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Jennifer Moore
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Effect of Institutional Design Features on the Security in International River Basins

Jennifer Moore

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Advisor: Jean Krasno

Abstract

An increasing global population and the threat of climate change influences the dynamics of security in international river basins. States may suffer from water scarcity, hydropower scarcity, pollution from an upstream state or lack of flood control, causing them to exploit a shared international river. States sharing a common water source must successfully manage the shared resource to increase cooperation and security in the basin. Yet, states are inclined to pursue self-interested foreign policies when seeking to secure scarce resources. By maximizing their gains, states are able to sustain life and develop economically. However, when a state's main source of freshwater comes from a shared river basin, it can no longer pursue its unilateral policies without affecting the other states that rely on the common resource. The threat of an international security problem increases when all co-riparian states pursue unilateral domestic policies without coordinating with their neighbors. The multipartite nature of transboundary rivers poses a challenge in managing internationally shared resources. Despite the inclination to pursue policies that would highly benefit domestic goals, states often reach a compromise to develop international river agreements. These agreements are key to mitigating conflict over shared freshwater resources and maintaining cooperation within the river basin. The institutional characteristics of an agreement can either enhance or detract from the success of the agreement. In environments characterized by uncertainty, it is essential to understand the commonalities in agreements that enhance cooperation. By increasing the awareness of what makes an agreement comparatively more successful, international relations scholars' and policy makers' understanding of the nature of the regimes will increase. This thesis argues that four particular institutional characteristics – flexibility, dispute mechanism, enforcement mechanism, and transparency – have a significant impact on security in international river basins. This thesis also argues that three external factors also have an effect on the success of the agreement in maintaining security in the basin. The creation of a river basin organization, including all co-riparian states in the agreement, and the state regime type of riparians significantly impact basinwide security.

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Chapter 1: Introduction

Freshwater is a vital economic and environmental resource essential to a state's development and human security. In recent decades, international relations scholars are more concerned with water security. Environmental changes, coupled with growing global population, places a greater strain on shared water resources. Approximately 40% of the world's population lives in transboundary river basins (United Nations Development Programme 2006: 231). They rely on the rivers for livelihoods, drinking water and recreation. With a large portion of the world's population vying for a finite resource, the likelihood of conflict over rivers increases within multiple sectors of society. Conflict can arise not only on the international level between states, but also between local farmers or municipalities within countries. States seek to maximize their share of the resource and make unilateral decisions to further domestic policies. As each riparian state pursues domestic policies in its own self-interest, the shared resource cannot be sustainably managed in terms of the collective good. The egotistical, selfish nature of states complicates managing shared resources.

The anarchy of the international system further complicates negotiating international agreements. States have not accepted an overarching international law, to date. One of the main obstacles in river resource management is the absence of a universal international treaty. The United Nations put forth the Law of the Non-Navigational Uses of International Watercourses in 1997 for ratification. However, too few states approved the treaty. Despite the lack of an overarching, encompassing international treaty, riparian states have undertaken negotiations in the vast majority of river basins globally. States possess a large amount of flexibility in international

watercourse law because there is no universal codification to which they must adhere.

Nevertheless, the UN Convention has served as a general framework for self-organization in river basins. Since 1945, riparian states have signed over 200 treaties managing internationally shared rivers (Giordano and Wolf 2003: 163).

Cooperation over international rivers has long preceded modern organizations. The first international water agreement dates back to a treaty between the Mesopotamian city state of Umma and Lagash in 3100 BC. The first international water management organization was established in 1815 to govern navigation of the Rhine River (Dombrowsky 2007: 118). Despite the long history of early cooperation, international river agreements and organizations are a relatively new concept. The number of transboundary river agreements and organizations greatly increased after World War II. Moreover, the scope and scale of the agreements expanded, covering a wider range of issues resulting from concerns over climate change, growing populations, industrialization, water quantity and water quality. River agreements in the twentieth century broke away from the traditional focus on navigation and covered new uses, such as pollution control, hydropower generation, and flood management and control. According to the Transboundary Freshwater Dispute Database, 109 out of the 263 existing international river basins implemented international water agreements. Of the 109 basins with agreements, 63 have international river organizations in place – approximately a quarter of international river basins worldwide.

Institutions are essential to water resource management because conflicts – which will inevitably occur – between riparian states can be referred to the institution, thus deterring any potential military or economic conflict. While it is important to understand

why states engage in conflict and why they cooperate, it is also important to understand what makes an institution successful in mitigating disputes that will inevitably arise. As riparian states establish an increasing number of river basin organizations (RBO)¹, there is a need to pay greater attention to the design of the institution. Only then, can political scientists and policymakers understand the factors that inhibit or promote the effectiveness of institutions in managing international river basins.

Much of the literature surrounding international rivers debates the wider resource scarcity and the water wars rationale. A popular theory maintains that increasing competition for scarce resources will lead to armed conflict (Alam 2002: 341). Nevertheless, quantitative analysis in the field demonstrates that cooperation greatly outweighs armed conflict amongst riparian states (Brochmann 2012). Cooperation is likely to endure between riparian states once a treaty has been signed. Brochmann demonstrates that peaceful cooperation between riparians is generally maintained after the establishment of formal institutions (2012: 144-5).

International river management presents a complex area for international cooperation. Managing a shared resource that is vital to all areas of survival becomes a challenge when all parties involved seek to maximize their gains. The way countries utilize the water may conflict. For example, an upstream state may be constructing a dam, while a downstream state has been increasing irrigation for farm use. Both states need to increase their water consumption for their respective projects; however, the water supply has not increased. Without communication, the two neighbors are stressing the resource and in turn relations between the states. Nevertheless, an overwhelming amount of

¹ For this study, river basin organizations may include bodies namely, “commission”, “committee”, “organization”, “authority”, etc.

bilateral and multilateral riparian institutions have been formed, with the oldest dating back to over 3000 years. Scholarship suggests that cooperation is likely to endure between riparian states once a treaty has been signed (Brochmann 2012: 144-5). While this thesis is not concerned with the origins of cooperation, it seeks to build upon the literature to further understand how the institutional regime itself contributes to the success of regime.

The literature fails to explain why certain institutions have endured over time between contentious states, such as the Indus Water Treaty between India and Pakistan. One explanation is that essential institutional characteristics reduce the uncertainties and apprehensions that surround the development of international river management as a factor of influence. This thesis builds upon the existing literature surrounding the institutional makeup of international river organizations. It investigates the conditions under which international riparian institutions are successful in mitigating conflict. Without analyzing the institutional characteristics that contribute to the success of regimes, international relations scholars and policy makers would not be able to understand the nature of international riparian institutions.

I hypothesize that certain institutional characteristics increase the likelihood of regime success in mitigating conflict. River Basin Organizations are created for a variety of purposes: environmental, navigation, allocation, etc. Moreover, the scope and design of river institutions vary from basin to basin. While it is important to assess whether the organization has been successful in altering behavior to achieve the institution's primary purpose, this thesis is concerned with river basins in the context of international security. It seeks to analyze the overarching security that institutions provide to international river

basins in order to gain a generalized knowledge of the effects certain elements of river basin organizations have on security in river basins. Therefore, for purposes of this thesis, RBO success is defined in terms of international security instead of behavioral change or problem-solving terms.

The fluctuating nature of rivers requires an agreement that is able to adapt and manage unforeseeable events. I expect that four particular institutional characteristics affect the success of the agreement: adaptability of the institution in its allocation of resources; a formal dispute mechanism written into the treaty or charter; a formal enforcement mechanism written into the treaty or charter with clear repercussions if provisions are breached; and, data shared between signatories. I expect the presence of these four variables to be positively related to the level of cooperation amongst parties and the success of an international regime.

Research Questions:

- What river regime institutional characteristics have the most effect on the success of the international riparian institutions?
- Under what conditions are riparian institutional regimes successful in maintaining compliance?
- Do the four institutional characteristics (adaptability, dispute mechanism, enforcement mechanism, and sharing of data) affect the degree of cooperation?
- Does the combination of certain institutional characteristics have an impact on the effectiveness of the regime?
- Are bilateral institutions more successful than multilateral institutions?

- Does the state political regime type of riparian states have an effect on adaptability, dispute mechanisms, enforcement mechanisms, and obligation to share data?
- Does the percentage of co-riparian states party to the regime affect the security in the river basin?
- Is a treaty alone or a governing river regime body more effective at regulating riparian relations?

1.1 Methodology

Theoretical and analytical models in the literature identify several variables as influencing the effectiveness of river basin organizations. To study the relationship between institutional characteristics and the success of institutional river regimes in mitigating conflict, a sample focusing on Europe, Asia and Africa is used. By studying these three continents, this thesis is able to compare the riparian institutions across both developing and developed countries. The river commissions established in Europe date back to 1815 and 1948; whereas, the commissions present in Asia and Africa were established in the later half of the twentieth century and in the twenty-first century. Therefore, the study will not be biased in examining a specific time frame.

The term international river is used in its broadest definition in this thesis. All rivers that are shared by two or more states are included in the sample. Toset *et al.* classifies rivers into three types: upstream/downstream rivers, boundary rivers and mixed rivers. No distinction is drawn in this thesis between rivers serving as an international border, upstream/downstream rivers, and mixed rivers. According to Toset *et al.*, all three

types of rivers are at risk for conflict, but the nature of upstream/downstream rivers makes these rivers more prone to conflict (2000: 989-990). River agreements focus on a variety of issue areas. The most common treaties and institutions signed center around water flow quantity, quality of the water, and streamflow alterations such as dams, amongst others. To gain a more wide-ranging understanding of important institutional mechanism, all types of river organizations and agreements are incorporated in this study. An international relations theory would serve little use if it were too particularistic in the type of international rivers.

In order to have the most comprehensive knowledge, combinations of both multilateral and bilateral river basins are examined. Additionally, a variety of international river basins within each region that are governed by international organizations are used in the study as well as basins that are governed only by a treaty. A sample that represents the two different types of governance permits a comparative analysis of the effectiveness of each method of governance. For each continent, three institutionalized river basins and two river basins with formal agreements that are not institutionalized are used.² Additionally, the level of conflict in the basin before and after the creation of a river basin organization is compared to assess the success of the institution and whether the institution has been more successful in the place of previous treaties. This thesis is then able to test whether formal institutional organizations are more effective than treaties or if the converse proves to be true.

Information is primarily used from the International Water Event Database (IWED) and the International Freshwater Treaty Database, two projects supported by the

² The exception is the examination of African river basins. There are no international river basins with data available on the continent that has formal cooperation, but has not institutionalized relations.

Oregon State University Department of Geosciences.³ The IWED documents over 7100 historical international water relations from 1948 to 2008. The International Freshwater Treaty Database contains information, including institution structure, of approximately 450 international, freshwater agreements, spanning the years 1820 to 2007. The agreements cover a variety of issue areas, including border issues, joint management, irrigation, territorial issues, water quality and water quantity, amongst other issue areas. Minor agreements are excluded from this study. According to the Transboundary Freshwater Dispute Database (TFDD), minor agreements are agreements that contain components related to water as a resource, but the water component is insignificant and little related to water resource management issues (e.g., a clause allowing border guards to access drinking water on adjacent territory). The TFDD and IWED cover water events up to 2007 and 2008, respectively. Therefore, the time period of analysis is slightly restricted by the available data.

To gain an understanding of the characteristics that allow institutional regimes to be successful, the research surveys river disagreements that have occurred under the presence of an international organization overseeing that particular river. By comparing the institutional characteristics of organizations that resulted in peaceful mitigation of river events with those that were unsuccessful in producing peaceful results, a pattern of important characteristics emerges.

³ “Product of the International freshwater treaties database, Department of Geosciences, Oregon State University. Additional information about the TFDD can be found at: <<http://www.transboundarywaters.orst.edu>>.”

