Yet, they might be the only viable solution when other means fail or when the alternative is a stalemate that will result in an unnecessary prolongation of tension. Table 1 presents the differentiation of mechanisms.

Table1. Four categories of conflict resolution mechanisms and their main characteristics

Conflict Resolution Mechanism	**Sub-Mechanism**	**Nature**	**Third Party**
Negotiation	Consultation	Cooperative	Absent
	Joint Commission of Representatives	Cooperative	Absent

	Unspecified	Cooperative	Absent
Mediation	Good Offices	Cooperative	Passive and informal
	Conciliation	Cooperative	Passive and informal
	Independent Commission	Cooperative	Passive and informal
	Unspecified	Cooperative	Passive and informal
Arbitration	Not permanent tribunal or board	Competitive	Active and formal
	Permanent arbitration	Competitive	Active and formal
Adjudication	Domestic Court	Competitive	Active and formal

4. Dependent Variables

Our main dependent variables throughout the research are **CRM-presence**, the type of CRM, its order of use, the number of CRM and the place of the CRM in the treaty, the conditions under which the CRM is supposed to be put to use, the activation procedure and the cost sharing method of the CRM and finally its issue area and whether or not the mechanism can be qualified as mature and institutionalised. In case the parties agreed to establish a commission, we also look at the voting pattern in place.

First we look if the treaty contains a **CRM and which type(s)** are listed as options to the parties. The available mechanisms for conflict resolution as described before in section 3 are also presented in table 2 below. When several options are available, the treaty sometimes prescribes an **order of use of CRM mechanisms.** In many cases, such as the 1978 treaty on the River Gambia, the treaty between Iraq and Iran of 1976 and Columbia River Treaty of 1961, the agreement lists an explicit preference for negotiation and mediation mechanisms (soft law) and refers only to hard law arbitration and adjudication in a second stage. Also the Treaty between Israel and Jordan of 1994 lists conciliation and arbitration as options, only when parties previously failed to address the dispute through negotiation. When the treaty does not command any specific order, parties can choose freely which of the listed CRM to use in case of dispute.

When parties agreed on the establishment of a commission (a joint commission of

representatives, in the case of negotiation, or an independent commission, in the case of mediation) we expect a variety of **voting patterns** to be in place, including *"consensus", "majority", "unilaterally (veto)"* or *"other/issue ignored"* when no mention of a voting system is made. The Boundary Waters Treaty, for example, states that decisions within the commission will be taken by majority.

Other dependent variables refer to the **number of CRM** per agreement (*"low"* or *"high"*) and the **place of the mechanism in the treaty** ("*the preamble*", "*the treaty body*", "*the annexes*" or "*more parts*"). Next, we distinguish four main **conditions of CRM use**. Parties can resort to a CRM in case a dispute arises from a "*breach*" of the agreement or the "*interpretation or application*" of the treaty terms. In other cases the treaty can prescribe CRM only by "*periodical review*" or whenever a sudden "*change in physical conditions*" should take place. When there is no mention of the conditions in which a CRM is supposed to be used, we refer to it as "*other*" or "*unspecified*". For example, the Columbia River Treaty leaves this matter unspecified.

A following variable relates to the **activation procedure** of the CRM, which means that parties can either decide "*unilaterally*", by "*consensus*", through "*voting*", or by "*majority vote*" when a CRM will be applied. Eventually the issue can also be *"ignored*" by the treaty. The agreement on cooperation and management of water resources in the Danube Basin (1987) stipulates that either one of the contracting parties can unilaterally decide to submit an issue to an arbitral tribunal while the Boundary Waters Treaty (1909) states can only refer disputes to the International Joint Commission by consent of the two parties. We also examine whether the treaty specifies the terms of **cost sharing**. Treaties can apply the "*polluter pays principle"*, prescribe the costs to be "*equally divided*" or covered by a "*third party*" or beneficiary ("*beneficiary pays*"). As with other issues, it can also be left "*ignored*". The treaty between Iran and Iraq of 1975, The Danube Treaty of 1987 as well as the 1989 treaty between the U.S and Canada on flood control in the Souris River Basin line out rules for parties to equally divide the costs that are attached to the use of CRM. In these particular cases this concerns the costs of arbitration and the expenses of an international joint commission (negotiation).

Another important aspect is the **issue area** of the CRM and whether the scope of the

mechanism has been specified in this sense. This variable controls whether the treaty prescribes to which specific water-related issue the CRM is supposed to be applied. The TFDD identified 13 issue areas including border issues, economic development, fishing, flood control, hydropower, infrastructure/development, irrigation, joint management, navigation, technical cooperation, territorial issues, water quality and water quantity. Since we only study treaties that consider water as a scarce or consumable resource, a quantity to be managed or an ecosystem to be improved/ maintained, we exclude fishing and navigation from the categories. Consequently we will examine whether the mechanism relates to multiple issues of the treaty or to one in specific. Finally, there are two dependent variables that relate to the maturity of a CRM and whether or not it is institutionalised**.** The latter comprises permanent commissions (negotiation or mediation) or/and permanent tribunals (arbitration), domestic courts and the International Court of Justice (ICJ) (adjudication). Maturity, on the other hand, is captured by five of the above-mentioned variables: the condition of mechanism use, the activation procedure, the cost sharing method, the issue area, and institutionalisation. As mentioned before, we also consider the voting pattern when a commission is in place. Depending on whether the specific values of these variables are expected to increase or decrease mechanism maturity we codified them either "0" or "1", the latter representing a higher level of maturity. An average of the attributed codes finally determines the level of maturity, which ultimately relates to whether the CRM can be considered developed. Each treaty in our sample will be read, categorised and codified according to the table below.

