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Evaluating Sustainable Decision Making on Water Resources: Comparing Cooperation Around the Aral Sea and Penobscot River

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EVALUATING SUSTAINABLE DECISION MAKING ON WATER RESOURCES:
COMPARING COOPERATION AROUND THE ARAL SEA AND PENOBSCOT
RIVER

by

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A Thesis Submitted in Partial Fulfillment
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ABSTRACT

Natural-resource security is an increasingly important area of international affairs. While there is a great deal of cooperation at the international level between actors with a stake in shared natural resources, there is also contention. Military and security issues can arise out of the coming together of nations over natural resources. A waterway or reservoir that is abutted by one or more nations can be problematic. This study seeks to clarify processes surrounding two specific examples of water-resource decision making involving state and non-state actors. The following questions guide my research: 1) How do international cooperations focused on water security work? 2) What, in the context of international cooperations focused on water security, does peace mean? 3) How and to what extent do these cooperations advance peaceful outcomes for water security? This thesis intends to develop a greater understanding of cooperation and conflict around natural resources and also contribute to knowledge about peace processes in this important area of international affairs.

My methods are based on and build from my social science research experience with the Future of Dams project which is a National Science Foundation project to understand and support linking knowledge with decision making about dams. In this research, I look at media articles to analyze discourse around negotiations and interactions around shared waters. My case study and cross-case comparison focuses on two specific cases. The first draws from interactions in the Aral Sea basin where states are cooperating to deal with the fallout of historically intensive irrigation practices that decimated the sea. The second focuses on the Penobscot River where a recently completed dam-removal project is being heralded as a new standard in collaborative

decision making around natural resources. Through my analysis, I discover some general trends in decision making on shared water resources and how actors can achieve successful outcomes. These insights arise from considering the similarities and differences between these two cases.

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES	vi
CHAPTER ONE: INTRODUCTION	1
CHAPTER TWO: LITERATURE REVIEW	7
CHAPTER THREE: METHODS	28
CHAPTER FOUR: ANALYSIS AND DISCUSSION	36
CHAPTER FIVE: CONCLUSION	66
REFERENCES	70
AUTHOR'S BIOGRAPHY	74

LIST OF FIGURES AND TABLES

Table 1. Definitions and justifications for codes.	40
Figure 1. Frequency of applied codes.	46
Figure 2. How many articles each code appeared in.	47

CHAPTER ONE

INTRODUCTION

Water is a vital resource, and one that faces increasing pressures due to many types of intersecting global changes in ecosystems, economies and societies. Given human reliance on water, our abilities to collectively govern this important resource are essential to our survival. Yet cooperation on issues of water sustainability and security is a complex challenge. On the one hand, “realists” of the world are skeptical that people are motivated by anything but survival and personal fulfillment. Others, optimistic in their assessment of the world, identify cooperation as a natural result of humans’ conscious or unconscious realization that the best collective outcomes are achieved when constituent members give and take, negotiate their differences, and realize common understandings. Cooperations on an international scale between states, organizations, and businesses can offer a unique set of analytical challenges to students of global affairs. We can ask ourselves why people cooperate, what elements of a decision-making process produce a successful — and peaceful — outcome, and how we can encourage positive relations. As the 20th century demonstrated and the 21st continues to stress, we live a world where every day we as distinct collectives of humans are forced into closer proximity. Many have attributed the shrinking of temporal and effective distance of communications and relations on Earth to the advent of new technologies which eliminate historical hurdles to interaction created by geography, but there are other forces at play that bring our common goods under threat.

Every year, climate change tightens its choke-hold on our shared natural resource,

and we humans are increasingly forced into the same corner, unable to find solutions without consulting with and understanding one another. As this process has become a larger subject of public discourse, climate change has brought about a new interest in the intersection of environmental studies and international relations. How this process will affect states on a global scale is a pressing issue in today's world. Many anticipate a heightening of tensions, especially in areas where natural resources are already a contentious issue. Some predict that as humanity waged wars over oil in the late-20th and early-21st centuries, so too will it wage war over water for the first time in the near future (Amery, 2002). The future trend is largely agreed upon: international relations in areas where natural resources are currently stressed will only heat up as time goes on.

In one area of the world, this principle plays out in to a heightened degree. What once constituted the Aral Sea, now largely a dried-up seabed with rusting hulls protruding from the dust like crumbling skyscrapers, was the subject of gross human abuse in the 20th century. In need of Uzbek cotton, the central government of the Soviet Union initiated incredibly intensive irrigation and environmental manipulation projects starting halfway through the century. Played out over decades, this process harmed the ecosystem of the region in which roughly 46 million Central Asians live (United Nations, 2011). Today, actors in the region — predominantly international organizations, businesses, and the states of Kazakhstan, Uzbekistan, and Russia — must reckon with the long-term instability seeded by this period of mismanagement. These actors have build infrastructure, negotiated through international forums, and crafted policies to reflect a shifting regional context. A 2005 dam project bankrolled by the World Bank and Kazakh government on the Syr Darya River — which feeds into the still waters of the small

North Aral Sea — was heralded as a success for a region that has faced so many setbacks. Still, efforts to cooperate are sometimes bogged down by power dynamics, geographical differences, and political and financial obstacles. The Aral Sea of today is a zone of dynamic negotiations whose nuances, good and bad, require deep analysis to fully understand (Elhance, 1997).