1.1.1 Dependent Variable: Organizational Success

No common definition of effectiveness of success appears in the literature of conflict and cooperation in international river basins. Scholars apply their own definition of effectiveness according to the governance process they are focusing on. This thesis defines success of the river basin organization (RBO) or the international river treaty as whether it is effectively able to mitigate conflict between riparian states and increase security in the basin. For this thesis, the term international river basin organization is used as overarching term for any kind of international organization, commission, or committee governing a shared watercourse. To borrow Neda Zawahri's definitions, cooperation exists when states alter their behavior to accommodate their riparian neighbors' concerns. Conflict occurs when riparian states maintain the status quo when their neighbor has a claim (Zawahri 2006: 1043). States can be considered in conflict even if they have signed a treaty.

Success is measured by the peaceful resolution of disputes, not the state of harmony between riparians. The success of the treaty or RBO in mitigating the conflict is measured on the BAR scale. The scale codes data from the Transboundary Dispute Database and the International Freshwater Treaty Database, two projects supported by the Oregon State University Department of Geosciences.⁴ The BAR scale codes each international water dispute on a scale of -7 to +7. The most peaceful outcomes (voluntary unity) receive a +7. The most conflictive events (declaration of war over water) are ranked -7. A score of 0 indicates a neutral outcome. The below table outlines

⁴ "Product of the International freshwater treaties database, Department of Geosciences, Oregon State University. Additional information about the TFDD can be found at: <<http://www.transboundarywaters.orst.edu>>."

the event descriptions as defined by the Transboundary Freshwater Dispute Database. For the purposes of this study, an institutional regime is considered successful in any event that receives a score of +1 through +7. To calculate a basin's BAR scale score, the BAR score of all events prior and after the agreement as recorded by the TFDD are averaged.

BAR SCALE	EVENT DESCRIPTION
-7	Formal declaration of war
-6	Extensive war acts causing deaths, dislocation or high strategic cost
-5	Small scale military acts
-4	Political-military hostile actions
-3	Diplomatic-economic hostile actions
-2	Strong verbal expressions displaying hostility in interaction
-1	Mild verbal expressions displaying discord in interaction
0	Neutral or non-significant acts for international situation
+1	Minor official exchanges, talks or policy expressions
+2	Official verbal support of goals, values or regime
+3	Cultural or scientific agreement or support (non-strategic)
+4	Non-military economic, technological or industrial agreement
+5	Military economic or strategic support
+6	International freshwater treaty; major strategic alliance
+7	Voluntary unification into one nation

1.1.2 Explanatory Variables

This thesis considers four distinct explanatory variables in order to examine the effectiveness of institutions in preventing conflict over international rivers: adaptability of the institution, dispute mechanism, compliance mechanism, and shared data between signatories. Information and data will be taken from the treaties themselves and the Atlas of International Freshwater Agreements and the International Freshwater Treaty Database produced by Oregon State.

The flow of rivers naturally fluctuates; rivers go through annual and seasonal changes in water flow quantity. The varying quantity of water supply to states must consequently be accounted for to mitigate any potential concerns over water availability. Adaptability mechanisms enhance the success of cooperation between riparian states. I expect the basins that include an adaptability mechanism will have higher scores on the BAR scale.

The regimes are coded for an adaptable agreement. The adaptability mechanisms take many forms: allocation strategies, amendment processes, review processes, revocation clauses, and institutional responsibilities. This thesis focuses solely on amendment processes. The ability to amend agreements is essential to maintaining a secure basin and preventing stakeholders from defecting from the agreement. The average of the BAR scale scores for agreements containing the mechanism are compared to the average of the agreements excluding the mechanism. I expect the basins with amendment processes will have higher scores on the BAR scale than those that excluded the mechanism.

This thesis also tests for the effect of dispute mechanisms on basinwide security. The most obvious disputes arise between riparian states over allocation of water resources, pollution of water, or a new dam. However, technical disputes over treaty clauses and interpretations often present themselves as a challenge to implementing the institution. Consequently, states must find a means to handle any administrative disputes in addition to other conflicts. Dispute mechanisms reduce conflict over vagueness or interpretations of treaties or charters. Dispute mechanisms are also essential for settling any violations of provisions. The impact of any dispute mechanism is measured by

comparing agreements that contain dispute mechanisms with those that do not. I expect that water events that received a score of -7 to -1 on the BAR scale will either lack a dispute mechanism in the managing regime or have a low presence of dispute mechanisms.

Any successful international agreement should have a compliance mechanism in place. In an anarchical international system, where states are not required to sign a treaty or cooperate, the absence of a means to enforce the law leaves little incentive for states to comply with the provisions of the treaty. In this thesis, compliance and enforcement are studied together, as they are two related concerns.

The compliance variable has two components: the enforcement mechanism and the monitoring mechanism. These two types of compliance mechanisms are examined in the study because they are two of the most commonly used mechanisms to entice states to comply with international law. Incentives to comply with international law generally take the shape of either positive or negative enforcement mechanisms. The two most common enforcement incentives – sanctions and reparations – are often used in international agreements. Monitoring mechanisms are also included in the study. They often take the shape of reporting on implementation of the provisions outlined in the agreement.

The two types of enforcement mechanisms are assessed both as an aggregate and individually. The BAR scale scores of the basins that contain any type of compliance mechanism are averaged and compared to the averages of the basins that do not have any compliance mechanism in the basin agreement. Then, the two compliance mechanisms are isolated to compare the BAR scale score averages of each variable to those basins in which the variables are absent. I expect to find that the absence of any compliance

mechanism in the institutional regime will lead to a low level of success in mitigating conflict.

States tend to trust one another more when their interactions are transparent (Stinnett and Tir 2009: 232-3; Abbott and Snidal 1998: 12). Open data sharing increases the likelihood of institutional regime success because it enables better allocation of resources and accurate reporting of consumption by each party. Data sharing allows for accurate reporting of the consumption levels needed by each state to maintain its human security and industry levels. Consequently, data sharing helps to alleviate some of the apprehension of joining an international institution and voluntarily ceding a portion of sovereignty. Therefore, I hypothesize provisions for data sharing in riparian institutions will increase the success of the regime. I compare regimes where data sharing is mandatory with those where data sharing is voluntarily provided by member states. As with coding for adaptability, dispute mechanisms, and enforcement mechanisms, the average BAR scale score of basins requiring data exchange is compared to those that do not require it.

1.1.3 Control Variables

This thesis controls for three variables to test the validity of the research: success of river basin organizations versus the success of river treaties; state regime type; and membership of the RBO and treaty. The primary concern is whether the findings hold true for both treaties and organizations. To compare the effectiveness of RBOs and treaties, the BAR scale averages for each type of each international river management system will be taken and analyzed. I anticipate that the basins with river basin

organizations will have a higher overall score compared to the basins without an RBO. However, I anticipate that any basin with the four institutional mechanisms present will be more secure than the basins that did not include the mechanisms, regardless of the presence or absence of a river basin organization.

This thesis also controls for the state regime type of co-riparian states. The democratic peace theory claims that states are more likely to cooperate when both are democratic. Under the theory, democracies are considered to be more trustworthy since they exhibit a greater amount of transparency in their processes. Common democratic values and norms present in democracies foster easier agreement between democracies. Cooperation between democracies and autocracies or between two or more autocracies can prove more challenging. Consensus is more difficult to reach between parties with vastly different priorities (Layne 1994).

States are coded for democracy based on the Polity IV index. The Polity IV index is supported by the Political Instability Task Force, Societal-Systems Research Inc, and Center for Systemic Peace. It measures the democratic nature of states on a 21-point spectrum ranging from -10 to +10. Classifications of governing authorities include fully institutionalized autocracies, mixed, incoherent, anocracies and fully institutionalized democracies. In the interest of simplicity, three categories are used in this thesis to compare the effect of state regime type on international security in shared river basins. The categories mixed, incoherent and anocracies of the Polity IV index are labeled as anocracies and range from -5 to +5. Anocracies are considered forms of government with scores that are not low enough to be considered autocracies and scores that are not high enough to be considered democracies.

Fully institutionalized autocracies and fully institutionalized democracies are labeled autocracies (-10 to -6) and democracies (+6 to +10), respectively. The sum of the polity scores of all members of the basin is averaged to find the polity score of the river basin. To test the validity of the democratic peace theory in international river basins, basins with a score of +6 and higher are compared to non-democratic basins with a score of +5 and lower.

The Polity IV index coding is compared to the Freedom House's *Freedom in the World* publication. The index measures states on political freedoms and civil liberties. The two variables are coded on a scale of +1 (most free) through +7 (least free). The scores of the political freedoms and civil liberties are averaged to give the state an overall score. To code for the freedom level of the river basin, the polity index average is taken for all states within the basin. The freedom score for the year the agreement was signed is used to code the cases. The two exceptions are the Niger River Basin that was created in 1964 and the Permanent Indus Commission that was established in 1960. The Freedom House Polity Index data reports data beginning in 1972. Therefore, the Niger River Basin's and the Indus River Basins' freedom indices are coded based on the data for 1972 instead of 1964 and 1960, respectively. The Freedom House and Polity IV indices are compared to rule out inconsistencies that may arise from using different indices. When compared, cases are classified in the same category for each index used. Since cooperation is mutually beneficial to all states involved, regardless of state regime type, I anticipate state regime types will not affect the security of the basin.

Finally, the number of states party to an institutional regime may affect the regime itself. A potential objection to theories is if not all riparian states are members of the

institution, the possibility of conflict increases. The average BAR scale score of river basins with full membership to the agreement is compared to those that only have partial participation. I anticipate the level of participation of states party to the agreement will not affect the security of the basin.

Chapter 2: Literature Review

Many scholars focus on the wider environmental security debate in the international riparian literature. One of the main subjects that international relations theorists study is why states cooperate over international rivers. States are concerned with absolute gains over relative gains and will only cooperate when cooperation produces more gains than acting unilaterally (Dinar 2008: 11). A collective action problem remains when states seek to maximize their gains from an internationally shared resource (Zawahri and Mitchell 2011: 840; Benvenisti 1996: 388-92). If each state sharing a common river increases its consumption, the collective consumption nears the sustainability rate of the river. When consumption exceeds the rate of sustainability, resource scarcity increases in a basin already at risk.

A main subject of debate in the literature revolves around the impending “water wars” that will result from water scarcity. It will likely be the main area of international contention in the twenty-first century. Gleick and Alam argue that the uneven distribution of water, coupled with a growing global population will be a major source of international dispute, expanding to the use of armed conflict (Gleick 1993: 79; Alam 2002: 341). Particularly in regions with high resource scarcity, states view competition as a national security issue. Since water is vital to a state’s survival, states will attempt to secure the necessary water they need to survive. Water wars will most likely occur between states with high political tension that have high water scarcity and low institutionalization (Gleditsch et al. 2006: 362-4). Higher levels of scarcity will lead to increased conflict as states resort to coercive measure to secure access to water (Stinnett and Tir 2009: 233). In juxtaposition, Dinar reasons that increased scarcity will encourage

cooperation because states need to manage the resource. The scarcity-cooperation relationship follows a U-shaped curve; those basins with both or all parties facing moderate scarcity have the highest rate of cooperation (Dinar 2009: 110).

The theoretical literature surrounding the study of international resource management primarily focuses on the conditions under which states are most likely to cooperate. Rieu-Clarke explains the four theories of river basin management. Under the Harmon Doctrine, a state has authority of the water within its own territory regardless of the effects it may have on other states. The second theory, Absolute Territory Integrity, also known as riparian rights theory, says that lower riparian states have a right to continued and uninterrupted flow of water resources. Limited Territorial Sovereignty, or Limited Territorial Integrity suggests that states are free to use the waters in their territory as long as it does not infringe upon other riparian states' territory or interests. The fourth theory, Doctrine of Equitable Utilization, states that all co-riparian states are entitled to a share in the shared resource (Rieu-Clarke 2005: 101-10; Gleick 1993: 106-7; Ochoa-Ruiz 2005: 348-9). Gleick argues that the Harmon Doctrine or the Doctrine of Equitable Utilization primarily influences a state's behavior. Ochoa-Ruiz maintains that Doctrine of Equitable Utilization is the cornerstone of international watercourse law.