Table 2. Dependent variables and their values

Variables	Values
1. CRM Presence	Yes, No
2a. Type(s) of CRM **2b. Order of Use** **2c. Voting Pattern**	a) TYPE: Negotiation (consultation, commission of representatives, unspecified), Mediation (good offices, conciliation, independent commission, unspecified), Arbitration (not permanent, permanent), Adjudication (domestic court, ICJ) b) ORDER: No (random choice), Yes (1st soft law, 2nd hard law or another order) c) PATTERN: Consensus, Majority, Unilaterally, Other/issue ignored
3. Number of CRM	No CRM: {0} Lower number of CRM: {1, 2} Higher number of CRM: {< 3}
4. Place of the CRM in the treaty	Preamble, Treaty body, Annex
5. Condition of use	Breach, Interpretation/application, Periodical review, Change in physical conditions, Failure of a previous mechanism, Issue ignored
6. Activation	Unilaterally, Majority, Consensus, Issue ignored
7. Cost-Sharing method of the CRM	Polluter pays, Equally divided, Third party, Beneficiary pays, Issue ignored
7. Issue Area of the CRM	Single issue, Multiple issues

8. Institutionalisation	Institutionalised (Joint commission of representatives, Independent commission, permanent arbitration, domestic court, ICJ), Not Institutionalised (consultation, unspecified form of negotiation, good offices, unspecified form of mediation, no permanent arbitration)
9. Maturity	Averaged value of: a) Condition of use: issue ignored (0), other categories: (1) b) Activation procedure: unilaterally, issue ignored (0), other categories (1) c) Cost sharing: issue ignored (0), other categories (1) d) Issue area: single issue (0), multiple issues (1) e) Institutionalisation: not institutionalised (0), institutionalised (1) → {a+b+c+d+e} / 5 = value between 0-1 with: Immature CRM: 0.00-0.49 and Mature CRM: 0.50-1.00

5. What affects the choice of CRM: a transaction cost approach

In this section we review the expected costs of CRM and hypothesise how this potentially determines the adoption of conflict resolution.

The origins and application of the transaction cost (also TC) theorem are based mainly on the findings of Ronald Coase, a British economist who stated that:

> "In order to carry out a transaction it is necessary to know what we are dealing with and on what terms, to conduct negotiations leading up to a bargain, to draw up a contract, to undertake the inspection needed to make sure the terms of the contract are being observed and so on" (Coase, 1988).

Hence, this presupposes the need for parties to gather information relevant to the transaction, to bargain extensively over the terms of exchange while trying to establish the necessary institutional instruments for effective monitoring and/or enforcement. These actions, however, are potentially very costly and often sufficiently costly as to prevent a transaction of taking place (Coase, 1970; Kesting, 2007). While the nature of international river basins and the growing interdependencies between riparians, give states a clear incentive for establishing shared agreements, states are also "rational egoists" and will only adhere agreements of which the terms offer mutual interests and a stand to gain from (Keohane, 1989:18). As with every transaction, the expected benefits of the treaty should outweigh the costs. If transaction costs are too high, parties will not even bother to negotiate an agreement or to use it effectively (Gilligan, 2003). Low costs on the other hand are believed to stimulate the adoption of CRM (Libecap, 1995; Streit, 1998; Bernauer, 2002; Rao, 2003). Hence, while the existence of transaction costs constrains the choices for solving real-world problems, an understanding of the role of TC allows us to evaluate pragmatic alternatives and chose the most efficient one

(Rao, 2001:67). As such, the transaction cost paradigm provides a framework for analysing the choice of governance mechanism used by contracting parties to govern their interaction (Boadu, 1998). When it comes to dispute resolution, the main question remains therefore how the TC affects the choice of CRM.

Along the line of general distinctions made in transaction cost (TC) literature, we distinguish between two types of costs: **political costs** (ex ante), attached to the establishment of a mechanism on one hand, and **monitoring and enforcement costs** (ex post), brought about by the operation of a mechanism on the other (Coase, 1970; Williamson, 1985). Since ex-post costs usually occur together[15], we will further discuss them as such. Yet, it is important to note that the two sets of cost elements (ex ante and ex post) are usually interdependent, hence an attempt to minimise one set of TC might affect the entire cost frame (Rao, 2003:8). In his study of the international water transfer treaty between Lesotho and the Republic of South Africa, Boadu (1998) illustrates this interdependency when pointing to the fact that parties deliberately incur ex ante costs of contracting and negotiation in order to reduce the risk of increased ex post costs. For example, it might be possible to lower monitoring costs in time by addressing problems of uncertainty beforehand and including as much future contingencies as possible[16]. Yet, negotiating each one of these contingencies will be a timely and costly activity, eventually implying a sharp increase of the bargaining expense (Boadu, 1998). This highlights the importance of TC at different stages (Rao, 2003:168). In what follows below we examine each of the different cost elements and we select a number of proxies to assess them. A table at the end of this chapter summarises the entire theoretical framework, while the codebook in annex provides more details on the proxies and databases used for our research.

5.1 Political Costs

In this section we examine the main elements of the political cost, or the costs attached to the establishment of a rule, arrangement or an institutional mechanism. It is the part of the TC parties encounter when trying to internalise and lower the cost of

[15] Appropriate enforcement, for example, also requires monitoring activities, which will at its turn induce a cost (Furubotn and Richter, 2000).

[16] In summary, trying to lower ex post TC might come at the expense of ex ante TC, or vice versa.

future externalities and optimise the benefits expected from the agreement between them. Hence, in our study these costs relate to the process of negotiating and eventually adopting a CRM. In this section we will identify the different elements of political costs and monitoring and enforcement costs, while examining the factors that affect them in real life. Hereby we follow a distinction based upon earlier work of Coase (1937), Williamson (1985), Hodgson (1988), Levi (1988), Ostrom (et al.1993), Furubotn and Richter (2000) and Rao (2003) which lists *uncertainty costs* and *bargaining costs* as part of the political transaction cost (ex ante) and *monitoring* and *enforcement costs* as the ex post set of transaction costs[17].