At the same time, on the other side of the planet, a recent multi-party river restoration initiative is being heralded as the new standard for cooperation in sustainability initiatives. Lasting for more than 15 years, the PRRP saw the coming together of multiple actors with different agendas and, remarkably, their success in crafting a solution to issues regarding the Penobscot watershed that all found equitable. In contrast to the Aral Sea context, whose issues mostly regard the appropriation of resources, economic changes, and environmental degradation, the Penobscot River's major issues concerned habitat restoration, redistribution of ownership of economic infrastructure, and rectification of past injustices for the indigenous Penobscot Nation (Roy et al., 2018; Day, 2006).

Taken together, the Aral Sea and Penobscot contexts can tell us quite a bit about the nature of international interactions over shared water resources. Both include instances of perceived successes and failures, cooperations, and conflicts. Because they are so different at their core, they present two distinct examples of international water resource security, negotiations, and potential outcomes of such processes.

The objective of this project — from a bird's-eye view — is to compare and contrast these two contexts. An obvious challenge is that these two cases appear to resist comparison in many ways. They are distinct geographically, primarily operating at two

very different scales, one regional and one international; they involve a different set of international and domestic actors; they take place in two areas whose cultures and histories bear little resemblance; and they ultimately concern vastly different material conditions in the form of a sea basin and a river basin. The cases at hand are incredibly different and defy traditional notions of cross-case study. However, putting different cases like this in conversation with one another can help yield novel insights about similarities, differences, and overall patterns (Silka, McGreavy, and Hart). But, as I will explore in through this study, there is great insight into the nature of international cooperation and resource security to be gleaned from considering these two seemingly incomparable cases.

This research is guided by a few research questions. First, to establish a foundation for further analysis, I ask how international cooperations focused on water security work. This provides the theoretical context to allow for a more nuanced dive into the case study materials. I then ask: What, in the context of international cooperations focused on water security, does peace mean? This question speaks to the heart of any worthy investigation of international affairs, whether it be related to economic policy, disarmament, or, indeed, shared natural resources. I am ultimately interested in understanding how different actors who share or have a vested interest in the same natural resources can achieve peaceful outcomes through their decision-making processes. This leads me to my final question: How do these cooperations advance peaceful outcomes for water security? By asking these questions, I intend to shed some light on an area of international affairs that is increasingly urgent to address with policy and recalibrations of macro-scale approaches to shared problems.

To this end, I have segmented my research. This project begins with a broad review of literature related to international water resource security, the relationship between conflict and collaboration, roots of conflict, the Aral Sea context, the Penobscot River context, and issues of scale. The next section of the project details the case study methods I used to conduct the research. My primary materials were two databases of news articles related to the Aral Sea and Penobscot River. I chose to analyze news articles in part because I saw the effectiveness of such methods when I helped conduct a news discourse analysis of the PRRP during a previous research project. Analyzing such documents, I found, was helpful in understanding events, their ramifications, and peoples' opinion around those events. Using the coding software NVivo, I was able to investigate common themes through these two cases and also where they diverge in important ways. The next component of the paper is a combined results, discussion, and analysis section. I base the structure of this section on my three principal research questions and include a short quantitative analysis to help visualize and quantify some of the results I obtain from coding. In my conclusion, I summarize the results of this process, discuss some of the limitations of my research, and suggest potential directions to take this work in the future or what more information might be needed to form a holistic picture of the issue.

As a whole, this project seeks to do a few things. First, it is my own personal endeavour to learn more about an important aspect of my area of undergraduate study, international affairs. Environments at the mercy of global climate change will be an increasingly important focus of diplomacy, news media, politics, and economics in the 21st century, and as someone who is aspiring to a career dealing with global affairs, it is

crucial that I understand these phenomena. Second, it is possible that this research could contribute to a niche area of study that has, up until now, not seen significant cross-case studies that compare two distinct contexts. This work expands on past research into the nature of cooperation, conflict, success, and failure in negotiations between two or more different types of actors. Finally, this project represents the synthesis of my studies in international security with my research in sustainability. It is an attempt to join together these two cornerstones of my undergraduate career. Just as these experiences played such a large role in my development as a student and young professional, so too does this work encapsulate a months-long process that has allowed me to capitalize on four years of growth and development.