Realism plays a large role in the literature. According to realists, a state is most likely to cooperate when its national interests are not at stake and it has little to lose (Barrett 2003). International relations theorist James Fearon demonstrates that states are rational actors pursuing policies that benefit their own interests. According to rationalist theory, states measure the costs and benefits of their international policies prior to taking action. If the repercussions exceed the benefits, a state will not pursue the policy (Fearon

1995: 381). Therefore, states will only cooperate when their losses for maintaining the status quo are greater than reaching an agreement (Brochmann and Hensel 2011: 865). If the provisions outlined under the treaty are not dissimilar to a state's intended actions in the absence of the treaty, the state does not stand to lose anything.

Alternatively, Thucydides argues that power distribution is the decisive factor in the success of negotiations. The dominant power in any international system will act as it sees fit to further its goals and the weaker states have no choice but to accept it (Thucydides 2008). Borrowing from hegemonic stability theory, weaker states lack the resources and capabilities to challenge the hegemon. The nature of upstream/downstream rivers epitomizes the hegemonic stability theory. Upstream states have the clear advantage since their use of the river is unimpeded (Brochmann and Hensel 2011: 862). The upstream state holds more power over the downstream state since it can manipulate the control of the quantity and quality flowing downstream through the use of dams (Zawahri 2006: 1054). Zawahri goes further to argue that upstream states can use data sharing as a weapon when it is not required under an agreement. Data withholding can leave downstream states vulnerable since they cannot prepare for variations in water cycles. The strong upstream state has little incentive to cooperate since their losses for maintaining the status quo will be minimal (Zawahri and Mitchell 2011: 837). They are better able to resist pressures and demands of weaker downstream states, particularly if the upstream state is more powerful militarily and economically. Consequently, uncoordinated development causes the most harm for the furthest downstream state (Zawahri 2006: 1049). Sometimes, the downstream state may have to absorb some costs

to incentivize the upstream state, resulting in side-payments. Cost-sharing becomes more prevalent in basins where the river forms a boundary between states (Dinar 2008: 61).

However, Zawahri goes on to point out that downstream states can also hold an advantage over their upstream neighbors. Downstream riparians can use the river as a 'weapon' by refusing the upstream state's drainage (Zawahri 2008: 287). Dinar argues that in some rivers, the upstream state may be the downstream state along some branches or tributaries. Therefore, it would be disadvantageous for either side to exploit their upstream position (Dinar 2008: 22). The Tigris-Euphrates river basin is a classic example where branches zigzag back and forth across the border of upstream and downstream states.

Neoliberal institutionalists claim that states are rational egotists and will cooperate for gains. Cooperation produces mutually satisfying outcomes (Dinar 2009: 115). Dinar argues that cooperation may often produce more gains for powerful states than exploiting their portion of the river (Dinar 2008: 24). Dombrowsky believes that river basin management should be coordinated at the river basin level where all riparian states involved should work together. The collaboration of all riparians, whether they are powerful or weak, will produce the best outcomes (Dombrowsky 2008: 457).

Collective action theory outlines the problems that arise when states manage common-pool resources. Elinor Ostrom explains that the uncertainties surrounding common-pool resources, such as floods or decreased rainfall inhibit cooperation. Engaging in collective action will increase the benefits shared by all appropriators. However, stakeholders are less likely to contribute when the benefits are not immediately

apparent. Actors are more willing to contribute when the benefits will be realized in the immediate future (Ostrom 1990: 33-41).

Just as international rivers can be a catalyst for conflict, Dinar maintains that they can also drive cooperation between riparians (Dinar 2008). According to realists, cooperation should not occur between states. Elhance as well as Just and Netanyahu argue that cooperation fails because it challenges the core of statehood: sovereignty, territorial integrity and security (Elhance 1999: 7; Just and Netanyahu 1998: 10). Some scholars have looked at the dynamics of international river basins as an explanation for cooperation in international river basins. Brochmann argues that the democratic peace theory does not come into play in riparian relations. She explains that two democracies do not cooperate more than other regime types because democracies tend to be in areas where water is not a critical issue (2012: 158).

A large portion of the literature analyzes the conditions that influence the creation of riparian agreements and institutions. On the other hand, political scientists Yoffe, Wolf and Giordano have focused on the institutional membership structure of river basin organizations. For instance, formal cooperation tends to emerge more frequently between dyads than in multilateral river basins (Yoffe, Wolf, and Giordano 2003: 1117). States may choose to sign bilateral treaties instead of multilateral treaties if some states have low interest in reaching an agreement and no basinwide agreement seems likely (Zawahri and Mitchell 2011: 838; Mohamed 2003: 221-223). Consensus is easier to reach between two parties. More concessions must be made as the number of states party to the agreement increases; bilateralism simplifies communication.

Zawahri and Mitchell argue that state interests, transaction costs, and distribution of power (2011: 836) are the most important factors in cooperation. In hydro-politics, an imbalance in power can impede cooperation. Schmeier agree that RBOs are more effective if power is equally distributed amongst stakeholders. The constellation of actors and distribution of power is the determinate of whether and to what extent resources will be governed effectively (Schmeier 2013: 67-77).

Many scholars focus on specific elements of agreements that encourage cooperation. Zawahri and Mitchell feel that the guarantee of adherence to the treaty or RBO is the most important element to study. The low interest in signing a treaty, due to the high likelihood of future renegeing, impedes the negotiation process (Zawahri and Mitchell 2011: 837). According to the managerial school, states will not dedicate the time or resources to negotiating a treaty that will most likely be violated (Downs, Rocke, and Barsoom 1996: 380; Chayes and Chayes 1993: 184). If a state knows it will violate the treaty because the treaty is not aligned with its policy objectives, a state will not waste the time and money to negotiate since the state's reputation will be damaged if it reneges on a treaty. Adaptability mechanisms can decrease the likelihood of violations. Sadoff *et al.* advocate for joint management committees in the organization to manage the fluctuating nature of rivers. Joint management committees allow for formal modifications that may need to be made. Joint management institutions can reduce the transaction costs of agreements and decrease the likelihood of future breakdowns (Sadoff et al. 2008: 70).

Enforcement and compliance is unlikely to work in an environment where defection proves the better option over cooperation (Downs, Rocke, and Barsoom 1996: 384). The problem of commitment and the problem of monitoring are the two main issues of common-pool resources (Ostrom 1990: 43-4). However, Chayes and Chayes argue when

states do choose to sign a treaty, they are most likely to cooperate and uphold treaties after signing because it is in their best interest. Signatories comply and in turn expect other states to comply, creating an environment of trust in which cooperation is expected and upheld (Chayes and Chayes 1993: 184).

An additional factor affecting the success of RBOs is the management of disputes when they arise. Many scholars argue the presence of a dispute resolution mechanism is essential for ensuring the effectiveness of river basin organizations (Finger, Schmid, and Wüest 2006; Ochoa-Ruiz 2005: 353-4; Grossman 2006: 66). The presence of a dispute resolution mechanism lays the foundation for a cooperative relationship between the riparian states. The absence of such a mechanism provides ample room for cheating and defection from the agreement without repercussions.

Grossman maintains that information and data exchange is essential for cooperation and should be transparent, thus inspiring confidence in negotiations and future cooperation (Grossman 2006: 229). Information and data exchange lay the groundwork for determining resource allocation. However, if stakeholders suspect inaccurate or false data reporting, the relationship could be compromised. Chenoweth and Feitelson argue that joint data collection, sharing or exchange is most likely to occur only when all parties view it as being beneficial (Chenoweth and Feitelson 2001: 510). Accurate data exchange increases transparency of the governance process. According to Berardo and Gerlak, transparency increases the effective management of shared resources because stakeholders can understand the inner workings of the governance process (Berardo and Gerlak 2012: 104).

According to some international relations scholars, the agreement itself may affect cooperation. Text ambiguity, temporal dimension of river treaties and limited capabilities to carry out provisions all limit the ability of states to comply with a treaty (Brochmann 2012: 147). Approximately 40% of river basin agreements include provisions in addition to water management (Brochmann 2012: 146; United Nations Development Programme 2006: 224). Faniran suggests a sectoral approach to river management may hinder the success of the institution. Treaties focusing on one aspect only, such as dams, are limited in their abilities to govern the shared rivers (Faniran 1980: 12). An agreement with a larger scope increases the likelihood of cooperation in river basins.

Chapter 3: Explanatory Variables

The anarchical nature of the international system creates an uncertain environment, in which states may incur a risk in their relations with other states. International law provides an opportunity for states to improve their relations and reach or strengthen agreements in a secure and structured environment. International law, in the form of either a treaty or institutional organization, allows co-riparian states to settle disputes to decrease the chance of both militarized and economic conflict over shared watercourses. The absence of an overarching international river law forces states to cooperate through joint measures. Yet, the lack of a universal international law also gives states flexibility in choosing how to cooperate and what provisions to include in their agreements.

The incorporation of certain institutional design functions in international river law increases the chance of mitigating and avoiding conflict between riparian states. Specifically, four design features present in international riparian treaties and organizations create an environment in which states are more willing to come to terms and negotiate with each other: adaptability, enforcement mechanisms, dispute mechanisms, and data sharing.

3.1 Adaptability of Institution

Rivers are a naturally fluctuating resource; they go through cyclical annual and seasonal changes in water flow quantity. Consequently, states must prepare for the varying quantity of water supply and be able to mitigate any potential concerns over water availability, such as droughts or floods. It is important for institutions to be able to

adapt and change to overcome unforeseen challenges that may arise in the future (Berardo and Gerlak 2012: 116). Formal treaties are difficult to alter once signed; therefore, the institutions must be designed to handle unexpected changes in conditions in the river basin (Sadoff et al. 2008: 83). For example, the 1994 agreement between Israel and Jordan did not include an adaptability mechanism; consequently the drought in 1999 threatened to dissolve peace between the two nations because they were unable to adequately and quickly react to the change in water levels.

States are able to prepare for hydrological variability by including certain amendment mechanisms in treaties. First, instead of measuring water allocation in fixed quantities, states should elect to allocate resources in terms of percentages of water availability. Additionally, organizations can be created to jointly manage the changing nature of rivers. Joint management committees between the parties allows for formal modifications that may need to be made (Sadoff et al. 2008: 66)

3.2 Compliance Mechanism

Even though a state may sign an agreement or join an organization does not mean it is willing or able to comply with the provisions. Institutions with effective reporting and implementation reviews are likely to be successful in maintaining cooperation and security in the river basin. Bernauer argues that the performance of riparian agreements increases when organizations monitor the behavior of the parties (Bernauer 1997: 188). The absence of a means to enforce the law leaves little incentive for states to follow the stipulations outlined in the treaty. However, compliance and enforcement are two-fold. Compliance deals with an on-going process of states adhering to the provisions of the

treaty and contributing as required (e.g., submitting data information, paying dues, etc.). On the other hand, enforcement deals with, mainly, punitive measures to entice states to comply with the agreements they make. The most commonly used form of negative enforcement mechanism in international relations is economic sanctions. Other types include trade, financial and asset sanctions. Not all enforcement mechanisms are negative, sometimes states include positive means, such as rewards, or “carrots” (Bradford and Ben-Shahar 2011: 380-2).

One of the best ways to ensure compliance with a treaty or organization, without requiring action from the members, is to promote the policies in a positive light. Even when a member state is opposed to a certain decision or policy, implementation should be seen as fostering cooperation and support, rather than an inconvenience to the state (United Nations 2009: 34). Nevertheless, in high politics, this approach is not always effective and must be supported through other means.

One type of mechanism to manage compliance is implementing a monitoring mechanism. To guarantee compliance, a treaty or organization may require periodic checks on the parties. For example, a treaty may require parties to regularly submit reports or undergo evaluations and holding annual joint meetings to ensure compliance.