5.1.1 Uncertainty costs

The problem of uncertainty is an essential obstacle that needs to be dealt with when negotiating solutions to a variety of environmental problems (Faber et al, 1992; Pahl-Wostl, 2002, 2007; Sigel et al, 2007). Negotiations usually take place under conditions of considerable complexity and uncertainty, and often it is not economical for the parties to specify in advance how they ought to behave under every conceivable contingency (Schwartz and Sykes, 2002).

This is particularly the case for water (UNEP, 2006) because a continuous lack of knowledge about the future physical conditions of the world's water resources poses unique challenges to global water management (Pahl-Wostl and Jeffrey, 2007; Drieschova at al., 2010). For example, uncertainty about groundwater flow combined with intensified dependency on this resource will likely shape states incentives to reach an agreement (Bhaduri, 2006) and might even spark conflicts over water quantity and quality (Jarvis et al., 2005). In other words, there is increased uncertainty about how to manage water resources due to legitimate concerns about scientific knowledge (Ostrom et all. 1993; Sigel et al., 2007), about how this knowledge will affect parties' preferences, now and in the future (Hipel et al., 2004), about insecure economic costs (Koppel, 2009), about changes in water use (Drieschova et al., 2010) and about the changing context of the resource (Ostrom et al., 1993; IPPC, 2007). But While the establishment of an agreement between riparians might be a response to such uncertainties (Yoffe et al., 2003) and a primary component in states ability to

[17] From here on we will refer mainly to political costs on one side and monitoring and enforcement costs on the other.

prevent and resolve water-related disputes (Wolf, 1998), the agreement itself might leave space for further, endogenous uncertainties[18] concerning treaty implementation and treaty finance (Drieschova et al., 2010). As discussed below, unaddressed uncertainty of any kind is likely to create space for dysfunctional decision-making or controversy.

As such, environmental uncertainty can give lead to high environmental costs. In his contribution to *"The Drama of the Commons"* Wilson discovers for example that scientific uncertainty induces conservation problems because of the fact that we build our governing institutions on an inappropriate scientific conception while the individual incentives that result from this fiction are mostly not aligned with goals of sustainability (NRC, 2002:327). In this case, the cost of scientific uncertainty results in the creation of dysfunctional governance structures, which in their turn obstruct conservation of a scarce resource. This and other costs related to uncertainty can effectively block adaptive attempts to changing environmental conditions (Hamlet, 2010)[19]. Also Challen's study of the Murray-Darling Basin offers an illustration of Hardin's thesis that environmental uncertainty can lead to over-harvesting and even resource depletion (Hardin, 1982). Lack of knowledge on the hydrological dynamics of this river system made it impossible for riparians to set a limit to water withdrawals, which in time could induce environmental costs for all riparians in the basin (Challen, 2000:151). Hence it is obvious that uncertainty about the current availability of the resource, as well as about the rate at which it replenishes itself, can considerably affect individual harvesting behaviour, cause over-consumption of the resource while eventually giving lead to ineffective and unsustainable resource management (Hine and Gifford, 1996)[20].

[18] Broadly speaking: endogenous uncertainty relates to uncertainties inside the treaty, while exogenous uncertainty relates to contextual uncertainties. The later-mentioned number of signatories is a source of endogenous uncertainty, while hydrological variability is an exogenous uncertainty.

[19] In his case study of the Pacific Northwest Region of North America, Hamlet (2010) describes the primary obstacles to adaptive response in the domain of water policy to be assumptions of stationarity as the fundamental basis of water resources system design, entrenched use of historic records as the sole basis for planning, short time planning, lack of familiarity with climate science and models, and downscaling procedures. All of which can be considered costs caused by scientific uncertainty and lack of knowledge.

[20] It is generally expected (and verified again by a study of Hine and Gifford) that under conditions of uncertainty, harvesters develop overly optimistic estimates of upcoming regeneration rates and thus to increase their harvests in comparison to harvesters that have more precise information about regeneration rates (Budescu, et al., 1990; Rapoport et al., 1992; Hine and Gifford, 1996).

Yet besides irrationally high environmental costs, uncertainty, if left unaddressed, can also give lead to elevated political or monetary costs. Differing interpretations of the evolving environmental circumstances, for example, are likely to stir discussions about the management of a shared system (John and Weitz, 1988) and spark conflict between resource users at a local, regional or even at state level. Eventually, such controversies might run the risk of turning a water matter into a broader political conflict (Fischhendler, 2008)[21]. In general, international conflict will and has already hindered the adoption of potential solutions to resource management problems (Just et al., 1994).

Yet, to reduce these complexities, to facilitate better resource management and to avoid conflict, cooperation across boundaries is needed. The higher the level of uncertainty, the more institutions need to permit adaptive decision-making because renegotiation is difficult in changed circumstances (John and Weitz, 1988). But when conditions of environmental uncertainty create a need for regulations and mechanisms able to address ambiguity, the same conditions might cause a rise of the political costs and make states cautious for engaging in comprehensive agreements (Just et al., 1994[22]). For example, while uncertainty over information and knowledge was a factor for the U.S to pull out of Kyoto, it provided the E.U with an incentive to "act before it is too late"[23], fearing an otherwise uncontrollable acceleration of climate change related costs (Kolstad, 2004). For this reason there is controversy in the literature about how uncertainty affects state behaviour in the establishment of environmental agreements[24] (Kolstad, 2004). In an attempt to avoid the elevated costs attached to it, we hypothesis that the higher the uncertainty, the more states will be stimulated to adopt CRM. More in particular, few studies focus on the benefits of soft-law

[21] In the case of the Israeli-Jordanian treaty continuous drought and deteriorating political relations allowed for the ambiguity in their shared water agreement to turn into a destructive factor for the peace relations between the two countries (Fischhendler, 2008).

[22] Just, Horowitz and Netanyahu (1994) discuss this mainly from a water perspective stating that countries will be more reluctant to give up their entire claim to a constraining resource when uncertainty over future contingencies and demand growth is high.