The second part of the variable is concerned with what happens when states do not comply. Incentives to comply with international law generally take the shape of either positive or negative enforcement mechanisms. Enforcement mechanisms can reduce the attempt to cheat because an impending fine for not complying with the agreement deters noncompliance. A treaty should clearly state how an event of noncompliance would be handled. For the most effective results to bring a party back to compliance, a treaty

should include a mixture of components: incentives to comply as well as punitive measures (Sadoff et al. 2008: 62). When states do not adhere to agreements, the potential for serious conflict rises, thus disrupting any current cooperation and negotiations and decreasing the likelihood of developing cooperation in the immediate future. When compliance is managed, however, the transaction costs of cooperation decrease.

3.3 Dispute Mechanism

No matter how carefully institutions are crafted, disputes will inevitably arise, whether they are over operations of an institution or interpretations of a treaty. Scholars agree that the inclusion of a dispute mechanism is essential to long-lasting organizations (Schmeier 2013: 54). The most obvious disputes that arise between riparian states concern allocation of water resources, pollution of water, or the creation of a new dam. However, technical disputes over treaty clauses and interpretations often present themselves as a challenge to implementing the treaty or institution. Dispute mechanisms reduce conflict over vagueness or interpretations of treaties or charters. They are also essential for settling any violations of provisions.

Unless specifically indicated in the treaty, states cannot be forced to adhere to a mode of settlement. There are multiple ways states can elect to handle dispute. For example, riparian states can adopt agreements that outline effective *ad hoc* dispute mechanisms to handle any conflict that may arise. On the other hand, the International Law Association (ILA) recommends referral to a joint agency or seeking mediation of a third party as the most effective way to mitigate riparian dispute. If all other modes fail to

resolve the conflict, the parties should seek a solution through an arbitral tribunal or the International Court of Justice (Ochao-Ruiz 2005: 372-4).

Negotiations are typically the first-sought means to handle disputes before proceeding to more formal resolution measures. Negotiations provide the most flexibility for states to maintain control over the process and occur in multiple modes: traditional diplomatic channels, summit discussions, and international joint commissions. Joint commissions are the most often used means for riparian dispute settlement since they are outlined in many treaties and are typically the first step to resolution before utilizing other modes. Most problems seem to be resolved here before they turn into larger issues (Ochao-Ruiz 2005: 362-4).

However, if disputes are unable to be handled at the negotiation level, they can become more involved and seek resolution through arbitration. Adjudicative means are typically a final resort. Adjudication involves being examined by an impartial third party, such as another states, the World Bank, or even the International Court of Justice, and results in a binding decision. However, states may seek third party involvement for mediation without reaching the adjudicative level.

3.4 Data and Information Exchange

Most data is gathered domestically and is not disseminated internationally. Thus, it is safe to assume that most river states do not have access to meteorological and hydrological data from other states. States also tend to be suspicious of the data that is released by co-riparian states because they believe the data is not accurate or may be fudged to benefit the state releasing the data. In private negotiations, private information

may remain private for various reasons. For example, states may withhold information for strategic purposes or a lack of communication. A common, transparent database that is easily accessible to all riparians is key to maintain cooperation in the basin (Nakayama 2003: 103; Grossman 2006: 229).

There is a distinction between bilateral data sharing between two members of an institution and centralized data sharing. States can opt to exchange data informally, without the involvement of the river basin organization. Centralized data sharing is formalized sharing that involves the institution in coordinating and managing the collection of data. This thesis focuses on centralized data sharing that is overseen by the organization. Schmeier argues that institutional involvement in data and information exchange can be expected to be more effective than bilateral means because it provides clear rules and access to the information (2013: 52). Involvement of the institution permits the benefit of joint-fact finding efforts to pool information and translate the data into a form that is usable. Pure data gathering cannot affect difference in water resource management; it must be converted to information in order to be used. River basin organizations can create data transmission instruments, such as bibliographic information systems, data information systems, water management models, hydrological databases and joint water resources assessments (Grossman 2006: 220-3). Additionally, international organizations are vital to harmonizing data from different states that may not be held to equal standards. Organizations can uniform standards and make the data compatible and, therefore, useful in managing rivers.

States tend to trust one another more when their interactions are transparent. Cooperation increases when greater transparency and information sharing is present in

states' relationships (Stinnett and Tir 2009: 232-3; Abbott and Snidal 1998: 12; Grossman 2006: 298). Open data and information sharing increases the likelihood of institutional regime success because it enables better allocation of resources and accurate reporting of consumption by each party. Data sharing in agreements requires stakeholders to agree on the accuracy and acceptability of the shared data. Therefore the parties can appropriately plan on how to distribute the shared resource.

Article 9 of the 1997 Convention on the Law of Non-Navigational Uses of International Watercourses obligates data and information sharing. Riparian states should regularly share data and information on conditions of the shared watercourse and relevant forecasts (e.g., flood events and droughts). Moreover, articles 11 and 12 of the Convention compel states to share information on planned projects, such as dams (United Nations 1997). International organizations are vital to harmonizing data from different countries that may not be held to equal standards. IOs can uniform the standards and make the data compatible and, therefore, useful in managing rivers (Grossman 2006: 157).

Chapter 4: Control Variables

Sometimes external factors outside the institutional design feature of organizations are thought to be responsible for the success or failure of RBOs. State regime type may have an effect on whether states comply or even cooperate in negotiations to reach an initial agreement. According to democratic peace theory, democracies are more likely to cooperate with other democracies because they share similar governing principles and values. Additionally, the number of riparian states may affect the magnitude of conflict within the river basins. If not all riparians that share a transboundary river sign an agreement, the likelihood of overall peace within the basin may decrease. The outliers could feel insecure in their access to the shared resource.

Finally, for policy purposes, it is important to understand whether treaties and organizations have comparable success rates. The institutionalization of agreements is typically seen as being more effective than treaties alone. Whether these three variables hold true in international river management is important from a policy perspective for the future development of international river treaties and organizations.

4.1 State Regime Type

The democratic peace theory asserts that states are more likely to cooperate when both are democratic. The theory maintains that democracies behave differently toward other democracies compared to the way democracies behave toward autocracies. Democracies tend to be more trustworthy since they exhibit a greater amount of transparency in their processes. Common democratic values and norms present in democracies foster easier agreement between democracies. Cooperation between

democracies and autocracies or between two or more autocracies can prove more challenging. Consensus is more difficult to reach between parties with vastly different priorities (Layne 1994).

Nevertheless, when states consider that cooperation will be more beneficial than maintaining the status quo, they are more likely to cooperate than not despite their state regime type (Brochmann and Hensel 2011: 877). While the democratic peace theory tends to hold true in other areas of international security, two democracies are not necessarily more likely to cooperate over international river management. One possible explanation, offered by Brochmann, is that democracies tend to be geographically located in areas where water is not a critical issue (2012: 158). In the areas where riparian cooperation is critical to managing the scarce resources (e.g., Africa and the Middle East), the states are a mixture of democratic and non-democratic regimes. Therefore, the two types of regime systems must – and have – managed to reach accords in order to survive.

4.2 Participation

The number of states party to an institutional regime may affect the regime itself. A potential objection that may be raised is: if not all riparian states are members of the institution, the possibility of conflict increases. However, I anticipate the percentage of states party will not affect the success of the regime based on the four characteristics. If the presence of the four institutional characteristics is strong, the success will not be affected.

Mitchell and Keilbach argue that a smaller number of participants in an agreement makes cooperation easier. According to institutionalist theory, as the number of stakeholders increase, the difficulty of coordinating policies also increases because the complexity of reaching consensus grows (Mitchell and Keilbach 2001: 897-898; see also Axelrod and Keohane 1985: 234-238). However, environmental politics naturally involves a large number of actors. The exclusion of an important stakeholder with a large influence over the river would hamper problem-solving efforts (Schmeier 2013: 40-1).

A collective action problem arises when all stakeholders do not have the possibility to contribute to governance. Environmental politics rely heavily on knowledge dissemination and expertise. Schmeier maintains that knowledge regarding the state of the watercourse and the challenges it faces are crucial to affecting the proper response and governance process (2013: 56). If all stakeholders do not participate in the governance process, the essential information cannot be gathered and the effectiveness of the organization will decrease.

Organizations are more likely to be established in multipartite river basins than bipartite river basins – 15 percent of bipartite river basins have organizations; organizations are present in 41 percent of tripartite basins (Dombrowsky 2008: 461). Approximately a third of the existing 86 river basin organizations are multilateral organizations, and two-thirds are bilateral organizations. However, when multipartite basins are isolated, only half have multilateral organizations.

4.3 Treaty vs. Body

Much of the existing literature focuses on the effectiveness of river basin organizations. There is a lapse in the literature analyzing the effectiveness of international river agreements in basins without an institution. By comparing the effectiveness of agreements creating RBOs with those that do not, we are able to discern whether creating a river basin institution is essential to most adequately foster cooperation and international security. This thesis is also able to test if river basin organizations are extraneous and a simple treaty would suffice in most international river basins.

The primary objective of creating an RBO is to institutionalize the negotiation process. River basin organizations are instrumental in maintaining cooperation through providing a channel for diplomacy. Organizations provide the means to disseminate accurate information, settle disputes, and ensure collaboration and cooperation. However, the institutional scope of international water resources management varies from basin to basin. Scope measures the extent to which riparian states are integrated in managing their common resource. Not all riparian treaties reach the stage of institutionalization; yet, cooperation is sufficiently maintained in these basins through a treaty alone.

In her research, Dombrowsky found that organizations are more likely to be established in multipartite river basins than bipartite basins. A little over half of river basins worldwide have river basin organizations. Nevertheless, there hasn't been a major conflict in the other half of the river basins (Dombrowsky 2008: 461). It is important to understand whether the river basins with organizations are more peaceful compared to the river basins with treaties alone.

Chapter 5: Introduction to Cases

In total, over 200 international river basins have been identified. The majority of states worldwide share at least one transboundary river. A large number of these rivers are shared by a significant number of countries. Nineteen transboundary rivers are shared by five or more states. Europe has the most international rivers (69 in total), followed by Latin America (61), Africa (58), Asia (57) and North America (19) (Schmeier 2013: 63-4).

Each river basin holds a unique geographical scope and stakeholder relations. Issues are not homogenous across river basins; the scope of problems is basin specific. River basin organizations and treaties emerge in response to their specific issues in order to jointly manage or solve the common problem. Consequently, not all organizations and treaties have the same structure or institutional mechanisms.

River basin organizations are much more rigid in their structure in order to ensure stability and endurance. Nevertheless, the composition of RBOs can vary depending on the agreement. An RBO will most often have a decision making body, executive body and working body. The form of these bodies can include a secretariat, technical committee, working group and plenary of the Commission, amongst other bodies. Additionally, RBOs are stricter in their meetings and interactions. RBOs will meet multiple times throughout the year. Comparatively, agreements without a joint commission have greater flexibility in meetings between the states party.

5.1 Africa

Many of the river basins in Africa have achieved a high level of integrated resource management. Even the states of one of the most contentious river basins – the Nile – have recently established a provisional institution, the Nile River Basin Initiative. However, there are no cases where co-riparian states have signed a river treaty that has not gone on to establish a river basin organization.⁵ It is interesting to note that the depth of cooperation is split in African river basins. Riparian states have either formed a river basin organization, or they have no formalized agreement.

5.1.1 Orange-Senqu River

Botswana, Lesotho, Namibia and South Africa comprise the Orange-Senqu River basin. The Orange-Senqu River begins in Lesotho, flows through South Africa and eventually creates the border between Namibia and South Africa before emptying into the Atlantic Ocean. The Orange-Senqu River does not directly pass through Botswana. However, Botswana, being a land-locked country surrounded completely by South Africa, heavily relies on the run-off and ground water from the Orange-Senqu River to meet its needs. The basin experiences considerable seasonal variation in precipitation, as well as geographic variation in rainfall and evaporation. The runoff of the Orange-Senqu basin is seasonal and highly variable from year to year. This could only become more exacerbated from the effects of climate change (Kistin and Ashton 2008: 2).

Along with variations in runoff along the course of the river, the proportion of the population that relies on the Orange-Senqu River fluctuates from country to country. For

⁵ According to the data available through the International freshwater treaties database.

instance, the entire population of Lesotho depends on the Orange-Senqu River, compared to Botswana, which has no direct access to the river.

The relations between the four riparian states of the Orange-Senqu River basin have evolved as politics have shifted in the region. Since 1983, one multilateral institution has been established, the Orange-Senqu River Commission (ORASECOM). Established in 2000, the basin-wide ORASECOM is particularly important in governing relations within the basin (Kistin and Ashton 2008: 8). Collaboration in the basin has been strengthened through the Orange River Replanning Study (ORRS). ORRS has been important in strengthening the relationship and trust between the riparians. The collaboration under the ORRS led to an official agreement for the joint development of a database and water resources management plan (Grossman 2006: 208). Data and information sharing is now a routine practice within the basin.

5.1.2 Niger River

Benin, Burkina Faso, Cote d'Ivoire, Guinea, Cameroon, Mali, Niger, Nigeria, and Chad all depend on the Niger River to meet a portion of their water needs. The nine riparians established the Niger River Commission in 1964, one of the oldest river commissions. The Niger River Commission was later renamed the Niger Basin Authority (NBA). Initially, the NBA aimed to manage navigation, irrigation, and the environment of the Niger River. However, the scope was scaled back in 1986 to focus only on river basin development planning. The NBA has since established an information center with real-time hydrological forecasting capabilities that can predict flooding (Grossman 2006: 212-3). Some have criticized the effectiveness of the Niger Basin Authority, saying it was

initially effective in achieving its goals in the first two decades. However, in recent decades, the achievements are not proportionate with the amount of money that has been invested (Schmeier 2013: 90).

5.1.3 Zambezi River

The states of Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe share the Zambezi River. The eight riparians set up a governing body in 2004: the Zambezi Watercourse Commission (ZAMCOM). The Zambezi river basin is the fourth largest river in Africa. The Zambezi is disproportionately distributed between the riparian states. The largest portion of the river lies within Malawi and Zambia. Significant portions of the river flow through Zimbabwe, Mozambique and Angola. The remaining three states are home to minor parts of the Zambezi watershed. Similar to the disproportion of the river, geographic characteristics of the basin vary substantially, including rainfall, temperature and elevation, amongst others (Euroconsult Mott MacDonald 2008: 7).

Two main managing bodies preceded the establishment of ZAMCOM. The bilateral Zambezi River Authority between Zimbabwe and Zambia to manage the Kariba Dam, bordering the two countries. The Action Plan for the Environmentally Sound Management of the Common Zambezi River System (ZACPLAN) was the first multilateral cooperation effort in the river basin when Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe established it in 1987. Angola, Malawi and Namibia eventually joined in the early 1990s (Grossman 2006: 215-6). However, many of the efforts

ZACPLAN aimed to achieve were not realized because many of the signatories felt the plans interfered with their domestic development plans.

Cooperation in the Zambezi river basin played an important role in regional cooperation over shared freshwater resources. ZACPLAN is the precursor to a regional protocol created by the Southern African Development Community (SADC). The Southern African Development Community established the Protocol on Sharing Watercourse Systems in the SADC Region in 1995 (Mohamed 2003: 214). The finalized, amended version of the protocol was adapted in 2000. It covers not only the Zambezi, but also the other fourteen river basins located in SADC.

5.2 Asia

Cooperation between riparians in Asia has not been as successful in creating basinwide organizations or treaties, compared to their counterparts in Europe and Africa. The effects of the Cold War and long-standing political tension between co-riparian states have hindered formal cooperation the most in East Asia and the Middle East, respectively. Of the cases studied in this thesis, no multilateral river basins were able to reach a basinwide agreement or form a basinwide institution. The Indus Water Treaty was only successful with the assistance of the World Bank.

5.2.1 Mekong River

The Mekong River originates in China and flows through its five downstream riparians: Myanmar, Lao PDR, Thailand, Cambodia, and Vietnam. It flows approximately 4,800 km and is divided into the Upper Mekong Basin and Lower Mekong

Basin. The combination of political tensions from wars and communist administrations has limited cooperation and resource development until recently. Additionally, the structure of the Mekong River itself presents complications for cooperation within the region. The upstream-downstream dilemma takes effect in the basin, where upstream states are unwilling to participate in formal institutions.

China is an increasingly powerful state in world affairs. It's growing population and economy requires more natural resources, particularly freshwater. China holds a vast amount of power as the upstream riparian in the Mekong River Basin. The Mekong River originates in China, providing China with the capability to control the quantity and quality of the Mekong to its downstream riparians. The situation is exacerbated by the fact that China is the dominant political, military, and economic state in the region (Menniken 2007: 101-110).

Only four of the six riparian states have collaborated to create the Mekong River Commission. The Mekong River Commission was established in 1995 through the *Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin* between Cambodia, Laos, Thailand and Vietnam. China and Myanmar, the two upstream riparians have elected not to join the Commission and only participate as 'Dialogue Partners'. Unsurprisingly, cooperation has been a struggle to maintain in the region.

5.2.2 Indus River

According to the water wars rationale, India and Pakistan should have gone to war. Water scarcity, lack of funding to develop infrastructure, complete dependency on

the Indus basin, and fragile political relations all should have fueled a conflict. Nevertheless, the two states have been able to cooperate over their common resource. Animosity between India and Pakistan originated in gaining independence from their common former colonial ruler. The partitioning of the two new states has fueled many disputes between the neighbors, including control of the shared Indus River. Pakistan relies on the Indus River as its sole supply of freshwater. Consequently, as the downstream state, Pakistan must depend on India to guarantee continued flow to meet Pakistan's water needs. Conflict arose when India stopped the water flow across the border after the temporary agreements to supply water expired on 1 April 1948. Then-Prime Minister Jawaharlal Nehru of India intervened to restore the water supply and enact an interim treaty. Interim agreements between the two riparians were signed until a final treaty could be agreed upon.

A final agreement on the collective control of the Indus basin was not reached until 1958. India, Pakistan, and the World Bank – the third-party mediator – signed the Indus Water Treaty on 19 September 1960. Since Pakistan relies solely on the Indus for its freshwater supply and India has multiple sources of freshwater in the east, Pakistan received 80% of surface waters and India received the remaining 20%. The treaty divided exclusive control of the six tributaries between the two riparian; the three eastern rivers were to be controlled by India and the three western were to be controlled by Pakistan (Alam 2002: 344; Benvenisti 1996: 396).

5.2.3 Tumen River

The Tumen River, rising in Mount Baekdu, forms the borders of Russia, North Korea and China. The Tumen Delta empties into the Sea of Japan, approximately 850 km from the Japanese port city of Niigata. The river is used for a variety of purposes, including industry and transportation. It is particularly vital for the agrarian societies in the region, particularly for rice production.

Negotiations over the Tumen River Basin have been affected by political and economic trends in the twentieth century. The lack of consistent, symmetrical diplomatic relations in Southeast Asia has hindered the overall cooperation efforts in the region. Nevertheless, growing economic strength in the region, and the end of the Cold War has opened the opportunity for cooperation between the ethnically and politically diverse states of Southeast Asia (Marton, McGee, and Paterson 1995: 10). The asymmetrical economic development of the region fueled the desire to jointly develop the river basin to maximize economic potential (Kim and Wu 1998: 241).

In 1995, China, Russia, the Republic of Korea and Mongolia signed the Tumen River Area Development Project (TRADP). On a peripheral level, North Korea and Japan participated in TRADP, contrary to North Korea's pattern of external relations. The TRADP boasts an ambitious agenda to coordinate efforts in the "Natural Economic Territory." Some of the issues TRADP focuses on are tourism, transport, water supply, and investment, amongst additional concerns (Cotton 1998: 148-9).

The Tumen River Area Development Project was extended for another 10 years in 2005 and was renamed the Greater Tumen Initiative (GTI). The GTI has four member countries: China, Russia, the Republic of Korea (South Korea), and Mongolia. As typical

of North Korean international policy, North Korea elected to not participate. The signatories seek to deepen cooperation and development in the areas of trade and investment, tourism, transportation, energy, and the environment.

5.2.4 Tigris-Euphrates River Basin

The headwaters of the Tigris and Euphrates Rivers originate in eastern Turkey. The rivers run south through Syria and Iraq, spilling out to the Persian Gulf. As the hegemon of the basin, Turkey has maintained dominant control over the Tigris and Euphrates Rivers. Since the 1960s, Turkey has sought to utilize the Euphrates and Tigris rivers for its hydropower potential, increasing resource strain in an already scarce region. Turkey created the Southeastern Anatolia Development Project (GAP) to increase its hydroelectric capability. Under the GAP, a planned 22 dams would be built in southeast Turkey.

In order to receive donor funding for the project, Turkey had to guarantee a minimal water flow downstream. Commitments guaranteeing a certain amount of water discharge across Turkey's borders expired once the first dams became operational. Turkey approached donors for additional funding, however, donors required a comprehensive commitment by Turkey regarding minimum water flow to the downstream states. Once Syria and Iraq rejected Turkey's offer, Turkey began financing the GAP through domestic funds and unilaterally pursuing its water objective without consideration of its effects on the downstream states. Fruitless negotiations were held from 1970 to 1992 to reach an agreement between the three riparian neighbors.

The Tigris-Euphrates basin remains a conflictive region. Turkey has continually pursued its domestic objectives on the Tigris and Euphrates Rivers, disregarding requests from Syria and Iraq. Syria and Iraq have filed numerous claims resulting in fifteen rounds of talks, most of which have failed to produce an agreement (Zawahri 2006: 1044-9).

5.2.5 Orontes River

The Orontes River, also called Asi (Turkish) or Nahr al-Asi (Arabic), is the only river that flows north in the Middle East. The Orontes River rises in Lebanon before flowing through Syria. The Orontes forms the Turkish-Syrian border for 31 km before continuing through Turkey and discharging into the Mediterranean Sea. All three riparians heavily rely upon the Orontes River for irrigation, domestic water supply and service industries.

Syria and Lebanon have been able to reach an accord in managing their shared resource. Although the agreement never became operative, Syria and Lebanon established a joint committee to manage the annual water needs for the two riparians in 1962. Nevertheless, the upstream and midstream riparian neighbors were able to reach an effective agreement in 1994. The *Bilateral Agreement Concerning the Usage and Sharing of the Waters of the Al-Asi River (Orontes) between the Syrian Arab Republic and the Lebanese Republic* allocated 80 MCM/year to Lebanon and 340 MCM (million cubic meters) per year to Syria. The agreement also laid the foundation to settle any future disputes between the two countries.

While Syria and Lebanon were able to reach a bilateral agreement, differing points of view regarding shared resource management have challenged basinwide

cooperation. Turkey treats the Orontes as a transboundary river, over which it has absolute authority of the portion that flows within its boundary. Conversely, Syria believes the common resource should be equally shared. Disagreement over agricultural water needs, planned irrigation projects (namely dams) and quality of downstream water challenges cooperation between Syria and Turkey regarding the Orontes River (Scheumann, Sagsen, and Tereci 2011). Additionally, Turkey and Syria share more than one international river. The two states have been unable to establish consistent water policies for all their shared rivers.

5.3 Europe

From the latter half of the twentieth century through present day, the European Community and the European Union have heavily influenced water resource management. The EU Water Framework Directive (WFD), passed in 2000, provides a framework to European Union member states to adapt water policy to meet the objectives of the directive. The WFD calls for an integrated water management approach aimed at the preventive protection of shared resources in each basin. EU Environmental Policy views water resources as a heritage that must be protected to ensure the sustainable quality and quantity. The EU Water Framework Directive aims to coordinate water policies and get all European waters in “good condition” by 2015 (Dirksen 2002: 200).