[23] For example: "There is also agreement that the scientific evidence is solid enough to warrant concrete and urgent action. Delaying action could increase both the rate and the eventual magnitude of climate change and hence adaptation and damage costs." (Delegation of the European Commission to the US, 9/2001: http://www.eurunion.org/legislat/climatechange.htm)

[24] Some scholars point to the fact that uncertainty over the distribution of costs and benefits facilitates agreement (Brennan and Buchanan, 1985:30) while others find that it retards agreement (Fernandez and Rodrik, 1991)

mechanisms when negotiating agreements under uncertainty, pointing to the fact that they still allow parties to formulate specific terms and requirements, without binding them legally to its terms in the future (~~Abbot and Snidal, 2000;~~ Koppel, 2009). For this reason we expect states to prefer soft-law mechanisms such as negotiation and mediation when uncertainty is high. In what follows we will discuss the two indicators of which we expect an influence on this matter of uncertainty. These include the number of signatories and the variability of the hydrological system.

Hypothesis A: ***"The higher the uncertainty costs, the lower the political cost, hence the more we expect the adoption of CRM to be stimulated".***

Hypothesis A.1: *"The higher the uncertainty costs, the lower the political cost, hence the more we expect parties to a negotiated agreement to adopt soft law CRM such as negotiation and mediation"*

a) Number of Signatories

Accordingly, the number of signatories has been acknowledged as an important cause of complexity[25] and treaty-related uncertainty. A shift from bilateral to multilateral treaties will most likely entail a rise of the uncertainty costs (Gilligan, 2003), as an increased number of parties implies difficulties of processing information necessary to find a zone of possible agreement, and of successfully negotiating an outcome within this zone (Koremenos, 2005; Downie, 2008). Barrett (2003) went a step further stating that a high number of players not only increases complexity but also signifies an enhanced risk of dispute. Especially when multiple parties of diverse backgrounds are involved, a spectrum of opinions, expectations and values must be accommodated and even the framing of the problem alone may result in ambiguities and conflicting opinions (Brugnach et al., 2008). In the case of most transboundary rivers, the number of riparian countries per basin is usually quite small. Yet, there are important exceptions such as the Danube (12), Niger (10), Nile (10), Zambezi (8) or the Mekong

[25] An increase in the number of signatories generally refers to an increase in "horizontal" complexity, as opposed to vertical complexity refers to the nature of the problem (Busch, 2006; Bauer et al., 2007).

(6) basins[26]. In virtually all of these cases heterogeneous preferences have resulted in protracted conflict among riparians (Bernauer in Young, 1997:172). Although the literature on multilateral negotiations is limited, one of the main focuses of negotiation scholars has been on how parties to such negotiations manage complexity (Crump and Zartman, 2003). It has been found that under conditions of high uncertainty, parties expect more benefits from entering an agreement (and to cooperate in general) (Young, 1994). When the number of parties is high, or when the environmental problem an agreement intends to address[27], regards many countries instead of only a few, this incentive appears to grow.

One way to address this kind of uncertainty is the establishment of an institutional umbrella. Kasper and Streit (1998) argue that costs induced by uncertainty can be kept relatively low if there is a possibility to extrapolate from past experiences or analogue cases, consequently avoiding innovation (Hodgson, 1988). Therefore it is useful to organise parties in a permanent way as to accumulate information and to prevent the costs of creating new rules (Axelrod, 1984; Keohane, 1984; Young, 1989; Keohane and Ostrom, 1995; Gilligan, 2003; Conca, 2006). A rise in uncertainty costs, inherent to multilateral treaties and caused by increased complexity, may provide decision-makers with an argument to adopt more institutionalised procedures and mature forms of CRM.

b) *Hydrological Variability*

While riparians set up rules and structures to govern their shared water resources, they must also consider uncertainties relating to the nature of the resource, such as hydrological variability. In a case study of the Murray-Darling Basin Ray, Challen finds that most of the uncertainty that relates to the environmental and ecological consequences of current levels and patterns of water use arises from the variability of the river system (Challen, 2000:151). This variability is so high little or no statistical generalisations can be made. But hydrological variability means also an enhanced risk of conflict. Among the most difficult situations to deal with is the upstream-downstream problem (Bernauer in Young, 1997:171) where a gradual change in

[26] Others include the Zaire (9), Amazon (7), Volta (6), Ganges-Brahmaputra (5) and LaPlata (5) river basins (United Nations, 1978).

[27] This means that the externalities attached to the environmental problem should at least be reciprocal and not unidirectional (Barret, 1990).

precipitation patterns and abrupt shifts in water variability might cause the inability of states to meet their mutual obligations regarding the allocation of their shared resources. While riparians may be inevitably driven to treaty violation, an incentive for international dispute is created. In her study on transboundary river floods Bakker (2006) finds that an increase in transboundary floods may contribute to conflict, especially if there are no mechanisms in place to absorb (sudden) change. An increase of the institutional capacity and flexibility of transboundary agreements will therefore reduce the likelihood of future flood-related conflicts (Bakker, 2006). Obviously, the same accounts for drought-related alterations, where states may opt to include specific conflict resolution procedures that allow them to change existing water allocations (Feitelson and Haddad, 1999). If the treaty does not foresee in such flexibility procedures, expensive and often-repetitive operational measures might have to be required to answer sudden changes in variability. As such, it is clear that parties benefit from adopting CRM under circumstances of high variability. At the same time well-defined arrangements reduce transaction costs of negotiated decisions, for example, by reducing the amount of information that must be collected (Challen, 2000:29). In other words, policymakers can limit further uncertainties about CRM implementation by adopting more mature mechanisms.