5.3.1 Danube River

Home to 80 million inhabitants, the Danube watershed traverses nineteen countries, more than any other river basin in the world. These countries include,

Hungary, Austria, Croatia, Romania, Slovenia, Slovakia, Bosnia and Herzegovina, Bulgaria, the Czech Republic, Germany, Moldova, Serbia, Montenegro and Ukraine. Additionally, the Danube flows through small parts of Albania, Italy, Macedonia, Poland and Switzerland. The Danube River originates in Germany, flows through Central and Eastern Europe before emptying into the Black Sea via the Danube Delta in Ukraine and Romania. The 80 million inhabitants rely on the Danube for a variety of uses, including, drinking water, tourism, navigation, hydropower, irrigation, fishing and recreation.

With so many riparians sharing a watershed, disputes arose frequently over water development projects and their effects on the environment (Gerlak 2004: 1-2). One of the main issues in the Danube River Basin continues to be water quality. Pollution has been a contentious issue for many riparians along the course of the Danube.

The International Commission for the Protection of the Danube River (ICPDR) is the largest commission governing the Danube. It was established in accordance with *The Convention on Cooperation for the Protection and Sustainable Use of the Danube River*. Fourteen states signed the agreement in 1994: Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Montenegro, the Republic of Moldova, Romania, Serbia, Slovakia, Slovenia, Ukraine, as well as the European Community. The ICPDR provides the principal framework for environmental governance and the platform for integrated river basin management in the Danube River Basin (Gerlak 2004: 5).

5.3.2 Scheldt River

The Scheldt River, also known as Schelde, rises in northern France, traverses the Wallonia and Flanders Regions in Belgium and enters the Netherlands before discharging into the North Sea. The Scheldt River basin is densely populated and home to nearly 13 million people who rely on the river for navigation and recreation as well as for their livelihood. Approximately 60% of the Scheldt River basin is used for agricultural purposes; additionally, 13% of the basin has been urbanized with multiple cities situated on the river.

The Scheldt has a history of conflict over pollution and water use. The basin is the most densely populated river in Europe. Additionally, with a rapidly urbanizing river and a large portion of the land used for agriculture, water quality has always been of primary concern. Consequently, the three co-riparians created an organization to equitably manage the Scheldt River Basin. The governments of France, Belgium, and the Netherlands signed the *Treaty on the Protection of the Scheldt* in 1994, which established the International Commission for the Protection of the Scheldt (ICPS). The objective of the ICPS is to integrate water management to multilaterally harmonize the obligations laid out by the EU Water Framework Objective. Moreover, the ICPS aims to monitor water quality and pollution in the basin and the effects it has on the environment to quell any future disputes over water quality (International Scheldt Commission).

5.3.3 Elbe River

Some 25 million people in Germany, the Czech Republic, Austria and Poland share the Elbe. The Elbe originates in the Czech Republic and empties into the North Sea;

99% of the Elbe Basin lies in Germany and the Czech Republic. From the end of WWII to the fall of the Berlin Wall, there was hardly any cooperation between the (then) three main riparian states. Despite attempts by West Germany to foster cooperation, heavy pollution by the German Democratic Republic and Czechoslovakia caused the Elbe to be one of the highest polluted rivers in Europe by the late 1980s. The possibility of international cooperation emerged with the end of the Cold War. Five days after the reunification of Germany, Germany and the Czech Republic signed the *Convention on the International Commission for the Protection of the Elbe* on 8 October 1990. The main objective of the commission was to reduce the pollution of the Elbe River in order to utilize the river for drinking water, while subsequently reducing the pollution of the North Sea from the Elbe discharge (Lindemann 2008: 133).

5.3.4 Kogilnik River

The Kogilnik River is a bilateral transboundary river, flowing between Moldova and the Republic of Ukraine. The river basin area is split nearly in half between the two riparian neighbors, with 57.82% of the Kogilnik basin lying in Moldova, and the remaining 42.18% in Ukraine (Wolf 2002: 22). The governments of Moldova and Ukraine signed the *Agreement between the Government of the Republic of Moldova and the Government of Ukraine on Joint Use and Protection of Transboundary Waters* in 1994. This agreement not only covered the Kogilnik River, but also all groundwater and other rivers shared by the two neighbors.

5.3.5 Dnieper River

The Dnieper River is the third largest river in Europe, running 2,200 km before emptying into the Black Sea. The river is shared by Russia, Belarus and Ukraine. Ukraine is heavily dependent on the Dnieper River as a water resource: 22 million of the 33 million people living in the Dnieper watershed reside in Ukraine. One of the major concerns of the Dnieper basin is water quality and the environment. Eight nuclear reactors, including the still-operating Chernobyl – lie within the Dnieper drainage system. The Chernobyl nuclear disaster of 1986, combined with poor waste treatment, intensively farmed areas, and additional spills of contaminated wastewater into the Dnieper have all led to high degradation of water quality in the watershed. While each riparian has developed interior departments or ministries aimed at preserving the Dnieper, the three neighbors have not established a basinwide institution or treaty. Nevertheless, the states have signed three bilateral treaties aimed to preserving the Dnieper River. Bilateral treaties between Russia and Belarus, Russia and Ukraine, and Belarus and Ukraine have been signed (United Nations and Economic Commission for Europe 2011).

Chapter 6: Discussion

To test the effect certain institutional mechanisms have on increasing the security in international river basins, this thesis examines thirteen river basins in Europe, Asia and Africa. A sample of three river basin organizations and two international rivers with treaties but no river basin organization is taken from each continent, with the exception of Africa. Due to limitations of data availability and the lack of river basins with a treaty only and no river basin organization in Africa, only three river basin organizations are examined. Both bilateral and multilateral basins are examined in order to compare institutional structure within different types of basins. While a number of states in these river basins have implemented multiple agreements throughout the past century, the most significant basinwide, or near basinwide, treaty is examined since it has the greatest impact on the basin.

This thesis is concerned with the effect river basin agreements have on international security within international river basins. International security is measured by using the International Water Event Database's BAR scale. As defined by TFDD, the BAR scale ranges from -7, representing a declaration of war, to +7, representing voluntary unification into one state with a common purpose to act in cooperation. However, based on the nature of the international system, I do not anticipate this to occur. An international river basin with an average basinwide BAR scale score of at least +1 is considered to be a secure river basin. Whereas, a score -1 to -7 represents an unstable river basin. A basin scoring 0 is a neutral basin. For the purposes of this thesis, a difference in the BAR scale score of 0.500 or higher is considered significant.

This thesis tests for the effectiveness of four separate institutional design features in increasing international security. In the first section, each variable is first examined to understand the role it plays in international security in shared river basins. The BAR scale score for each river basin with the mechanism is averaged to find the mean of the score for each mechanism. Those basins that contain the design feature are compared to the river basins that do not include the design feature in their agreement. In the following section, each variable is controlled for three external variables to further analyze the effects the variables have on security within shared river basins.

6.1 Institutional Structure

The four institutional structures this thesis studies were chosen based on the emphasis they are given in the examined literature. The capability of river organizations and treaties to adapt to changing environments, maintain compliance through enforcement and monitoring mechanisms, employ methods to manage disputes among riparian states and transmit data are presented in the literature as adding great value to the success of the RBO or treaty in achieving its objectives and maintaining cooperation. The purpose of the thesis is to apply these concepts to international security. Whether the theories supporting the importance of the four institutional mechanisms can be applied to international security is especially important in a world of climate change and decreasing freshwater supplies. In a world of impending water wars, it is important to understand which institutional structures can foster the greatest peaceful cooperation in a river basin.

6.1.1 Adaptability

The hypothesis anticipated that the presence of an adaptability mechanism would increase the overall security of international river basins. The needs and relationships between states are not static; they change over time as a result of many factors, such as economic prosperity, stability in the region, relations over other issue areas, etc. Consequently, it is important for parties to a treaty or organization to include methods with which they can amend the agreements to suit their needs as time changes. The inability to redefine or amend treaties poses the risk of creating an environment in which states party no longer approve or respect the treaty. If a party can no longer honor the treaty because it conflicts with other needs or policy initiatives, it may altogether desert the treaty because it cannot be altered. To measure adaptability of agreements, the amendment variable from the International Freshwater Treaties Database (IFTD) is used. IFTD considers a treaty to contain amendment ability if the text of the treaty mentions the possibility for amendment.

Six out of the thirteen basins examined possess an article that incorporates an amendment process into the treaty. The data demonstrates that a basin that incorporates adaptability mechanisms into its treaty is likely to have higher security within the river basin than those that do not. These river basins increased on average by 0.423 on the BAR scale. The basins with amendment abilities BAR scale averaged +2.366 after signing an agreement with the capacity to amend the treaty.

Conversely, basins that did not include an amendment provision saw a slight decrease in the Basins At Risks score. Before implementing the agreement, the basins that did not include an amendment article had an average BAR scale score of +1.645.

After signing the treaty, the score dropped to +1.537. The absence of a means to amend the river basin agreement impacts the security within the basin by -0.829 on the BAR scale.

The capacity to alter the agreement to suit the ever-evolving needs and political situations in river basins is key to increasing the overall stability and security in the basin. International river basins that are rigid in their agreements are less than ideal for maintaining cooperation in the basin. When a treaty has been outdated, it is easier for a treaty to be updated and revised when it has amendment mechanisms.

6.1.2 Compliance: Monitoring and Enforcement

The nature of the international system gives states sovereignty over their territory and affairs. States are not obligated to engage in relations with other states. When states do elect to engage in relations with other states, they are not required to remain party to the treaty or convention. Nevertheless, states often adhere to the international treaties that they sign. A number of theories pose different explanations for why states tend to respect the agreements they sign.

For this thesis, compliance focuses on whether the inclusion of specific compliance mechanisms increases cooperation. When states sign an agreement, there is no overarching, international enforcement mechanisms forcing states to comply with the agreement or preventing states from defecting. One way to incentivize states to adhere to the agreements they make is to include mechanisms built into the treaty mandating compliance through enforcement mechanisms. Enforcement mechanisms can take the

form of monetary fines for trying to cheat or not comply with the provisions of the agreement.

Additionally, parties may opt to create monitoring mechanisms to ensure all parties are implementing the provisions outlined in the agreement and are not reporting false data and information. This thesis analyzes the inclusion of enforcement mechanisms and monitoring mechanisms as a method of encouraging compliance from the states party. The effect of compliance mechanisms on the security within the basin is measured by comparing basins that included enforcement provisions or monitoring provisions as well as basins that included both types of compliance mechanisms in their agreements. The International Freshwater Treaties Database codes an agreement as having an enforcement mechanism and monitoring mechanism if the agreement includes an article with the mechanism.

When the two compliance mechanisms are analyzed together, the security in the shared basins increased by nearly a half point after agreement implementation. However, contrary to the initial hypothesis, the BAR scale score of basins with any type of compliance mechanism was on average approximately a half point lower than basins that did not introduce mandated compliance to the agreement. Nevertheless, when the two compliance variables are analyzed separately, the data shows that the types of compliance mechanisms included in the agreement have different effects on the BAR scale within the river basins.

Contrary to initial predictions, basins that included a monitoring mechanism saw a decrease in the BAR scale score after signing the agreement. On average, the BAR scale decreased by 0.717 points from before the agreement existed. Additionally, basins with a

monitoring mechanism scored significantly lower than basins that excluded it in the agreement. Conversely, the hypothesis is upheld when the enforcement mechanism is isolated. River basins that included an enforcement mechanism saw a significant increase in the BAR score scale by an average of 1.609 points. Compared to basins enforcing the agreement, being an international river basin without an enforcement mechanism impacts the score by -0.415.

The Indus Water Treaty is the only treaty of the agreements studied that included both an enforcement and a monitoring mechanism in the agreement. While the sample is not large enough to offer valid conclusions, it is interesting to note that the BAR scale score of the Indus River basin increased the most compared to the BAR average of basins that included only a monitoring mechanism. After implementing the agreements, the Indus BAR scale was 1.266 points higher than basins with only monitoring mechanisms. The Indus River and the Niger River basins are the only two cases that included an enforcement mechanism. The two basins had comparable levels of international basin security after implementing creating the river basin organization.