Hypothesis 1: *"The higher the number of parties to a negotiated agreement and the higher the hydrological variability, the higher the uncertainty costs and the political costs, hence we expect parties to adopt a high number of CRM's, and more mature and institutionalised forms of CRM"*

5.1.2 Bargaining costs

Although negotiation among countries is unavoidable, political barriers can complicate the process substantially (Le Marquand, 1977). The costs of bargaining relate to the outlays that must be made when parties decide upon an institutional arrangement. Therefore one should expect international institutions to appear whenever the transaction costs are relatively low compared to the benefits to be derived from the exchange (Keohane, 1989:166-67). Negotiating a treaty is costly (Garriga, 2009) and every mechanism or arrangement incorporated in it requires further effort (Miles and Posner, 2008) and will bring about an additional bargaining

cost. Hence, despite the need to adopt conflict resolution mechanisms as to increase a treaty's flexibility to cope with growing rates of change, variability and uncertainty, states find it difficult to do so and as a result many treaties still lack such language (Goldeman, 1988; Hamner and Wolf, 1998; Fischhendler, 2004). This is primarily due to the fact that the unifying principles of integrated watershed management clash with the forces of state sovereignty and the principle of self-government (Wouters et al., 2005; De Stefano et al., 2010). For example, in a case study of the transboundary basins between the US and Canada and Israel and Jordan, Fischhendler (2004) found that crisis-mitigating mechanisms were excluded from treaties because they were seen as posing a threat to national sovereignty, which boosted the political cost of their inclusion. The same occurred in the lower Rio Grande basin, where the US was cautious to establish a comprehensive treaty in scale and scope, because it feared the International Boundary and Water Commission to become a supranational organisation that could have basin-wide authority (Fischhendler, 2004). As a consequence the water commission was delegated only limited power, eventually causing its inability to meet the challenge of climate uncertainty.

In conjecture, it has been found that non-binding rules and soft law mechanisms constitute a less significant infringement of state sovereignty (Abbot and Snidal, 2000; Fischhendler, 2004), hence impose lower bargaining costs upon the parties. For this reason states generally prefer to adopt mechanisms such as negotiation and mediation - or in the case of the Boundary Waters Treaty (1909) more support for non-binding arbitration from the part of the U.S. (Fischhendler, 2004). Yet, it should be noted that regardless whether the CRM is soft or hard law, if bargaining costs are high, negotiating the inclusion of a CRM might impose an extra cost upon the process, which parties will be eager to avoid. That is, if these costs are perceived to outweigh the benefits. This follows the logic that countries that wish to adhere an agreement, will have to abate more than countries that do not wish to adhere an agreement, hence they will also incur higher costs. Hence, every clause and every mechanism will therefore induce an extra cost. This leads us to the basic hypothesis concerning the bargaining cost and the adoption of CRM:

Hypothesis B: ***"The higher the bargaining costs, the higher is the political costs hence the more we expect the adoption of CRM to be hindered"***

In our study we expect the bargaining costs to be affected mainly by the level of trust among parties, the political compatibility of regimes, the degree of water poverty, the adaptive capacity of the signatories and the degree in which they are dependent upon external resources for their water supply. Below follows a description of each of these indicators, with specific hypothesis, which illustrate the influence we expect from each one of them on the bargaining cost, hence the adoption of conflict resolution.

a) Level of Trust

Lack of trust between political entities can obstruct cooperation and its consequential benefits and can induce often-unnecessary outlays. Fragile diplomatic relations, for example, may increase the political desire for agricultural self-sufficiency, leading to subsidisation of water to agriculture hence to irrational water use, inefficiency of water pricing and disputes over allocation issues (Just et al., 1994). This is a clear standard bargaining consideration that induces a raise of the political costs and, consequently, hinders cooperation in spite of large potential gains. Yet, when mutual trust is lacking, soft law mechanisms may allow states to tackle a problem collectively at a time they otherwise might not have approached (Koppel, 2009). In other words, when the cost of bargaining is high because of distrustful relations between states, soft law mechanisms and nonbinding arrangements may offer an alternative to binding resolutions as they will enable governments to formulate their commitments more precisely and ambitiously than would be the case when the mechanisms are binding (Koppel, 2009)[28]. Also, Fischhendler (2004) found that the cost of some climate-uncertainty mechanisms could be decreased if their adoption or activation is conditional on a unanimous decision-making process. This is especially the case for states that share ambiguous relations, because they are more likely to introduce a requirement of consensus in order to activate any rule or procedure, including conflict resolution (Benvenisti, 1996). Consequently, the above leads us to the following hypothesis:

Hypothesis 2a: *"The lower the level of trust among parties to a negotiated agreement, the higher the bargaining and political costs, hence the more we expect parties to adopt soft law CRM's such as negotiation and mediation"*

[28] Conversely, it has been found that states with strained relations are less likely to incorporate binding mechanisms into agreements (Wouters et al., 2005).

Hypothesis 2.b: "The lower the level of trust among the parties, the higher the bargaining and political costs, hence the more we expect the parties to adopt a consensus-rule for CRM-activation"

b) Political Compatibility

Second, we expect the political make-up of the respective state regimes to influence the bargaining costs. When states differ substantially with regards to their political systems, preferences, resources and information, more time and effort will be required to bargain an agreement (Ostrom et al., 1993:check page), a cost-provoking effect that becomes stronger when the number of parties involved is high (Lindemann, 2005). Conversely, parties with the same expectations and preferences face lower bargaining costs (Shirley, 2003). The literature on international conflict and cooperation presents democratic systems as more peaceful to one another as opposed to autocratic or politically asymmetric[29] dyads (Rummel, 1993). One reason for the relative harmony among democracies relates to their domestic political culture, which is characterised by regulated political competition, conflict resolution and compromise (De Stefano et al., 2010). Consequently, when democratic regimes interact with each other, these domestic characteristics are extrapolated to the international arena (Russet, 1993)[30]. This claim has been examined in the environmental politics literature (Neumayer, 2002b, Bernauer et al., 2010) and the hydro-politics literature (Espey and Towfique, 2004; De Stefano et al., 2010). As a related conjecture, it is believed that democracies are more committed to resolve transboundary problems[31] (Kalbhenn, 2007) and more able to handle the ever increasing environmental challenges in a non-violent manner (Auvinen, 1997; Gurr, 2000). In addition, democratic regimes tend to interact more than autocratic ones (Milner, 1997) while also having more alternative forms of conflict resolution available[32](De Stefano et al., 2010). For this reason we expect them to engage more in cooperative processes of conflict resolution such as interstate negotiation and mediation (Carroll, 1988; Keohane et al., 2000).

From the above follows the first premises that democratic dyads do not necessarily

[29] Politically asymmetric dyads are made up of one democratic and one autocratic country.
[30] This means that the domestic political practices of democracies, which are characterised by an enhanced openness of the political system, are translated in the international arena when democratic systems interact wit each other.
[31] Specifically in the form of treaty signature and formalised cooperation (De Stefano et al., 2010)
[32] As opposed to non-democracies

face lower bargaining costs, as their domestic political procedures may cause negotiations to be lengthy and burdensome, but rather that their common notion of consensus politics implies a mutual preference for the adoption of soft-law regulation. Second, mixed dyads are expected to face higher bargaining costs, because of their heterogeneous preferences and approaches to problem solving (see above). Eventually, this might hinder the adoption of institutional mechanisms such as CRM. Third, as mentioned before the costs of negotiating an agreement with or between democracies might well be high. Democracies face a series of political constraints mainly at the domestic level. At the level of public opinion, for example, democratic institutions create audience costs[33] (Fearon, 1994) and democratic leaders need majoritarian consensus to govern (Bueno de Mesquita et al., 2003). Within autocratic regimes, these costs are either lower or absent. Therefore, we build upon Garrida's study on the formalisation of bilateral treaties when stipulating that autocratic dyads face lower bargaining costs than mixed dyads (one democracy and one autocracy) and pairs of democracies (Garrida, 2009). Since the political price of bargaining international institutional arrangements is lower for autocratic regimes, we expect them to adopt a higher number of CRM, less mature forms of CRM and more hard-law mechanisms.

The hypothesis here is therefore threefold:

Hypothesis 3a: *"The more the parties to a negotiated agreement are democratic, the higher the bargaining costs, the more we expect them to adopt soft-law mechanisms such as negotiation and mediation"*

Hypothesis 3b: *"The more the parties to a negotiated agreement are politically incompatible (mixed), the higher the bargaining and political costs, hence the more we expect them to adopt a low number of CRM"*

Hypothesis 3c: *"The more the parties to a negotiated agreement are autocratic, the lower the political and the bargaining costs, hence the more we expect them to adopt a high number of CRM, more immature forms of CRM and more hard-law CRM such as arbitration and adjudication"*

c) Water Scarcity

[33] In the sense that they need to defend their policy to their citizens and the requirement of transparency of the decision making process also entails a price.

Many authors already focussed on the link between resource scarcity and (violent) conflict. Homer-Dixon (1991) is undoubtedly one of the main scholars focussing on this nexus in the environmental field, complemented by many other environmental and hydro-political scholars (Wolf, 1997; Elhance, 1999; Ohlsson, 2000; Bernauer, 2010). In all of these studies water scarcity is in some way believed to induce conflict or at least to create a risk thereto[34]. Ohlsson (2000) finds that it might not necessarily be the lack of water inducing interstate conflict, yet more the lack of institutions to adapt it. On the other hand, Lynne et al. (1990) point out that water poverty can lead to disputes, but that this risk increases considerably when parties also differ in values, beliefs and hence behaviour over water issues. Conversely, if we consider Dinar's idea of an U-shaped relation, scarcity may induce cooperation instead, at least when it does not exceed a certain level (Dinar, 2006). Hence scarcity might be a necessary condition for cooperation to take place, but not a sufficient one.

Be it that the lack of scientific evidence does not allow us to hypothesise a direct link between scarcity and conflict (Buhaug et al., 2008; Bernauer, 2010) we can fairly argue that it gives states an incentive to bargain institutional mechanisms able to address conflict. Yet, our hypotheses is that while dyads characterised by high water scarcity and a higher risk of conflict would benefit more from adopting a higher number of CRM, the political costs attached to bargaining such a mechanism under conditions of high scarcity might rise considerably, eventually blocking the adoption of such mechanisms. The reasoning is that states in a water scarce position will be even more cautious to preserve and safeguard their already limited resources. The general mistrust among water scarce riparians will be high (Dinar et al., 2007:130), which will cause a rise of the bargaining costs and dampen countries' aspiration to adopt CRM, especially mature forms that need even more intensive bargaining. Consequently, we believe that highly water scarce dyads will adopt less CRM than mixed dyads (a combination of high and low scarcity). However, the way in which the quantity of water present in a nation influences the arrangements, also holds stand in the opposite direction. If water is abundant, there is no need for tight arrangements among users and conflicts and environmental concerns will be minimal (Bakker, 2006).

[34] P.e: Homer-Dixon notes that conflicts over water are likely to occur, but only under specific conditions such as a history of antagonism between two countries (Homer-Dixon, 1999:179).

***Hypothesis 4**:" The more the parties to a negotiated agreement are water scarce, the higher the bargaining and political costs, hence the more we expect parties to adopt a low number of CRM and immature forms of CRM"*

d) *Adaptive Capacity*

The adaptive capacity of states to respond to hazards caused by variability and resource scarcity is a third factor of which we expect an influence on the bargaining cost, hence the political cost. Adaptive capacity concerns the degree to which adjustments in practices, processes, or structures can moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate (IPCC, 2001:89). As we already mentioned resource variability threatens stability in two ways; on one hand there is the gradual reduction of water availability (for example through the rise of sea-level or desertification) while on the other hand stability will be put to a test through sudden or unexpected climate-induced events such as flash floods and droughts (Buhaug et al., 2008). Both aspects are responsible for high uncertainty costs that require the development of adaptive institutions and innovation (Homer Dixon, 1999). Yet, the level to which states are able to respond to future challenges also greatly influences their position in the negotiation process.