6.1.3 Dispute Mechanism

According to the literature, including a dispute mechanism is important to maintaining cooperation in international agreements. It provides the opportunity to peacefully resolve disagreements between parties to an agreement. It also reduces the uncertainty of the anarchy of the international system. This thesis predicts that the inclusion of a dispute mechanism will increase the overall security of international river basins compared to basins that do not include a dispute mechanism in it agreement.

Six of the river basins that were examined mentioned a dispute mechanism: Danube, Indus, Mekong, Zambezi, Orange-Senqu and Niger. Contrary to the initial hypothesis, the river basins with a dispute mechanism did not significantly impact the security within the basins. These six cases on average scored 0.442 points lower than those basins without a way to resolve disputes.

Collectively, the basins including this type of agreement characteristic saw, on average, a decrease in the BAR scale score after implementation of the agreement. Half of the river basins – the Niger, Danube and Indus – increased in security. Conversely, states that did not formalize a method to resolve disputes had an increase of nearly half a point in their score. Generally, including a dispute mechanism in an international river agreement will not guarantee an increase in security within the river basin. The fact that dispute mechanisms were only present in river basin organizations may explain why the mechanism did not have an effect on the BAR scale score. The higher level of interdependence automatically creates an environment in which dispute must be resolved in order for the organization to function. Additionally, some of the RBOs that did not include dispute mechanisms may use *ad hoc* dispute mechanisms to resolve disagreements instead of having a formalized process.

6.1.4 Data Exchange

An important factor in fostering cooperation and increasing security within international river basins is effective exchange of data between co-riparian states. Diligent and accurate data and information exchange is essential to properly implement programs and projects, such as building dams. Additionally, downstream states would not

be able to efficiently prepare for a potential flood if their upstream counterparts do not disclose accurate data regarding water quantity levels or any relevant information regarding the building of or malfunction of dams. The initial expectation predicted that the inclusion of a data exchange mechanism would increase the overall security of international river basins.

Nine of the cases studied included articles in their agreements that pertain to data and information exchange. Those basins that do not include the mechanism in the agreement are significantly less secure than the basins that do include the mechanism. River basins that include a data exchange mechanism in their agreement have a positive impact of 0.410 points on the BAR basin scale over basins that do not mandate data and information exchange between members. Data exchanged that is overseen by an organization or agreement increases the trust and transparency between member states, thus increasing security in the basin.

6.2 Control Variables

Additional factors may affect the extent of the influence the four institutional design features have on the security in international river basins. Three control variables were tested for to further analyze the implications of the four explanatory variables under the three conditions. The variables are first controlled for whether the agreement created an institution or not. Certain design features may play a different role in the type of agreement it is included in. The participation level is also controlled for as a factor that may alter the behavior of the four institutional mechanisms. Finally, the state regime type is tested for to confirm or debunk if the democratic peace theory places a role in

international river basin security. Each explanatory variable is broken down into subsections categorized by whether the control variable is present. The two subsections' BAR scale score are compared to analyze the influence the three control variables have.

6.2.1 Treaty vs. Body

Of the thirteen river basins examined, the treaties of four of the basins did not establish a river basin organization: Dnieper, Kogilnik, Orontes and Tigris/Euphrates river basins. In general, the creation of a river basin organization has a positive effect on the general security of the basin. On average, river basins that created an organization increased their BAR scale score by 0.601 points after implementation of the agreement. Conversely, basins that signed an agreement that did not create an RBO had a substantial decrease in the BAR scale score after implementation; the average score decreased by 0.809 points. Signing an agreement that does not create a river basin organization impacts the overall security of the basin by -1.409 points on the BAR scale score.

None of the basins without an organization – Dnieper, Kogilnik, Orontes and Tigris/Euphrates – included an amendment article in their treaty. Out of the nine RBOs examined, one third of the cases did not write in an amendment process. The six basins that did include an amendment process had an average BAR scale score of +2.366. However, compared to river basins with RBOs that did not include an adaptability mechanism, the inclusion of an amendment process in a river basin organization was insignificant in increasing the security of the basin. By including an amendment process in RBOs, the score was barely higher (0.087) than excluding it. Nevertheless, the BAR scale score grew by 0.454 points for RBOs that did include the mechanism. While basins

that included the mechanism may not be more secure than those RBOs that did not include the variable, by incorporating the amendment process into the agreement, the basins were able to increase the security relative to the absence of the agreement in the basin.

The data suggests that having a river basin organization with or without the mechanism over having an agreement significantly increases the security of the basin. Having a river basin without an institution and without adaptability impacts the BAR scale score by -1.386. The absence of the structure provided by institutions may decrease the likelihood for riparians to put in the effort to adapt their relations, and they may instead abandon the agreement altogether.

When the two compliance variables are analyzed together, the results align with the initial predictions when they are controlled for institutionalization. Non-river basin organizations are significantly less secure than those basins with RBOs. The BAR scale score is negatively impacted by 2.277 points for non-institutionalized basins compared to their institutionalized counterparts. However, when the compliance mechanisms are analyzed separately, one mechanism supports the hypothesis, while the other is inconclusive.

Only two agreements from the sample included an enforcement mechanism to encourage compliance. Both agreements occurred in basins – Indus and Niger – that had a river basin organization. While being unable to compare with basins without an organization, it is important to note that the BAR scale remained on the positive side for the two river basins. The average of the two basins significantly increased by 1.609 points after the states implemented agreements with enforcement mechanisms.

The second compliance mechanism under examination is present in both basins that created an organization and basins with only a treaty. The difference between agreements that included monitoring mechanisms is highly significant between basins with and without RBOs. On average, a basin with an enforcement mechanism without a river basin organization is negatively impacted by -1.852 points less than their RBO counterparts. Those basins that do not have a river basin organization have BAR scale score of -0.417 and are considered conflictive basins.

Similar to enforcement mechanisms, dispute mechanisms were only present in basins that had a river basin organization. The average BAR scale score remained on the positive side with an average score of +1.777. The river institution with the lowest score was the Mekong with a little less than +1.000. Four of the six basins had scores of +2.00 or higher. Compared to other river basins with RBOs but no dispute mechanisms, those with dispute mechanisms had a lower BAR scale score. Nevertheless, both RBOs with and without a dispute mechanism had a significantly higher score than the basins without dispute mechanisms and without a river basin organization.

Institutionalized cooperation creates a formal environment to manage relations between states. Institutionalization requires more time, effort, and money to maintain the agreement. The deeper cooperation and interconnectedness involves more frequent meetings and funding to operate the institutional structure itself, presenting more opportunities for disagreements over administrative issues to occur. Dispute mechanisms can cover administrative disagreements, in addition, to the traditional realist disputes that arise between states. Whereas treaties are more easily dismissed, states would naturally

be more interested in preserving the intricate organization that required so much effort to create.

Both institutionalized and non-institutionalized river basins incorporated data exchange in their agreements. However, the data significantly impacts the BAR scale score between river basins that have a governing organization and those that do not. Having an RBO impacts the data exchange score by +1.419. The structured interactions that riparian relations have under river basin organizations increases the reliability and trust in accurate data and information sharing between members. Consequently, the members are more apt to cooperate and participate in the exchange. Accurate data and information exchange can increase the efficiency of project implementation and decrease the concerns downstream states may have over water quantity and quality; thus, reducing or buffering the intensity or frequency of disputes.

6.2.2 Participation

The number of states party to an agreement relative to the number of states within the entire basin may play a role in the effectiveness of treaties and the overall security within the basin. If not all states are members of the governing basin organization or signatories to the treaty, they are not obligated to adhere to provisions outlined under the treaty. Moreover, they are not obligated under international law to cooperate or seek peaceful solutions with their co-riparian neighbors. Consequently, the possibility of an increase in conflict rises. Cases where not all states within a basin participated in the agreement were purposely chosen to compare whether basins with 100 percent

membership are more effective in international security than basins with partial participation.

Six of the thirteen cases examined have 100 percent of basin states party to the basin's agreement: Kogilnik, Schedlt, Indus, Zambezi, Orange and Niger. The initial hypothesis predicted that basins with full participation of all states that share the river would be more secure than the basins in which only a portion of the states signed the agreement. The six basins that had full participation in the agreement had on average a half point increase in the BAR scale score after signing and implementing the agreement. Conversely, the seven basins that did not have full participation had on average a slight decrease in the basin BAR scale score. The basins with full participation had on average almost 0.300 points higher than those that did not have full participation.

The six basins that included adaptability mechanisms in the agreements were split on the number of states party to the agreement. The three African basins had full participation, whereas, the Elbe, Mekong and Danube had partial participation. The security in the three African river basins was sustainably higher than in the Elbe, Mekong, and Danube. Basins in which all riparian states of the basin participated and had adaptability mechanisms averaged 0.644 points higher than basins in which only a portion of riparian states participated.

Similar to the effect that the absence or presence of a river basin organization has on compliance, basins that had full participation of all riparian neighbors had more success in international security compared to the basins with only partial riparian participation in the agreement. In the comparisons of any type of compliance mechanism and the individual mechanisms, the basins that had full participation had more secure

basins than those that did not have full participation. Those that had full participation had on average 1.229 more points than the basins with partial participation. The hypothesis also holds up when the two compliance mechanisms are isolated.

As expected, the inclusion of formal monitoring mechanisms in relations between riparian neighbors had a greater impact on the basins that have full participation of states than basins with only partial participation. By fostering compliance through monitoring states party's implementation of the agreement and other basinwide provisions the BAR score is 1.205 higher than the basins that do not have full participation.

The Indus and Niger basins are the only two of the thirteen cases examined which had an enforcement mechanism in place. In both instances, all riparian states of the basins participated in the Indus River Commission and Niger Basin Authority, respectively. While unable to compare with basins that have partial participation of states, it is important to note that relations in both basins remained, in general, peaceful and cooperative. In both cases, the BAR scale score increased after the agreement was implemented.

The results from the data regarding the presence of a dispute mechanism support the hypothesis that full participation of all states within the basin increases the overall security of the shared river basin. The basins in which all riparian states were party to the agreement increased the mean by nearly nine tenths of a point. Basins with partial membership remained at +1.033, while basins with full membership averaged a score of +2.143. Basinwide engagement in dispute resolution is likely to increase the security of the river basin. When only part of the basin is party to an agreement, only that part is able to structurally confront the disagreement. The co-riparians outside the agreement are not

obligated under an international treaty to resolve their disagreements, even if the other riparian is a party to the basin's agreement.

Contrary to the other structural mechanisms, neither basinwide nor partial basin participation has a substantial effect on the BAR scale score in basins with formalized data exchange. The score difference between basins with full participation and those with partial was 0.147 points. Although the basins with 100 percent participation are only slightly more secure, it may be higher because data and information exchange will increase transparency and cooperation between states party in the basin.

6.2.3 State Regime Type

According to the Democratic Peace Theory, democracies cooperate more with other democracies than different governing authorities. The shared values and greater transparency increases the trust, and therefore, ease of reaching an agreement. This Democratic Peace Theory is controlled for to test whether the regime type of the states within a river basin has an implication for the agreements within a shared river basin. I anticipated that the type of governing authority would not adversely affect security within the basin, since cooperation is mutually beneficial to all parties regardless of regime type. The cases were split with six democratic river basins and seven anocratic river basins. However, the data shows that, in general, democracies tend to have more cooperative relations.

The data suggests that, overall, democracies have a significantly higher BAR scale score (+2.562) than anocracies (+1.398). When separated from other anocratic basins, autocratic basins had a BAR scale score of +2.333, much higher than the

anocratic basins as a whole. Not only are democratic basins more secure in their inter-state relations, these six river basins' average BAR scale score increased significantly after signing an agreement. The score increased by 1.027 points. Whereas, anocratic basins had a substantial dip in their BAR score by -0.571 points. Additionally, it is interesting to note that RBOs were created in basins regardless of whether the basin is democratic or anocratic.

While state regime type have significant correlation in the overall security of river basins, the security also varies significantly between democratic and anocratic basins that include an adaptability mechanism in their agreement. The democratic basin will be, on average, 1.355 points higher on the BAR scale than its anocratic counterparts. The difference between democratic and anocratic river basins could be the result of the higher level of transparency in democracies.

The data also demonstrates a consistency for basins with compliance mechanisms. In general, democracies have a higher BAR score, by 0.761 points, than anocracies in basins with any type of compliance mechanisms. When isolated, the one compliance variables does not support the hypothesis. The difference is negligible between democracies and anocracies with enforcement mechanisms. On the other hand, anocracies with monitoring mechanisms have a significantly lower score – a difference of 1.427 – than democracies.

Unlike adaptability and enforcement mechanisms, the presence of dispute mechanisms in democratic river basins hardly differs from the anocratic river basins. Democratic river basins had an average score of +1.790, whereas, anocratic river basins

had an average score of +1.755. Whether a river basin incorporated a dispute mechanism is enough to maintain cooperation, regardless of state regime type.

Similar to the presence of an adaptability mechanism, whether a river basin is democratic has a significant effect on river basins that formally exchange data and information. Democratic river basins that exchange data and information are much more secure than anocratic basins that include the mechanism. The difference between the two is nearly 1.500 points. The greater level of transparency democracies offer increases the likelihood and accuracy of data reporting.

6.3 Summary

This thesis tested for the impact certain design features have on security within international river basins. The initial hypothesis anticipated that the presence of the four mechanisms – adaptability, compliance, dispute and data exchange – would increase the security of international river basins. These basins would have a more secure river basin than those basins that did not include the mechanisms in their agreements. Overall, the findings for two of the four mechanisms uphold the hypothesis. International river basins that included amendment and data mechanisms had a significantly higher BAR scale score than the basins in which the mechanisms were absent from the agreements. The results showed hardly any difference between river basins that included a dispute mechanism and those that did not. The results suggest that river basins that included compliance mechanisms in the agreement had a lower BAR scale score than those that did not include the mechanism. However, when the two compliance mechanisms are analyzed separately, one variable supports the hypothesis, whereas the other does not.

The BAR scale score is significantly lower in basins that included monitoring mechanisms than those that did not. Conversely, basins that had an enforcement mechanism in the agreement had a substantially higher score than those that did not. The Democratic Peace Theory may explain why the monitoring BAR scores were lower than expected. The Mekong and Orontes river basins included monitoring mechanisms. They are both anocratic river basins with significantly low BAR scale scores – a difference of 1.427 points compared to the democratic basins with monitoring mechanisms.

The four explanatory variables were controlled for the presence of a river basin organization, the number of states participating in the agreement and the state regime type of the states party to the agreement. Overall, river basin organizations increase the security of river basins, compared to the basins that have only a treaty. The data supports the hypothesis that the presence of compliance and data exchange mechanisms in river basin organizations will incite more secure basins. The BAR scale score increases in both variables, including when the two compliance mechanisms are analyzed separately. It is interesting to note that only river basin organizations included enforcement mechanisms in the agreements. Additionally, adaptability and dispute mechanisms cannot be controlled for because they are only present in river basin organizations.

The data shows that full participation of all riparian states in a river basin increases the overall security of the basin. When the variables are controlled for, three support the hypothesis. The river basins that had 100 percent participation of riparians and included amendment, compliance, or dispute mechanisms in the treaty had a higher BAR scale score than the basins that had only partial participation. The basins that had full participation and a data mechanism did have a slightly higher average score than the

basins with partial participation. However, the difference was not high enough to classify it as conclusive.

The hypothesis anticipated that state regime type would not play a role in the security of international river basins. Nevertheless, the data shows that democratic river basins tend to be more secure than anocratic, upholding the Democratic Peace Theory. The compliance mechanism is the only variable that state regime type does not play a role.

Chapter 7: Conclusion

Water security is a rising topic of concern for international security scholars. The increasing global population, coupled with climate change, leads to an increased strain on a diminishing resource. A growing population requires more water from a resource that is restricted in quantity. Moreover, the cyclical seasonal and annual changes in the water quantity of internationally shared rivers cause periods of low supply in areas of high demand. Strained basins are at greater risk for conflict that could escalate to armed conflict. The threat of impending water-wars has the potential to become a very real issue if states cannot cooperate over shared resources. Consequently, co-riparian states must collaborate to seek a solution to an important security issue.

This thesis sought to examine how international river agreements can be best crafted to promote the greatest level of cooperation and security in transboundary river basins. It analyzed a sample covering three large regions of the world and included varying types of agreements that covered an array of issue areas. A broad case selection offers a comprehensive analysis that can be applied to all types of river basins worldwide. The scope and number of international river agreements has increased in recent decades; therefore, it is important to understand the nature of all types of international river agreements.

Examining thirteen river basins across Africa, Europe and Asia, this thesis tested the hypothesis that the international river agreements that included specific institutional design features in the agreement would improve the security of the river basin. The hypothesis stated that the basins that created agreements incorporating adaptability, compliance, dispute and data mechanisms would be more secure than those with

agreements that did not include the design features. This thesis then controlled for three additional factors to further analyze the effects the agreements have on the thirteen cases. I anticipated that those basins that had established river basin organizations, those that had full participation of all states that shared the river or its tributaries would be more secure. Additionally, I anticipated that the state regime type of the members of the agreement would not affect the security of the river basin since cooperation over shared resources is mutually beneficial to all parties involved.

The results show some slight inconsistencies with the expectations. The data from two of the four institutional mechanisms do not support the hypothesis that the inclusion will boost the security of international river basins. The inclusion of compliance mechanisms or dispute mechanisms did have a higher BAR scale score of the cases examined. In fact, the score was lower for the basins that included compliance mechanisms than those that did not. However, the data shows that the type of compliance mechanism impacts the security of the basin. The more peaceful basins included enforcement mechanisms, whereas, monitoring mechanisms appeared more often in basins with a significantly lower score. When creating an agreement to manage river, co-riparian states should take into consideration the types of compliance mechanisms that would most benefit the specific basin.

Dispute mechanisms, overall, did not impact the security of the basins examined. However, it is interesting to note that dispute mechanisms were only present in basins that established a river basin organization. According to the data, RBOs are, in general, more secure than the basins that signed an agreement without creating an organization. The higher level of cooperation necessary to establish and maintain an RBO may explain

why including a dispute clause did not increase the security of the basin. The member states are already prepared to settle disagreements and cooperate to ensure that the organization survives and thrives.

The data for two institutional mechanisms did, nevertheless, uphold the predictions. The exclusion of amendment and data mechanisms negatively impacts the security of international river basins. Those basins that included the mechanisms had a significantly higher score than those that excluded the mechanisms. In particular, river agreements that included an amendment variable increased the security of the basin by over 0.800 points after the agreement was signed. Those agreements that included a data mechanism also increased after implementation, but not as significantly as the amendment variable.

The four variables had slightly different outcomes when controlled for the three control variables, compared to the comprehensive analysis. Regardless of inclusion of the explanatory variables, river basins are more secure when a river basin organization is created. The basinwide security level is more likely to increase if the river basin organization includes the four design features studied. The RBOs that included mechanisms consistently had higher scores than the RBOs that excluded the mechanisms in their agreements. It is interesting to note that only river basin organizations included adaptability and dispute mechanisms in the agreements. These two mechanisms were not present in any non-RBO agreements. To gain a better understanding of the role of adaptability and dispute mechanisms, future research could expand the case selection to include non-RBO agreements that incorporated the two variables into the agreement.

The data supports the hypothesis that full participation will lead to higher levels of cooperation. When all states within a basin partake in the agreement, the security of the basins is likely to increase. River basins in which all co-riparian states participated in the agreement and included adaptability, compliance and dispute mechanisms had a higher average BAR scale score than those basins that did not have full participation. When all the states are included, each state is able to propose its own policy objectives and can voice its concerns. The members of the agreement can then shape the goals and provisions of the agreement to best accommodate all states, thus aligning basinwide objectives and increasing cooperation. Mandated data exchange did not significantly affect the security of basins with full participation, compared to those with partial participation. The score of basins in which all riparians participated was only slightly higher. The expectation of data exchange in any type of basin is likely to increase the security, regardless of how many members participate.

Contrary to the initial expectations, state regime type plays a role in the security of international river basins. The Democratic Peace Theory is upheld in environmental security. International river basins with primarily democratic states party to the agreement were overall more secure in their intra-basin relations. The democratic basins that included adaptability, dispute and data mechanisms in the agreements had a higher score than those without the mechanisms. Interestingly, the inclusion of compliance mechanisms in democratic basins did not increase the security. The democratic basins are likely more able to maintain cooperation because they share the same values and visions of the basins. Democratic states are also used to the bureaucracy that international law entails, and are thus willing to support the process. Therefore, compliance mechanisms

are not essential in democratic basins to maintain cooperation. The anocratic basins that included enforcement mechanisms in the agreements had a significantly higher BAR scale score than those anocratic basins that did not have a means to enforce the international law. When creating an agreement in anocratic basins, policy makers should consider including an enforcement clause. However, monitoring mechanisms do not seem to increase security in anocratic river basins. It is important to further analyze the effects of compliance mechanisms in anocratic river basins to develop future river basin agreements.

Overall, the data suggests that to maximize security in river basins, co-riparian states should establish a river basin organization that includes adaptability, compliance, dispute and data mechanisms. The RBO should also seek to include all states that share the river and its tributaries in order to increase cooperation within the basin. If some states are not included in the river basin organization, cooperation is likely to decrease since the states unilateral domestic policies may not be aligned with the organization's goals for the basin that would be beneficial to the basin as a whole. Even though state regime type is an external factor that cannot be easily altered, the river basin organization is more likely to be successful if the member states are mostly democracies and not autocracies or isocracies.

This research is intended to be used as a starting point to further explore the success of different structures and institutional design features of international river agreements. To further the findings, increasing the sample size within the three continents, as well as increasing the case sample to include all regions of the world could

expand the research in this thesis. Examining all regions of the world would provide a more accurate universal theory to apply to future international river agreements.

The number of river basins with both enforcement and monitoring mechanisms in the agreement limited the sample. Expanding the sample of basins that included both types of compliance mechanisms in their treaties would provide a more accurate picture of the effects of the inclusion of both design features in agreements. Additionally, it would be important to further analyze the types of compliance mechanisms that are used in the agreements and which are the most effective. This thesis analyzed only two types of compliance mechanisms. However, there are a number of additional features to include in agreements. Exploring these additional variables would provide international policy makers with the necessary information to select the most effective tools to include in future agreements or amend current agreements to include the most appropriate mechanisms.

It is interesting to note that the regions with high political tensions between the riparians seem to have the lowest security within international river basins: the Orontes/Asi (-0.417), Mekong (+0.933) and the Tigris (+0.003). These three river basins all lie in Asia. Additionally, all three river basins do not have 100 percent participation of riparians. Research analyzing the effect overall inter-state relations between co-riparian countries have on cooperation of international rivers would be helpful to understand the nature of environmental politics in conflictive regions. The four variables may play a different role in different regions of the world. Additionally, a further analysis of the effects the mechanisms have in different regions of the world would be beneficial to

understanding if different mechanisms play a different role in different regions of the world.

The findings of this thesis are important for both policy makers and scholars. Policy makers can use the results while shaping future agreements and amending current ones to suit their goals. The findings contribute to the literature surrounding design features of international river institutions. However, further analysis would increase the understanding of the effects agreements have on environmental security.

River basins across the world vary by the size, number of riparian states in the basin, climate of the region, state regime type of riparian states, amongst other external factors. The agreements co-riparian states create to govern the shared resource must be shaped to suit the unique factors of the basin. However, certain design features of the agreement seem to positively affect the security of the river basin. Policy makers should take these features into consideration when shaping future international river agreements.

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