The available literature identifies economic wealth, technology, information and skills, infrastructure, institutions and equity as the main determinants which make regions, countries or communities able to adapt to change (IPCC, 2001:895), hence as the main drivers of the bargaining costs (Homer Dixon, 1999; Yohe, 2001).

Generally it is assumed that countries with high adaptive capacity are more resilient[35] to changes while also being able to make more concessions than vulnerable states when bargaining. For example, countries that dispose over strong economic assets and capital resources are assumed to be better prepared to bear the costs of adaptation (Burton, 1996:55-67). It can enable them to find substitutes and alternative sources for water and may allow better adaptation to climate change through technological and other means (De Stefano et al., 2010). India's wealth, for example, illustrates how a high GDP can influence bargaining over shared resources. In this case it obviously

[35] More resilient means less sensitive and more able to adapt to variability and change (IPCC, 2001:89).

enables a state to act unilaterally in the development of a shared resource while imposing the Mega River Linking Project, a plan to link dozens of rivers and divert water from the Ganges River to parts of the country that are prone to water scarcity (De Stefano et al., 2010)[36]. However, there is great uncertainty about the way the main determinants of adaptive capacity are expected to develop in the future. Concerns about population growth or economic wealth, for example, can cause states to be very cautious when it comes to matters of water allocation, eventually obstructing the adoption of rational and adaptive water policies. Hamlet (2010) finds that while some future projections about these determinants are commonly incorporated in planning studies, they are not typically considered in planning. This implies they may be left unaddressed and can distort policy decisions related to water infrastructure or allocation, which are generally very difficult, if not impossible to reverse (Hamlet, 2010).

The following hypothesis is two-fold:

***Hypothesis 5a**:"The higher the adaptive capacity (symmetric) of the parties to a negotiated agreement, the lower the bargaining and political costs, hence the more we expect parties to adopt a high number of CRM"*

***Hypothesis 5b**:"The more the parties to a negotiated agreement are asymmetric in their capacity to adapt, the higher the bargaining costs and the political costs, hence the more we expect unilateralism in the voting pattern of a commission and as an activation procedure of the CRM"*

e) External Resource Dependency

By way of conjecture with the former hypotheses on water poverty and adaptive capacity, we also consider external resource dependency as an indicator to assess the bargaining costs. Homer-Dixon (1999:179) believes that among all renewable resources, water might be the most likely candidate for stimulating international conflict, yet he adds that such disputes are likely to occur only under special conditions such as high dependency on extra-territorial water resources. Hence, when states depend largely on external resources for their national supply, they have a clear

[36] Naturally, this will affect the intake of water for Bangladesh, as a downstream riparian.

incentive to negotiate (Just et al., 1994), in particularly regarding arrangements of conflict resolution. Yet, at the same time their dependency induces political costs that may obstruct such outcomes. For example, Syria's dependency on Jordanian water for agriculture in the south is likely to drive up the bargaining costs when negotiating the allocation of shared waters, because Syrian negotiators will be reluctant to give up any rights to the resources. On the other hand, Lebanon's economy does not depend on external water resources, in this case the Jordan, which leaves the country more space and flexibility in negotiations (Just et al., 1994). As such we expect great dependency on external water resources to drive up the bargaining costs, eventually obstructing the negotiation and incorporation of conflict resolution mechanisms.

Hypothesis 6: *"The more the parties to a negotiated agreement are dependent upon external resources, the higher the bargaining and political costs, hence the more we expect them to adopt a low number of CRM"*

In summary, we assume that states take up bargaining costs in order to reduce the costs of future transactions within the same international framework (Moravcsik, 1999). Yet, if bargaining such new institutions and arrangements is too costly, states will not bother to negotiate (Gilligan, 2003).

5.2. Monitoring and Enforcement Costs

Treaties are not only costly to negotiate but also to enforce (Miles and Posner, 2008). If it were possible for parties to envision all future contingencies, reach prior agreement about how they should be handled and develop enforceable mechanisms, all transaction costs involved would be expended prior to the agreement (Ostrom et al., 1993). But because of the need to monitor the agreed upon mechanisms (Furubotn and Richter, 2000) and to ensure the parties fulfil their exchange obligations (Maitland et al., 2009) ex-post transaction costs or continuing costs nearly always occur (Furubotn and Richter, 2000). Each party must monitor the other in order to guard against treaty violations and even after the violation is detected, the cost of enforcement still lingers (Miles and Posner, 2008). A breach of the treaty terms is often the result of ambiguity or state incapacity to comply with the treaty (Downs, 1998) and enforcement costs may in such case appear as the temporary suspension of the provisions agreed upon in the treaty. If, for example, such provision includes the

production of a public good, enforcement procedures might obstruct its supply.

It is generally assumed that while states could achieve deeper cooperation with higher levels of enforcement, states often do not want more enforcement (Downs, 1998). Avoidance of the costs attached to could be a very plausible reason for this. Yet, when treaties leave space for ambiguity, states might have different opinions about when a treaty violation has taken place and about what form of punishment or enforcement they see necessary as a response. On the contrary, when a formal dispute resolution procedure is in place, accuracy of the violation assessment and the appropriate response will be improved. Since hard law is more precise, the cost of interpretation and delegation, which specifies procedures for conflict resolution, will decrease (Abott and Snidal, 2000). Hence, we assume that states that wish to avoid high enforcement costs would in fact benefit more from adopting sophisticated mechanisms, including hard law CRM. Yet, negotiating such a mechanism would clearly induce a higher political cost, especially in terms of bargaining. Also institutionalisation is believed to lower the enforcement costs[37] (since a framework for enforcement is already available), yet it may increase the monitoring costs (a permanent commission equals permanent monitoring and permanent expenses) and the political costs of negotiating and establishing the institute.

Unrelated to the type or institutionalised character of the mechanism, it is understood that parties that univocally agree upon a mechanism (consensus), will more carry and support the adopted mechanism and the costs of its monitoring and enforcement will be lower than in other cases (Ostrom, 1990:204). For this reason we may expect states to adopt CRM upon consensus, even if it comes at a higher political cost (in terms of negotiating and finding a space of general agreement). Finally, also the context of the resource will affect the monitoring costs, as it is more difficult and costly to monitor large resources (Ostrom, 1990:204) (not sure if I need this). To assess monitoring and enforcement costs we consider two variables; the level of trust among parties and the state history in relation to colonisation.

Hypothesis C.1: ***"The lower the enforcement costs, the more parties to a negotiated***

[37] Ostrom, 1990:204; Pae, 2006.

agreement will adopt mature and institutionalised forms of CRM, including hard law mechanisms, hence the higher the political costs"

<u>Hypothesis C.2</u>: "The lower the monitoring and enforcement costs, the more parties to a negotiated agreement will adopt CRM upon consensus, hence the higher the political costs"

a) <u>Level of Trust</u>

First, we assume that trustful relations will bring about lower monitoring and enforcement costs over time, as uniform ideas exist about implementation procedures and the nature of fair solutions to disputes (Furubotn and Richter, 2000; Ostrom, 2005). States that mistrust each other, however, will fear more cheating and breaching of the treaty terms over time (Dinar et al., 2007:150). For that reason we would expect them to address such risks by incorporating a higher number of CRM.

***<u>Hypothesis 7</u>**: "The lower the level of trust among the parties to a negotiated agreement, the higher the monitoring and enforcement costs, hence the more we expect them to adopt a high number of CRM"*

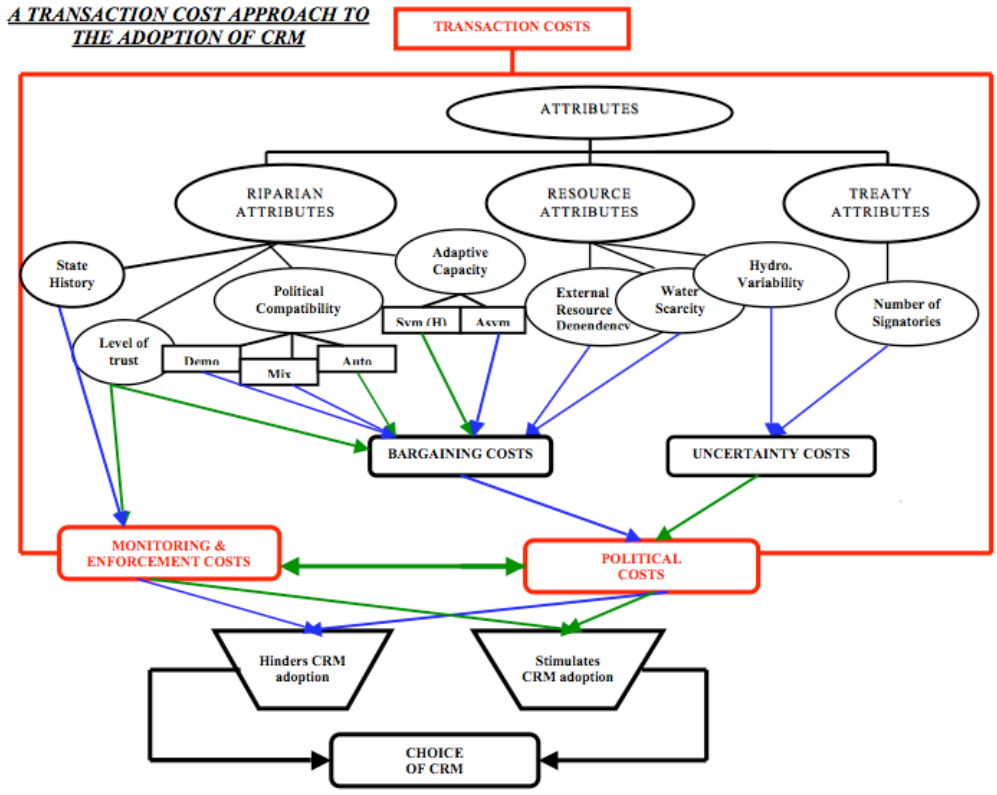
b) <u>State History (Colonisation)</u>

Building on the assumptions of Miles and Posner (2008) we assume the history of the country to play a role in the determination of ex post costs. Their study states that older countries face lower transaction costs than newer countries do, mainly because older countries have more established customs, norms and political institutions, which allow for smoother operation of the government and hence cheaper monitoring and

enforcement of treaties. However, in conjecture it could be argued that older countries have more and more sophisticated means available for monitoring and enforcement, and many of them can be very costly. Therefore we prefer to shift focus to colonised states versus non-colonised states. Yet, we believe the same reasoning holds stand with regards to the establishment of more sophisticated norms and political institutions in non-colonised countries. Hence, we argue that colonised states are immature in comparison with non-colonised states, for which they face higher monitoring and enforcement costs, which may eventually prevent them from adopting more mature CRM.

Hypothesis 8: *"The more the parties to a negotiated agreement have a history as colonised state, the higher the monitoring and enforcement costs, hence the more we expect them to adopt an immature form of CRM"*

Figure 1: Conceptual Model - a transaction cost approach to the adoption of CRM



Legend:
- Mainly, the GREEN lines signify a lowering effect.
For example: *"the higher the level of trust, the lower the bargaining cost"*

Or: *"the higher the political costs, the lower the monitoring and enforcement costs"*
- The BLUE lines signify an elevating effect.
For example: *"The more parties are asymmetric in their adaptive capacity, the higher the bargaining costs"*
Or: *"The higher the political costs, the more CRM adoption will be hindered"*
- RED represents the transaction costs