CHAPTER TWO

LITERATURE REVIEW

Introduction

To establish a framework for this project, I consult literature across a diverse array of disciplines. Such breadth is necessary to understand regions of the world and decision-making processes where social, environmental, economic, and governmental interests converge. Here, I incorporate insights from these varied fields in my examination of past scholarship. The first section is devoted to examining past research on water resource security, a subfield of security studies that considers how actors behave when control of water or access to it is the primary goal of cooperation or conflict. Particularly important in this field of study is research on the nature of the relationship between cooperation and conflict, a discussion which comes up again later on in my “Results and Analysis” section. After this, I identify key aspects of past literature on roots of conflict to support my discussion later on of success and elements of it in decision-making processes around shared water resources. I then identify specific themes related to cooperation and conflict and important characteristics of the two cases I am concerned with in this study: the Penobscot and Aral Sea contexts. This literature review ends with a consideration of how past research treats issues of scale. In this project it is important to attend to obvious differences between the two cases, particularly in regard to how we should bridge the gap and make comparisons between two seemingly dissimilar processes. Through integration of this literature, I attempt to support my subsequent analysis of a set news articles about the Penobscot and Aral Sea.

International water resource security

Water resource security is not a new area of study. During the latter half of the 20th century, research into this area of interdisciplinary study, particularly in relation to its international component, increased exponentially. In the last few decades, the discussion around resource security has evolved much as researchers' conceptualizations of what security means in an international context has shifted. The focus of analysis has historically been on areas of conflict, but new scholarship recognizes the need for more in-depth analysis of successful projects, regional collaborations, and water security negotiations to develop proactive policies for governments (Vishwanath et al., 2015).

The study of water security arose from the overlap between various different disciplines, including political science, economics, environmental studies, and security studies. In this way, the manner in which water security studies grew reflects its highly interdisciplinary nature. Within this subject, a key focus is on how states make decisions over a finite amount of shared water resources, which are often economically, politically, and socially significant (Morai and de Almeida, 2012). Olson (1965) and many others theorized that in such situations, the group achieves a poor collective outcome when its individual members pursue their personal best strategies. There must be give and take, concession and compromise, for a successful negotiation process to take place.

While past scholarship has emphasized the conflictive nature of water security, it also recognizes that few if any wars are fought over water in the modern era. Despite this fact, water-related security incidents are not downplayed, and a plethora of theoretical

frameworks have been developed to predict water conflicts. The scale of water conflict event intensity pioneered research to measure degrees of severity in water interactions (Yoffe et al., 2001). Frey (2009) emphasized the power dynamics present in water interactions to develop a method of analyzing international river systems and basins. Building off these models, Zeitoun and Warner (2005), seeking to characterize the dynamics of water conflict, theorize that control of water resources is not the incentive or reward for war but the result of strategic policy and power tactics in a system of “hydro-hegemony.” The distinction here is one of nuance; by integrating ideas of relative conflict intensity with a framework for analyzing power in a system, we achieve the ability to more accurately characterize complex interstate relationships over water. Based on past research, this is an important insight. In any analysis, a balance must be achieved between measuring the intensity of an interaction and theorizing how that interaction came to be, what factors act as stressors, and how it can be resolved.

In addition to developing predictors of water interactions and scales for measuring intensity, research around water security has peripherally attempted to answer the question of why few wars were fought over water in the 20th century. Numerous theories have been put forth. In the 1990s, Allan developed the theory of “virtual water” as a reason why countries that lack hydro resources may not have devolved into conflict (Allan, 1998). In this research, Allan (1997), using the example of the Middle East, also predicted that to alleviate the pressures of physical water scarcity a country may lean more heavily on food imports, essentially substituting the means to produce food for the product itself. Allen’s assessment rests on the presumption that the demand for water is based on 1) demographics and 2) agriculture and patterns on food consumption. Homer-

Dixon (1999) agrees with this view and adds that humans have a propensity to adapt their behavior and attitude when confronted with the issue of natural resource scarcity, meaning that war is often a low-tier option and other solutions can be found first by innovating and adapting. Still, Zeitoun and Warner (2005) argue that countries do not wage water wars because of a tendency of states to comply with regulations and norms established by dominant hegemons in individual systems, exemplified by interactions in the Middle East (Feitelson, 2000). While various in their reasons, these explanations for the absence of water wars on a global stage all indicate a common theme: War is not a desirable outcome of water interactions. When conflict does erupt, it is usually at a local level, not between states (GCI, 2000). When all parties share the resource, all parties are able to affect the resource. This collective investment seems to be a factor that dissuades states from raising arms over shared rivers and basins.

The result of the lack of water wars means that hydrosecurity research instead focuses on conflict. But this has proven to be a problematic paradigm due to the tendency to ignore instances of cooperation. As I will discuss later on, a major focus of research in the 21st century in hydrosecurity has taken aim at understanding how all water events involve elements of cooperation and conflict which often intertwine in complex ways (Zeitoun and Mirumachi, 2008). A single event or series of events can incorporate elements of cooperation and elements of conflict. In fact, while the predominant trend for much of the 20th century was the look at hydro security through the lens of conflict, research indicates that international relations over water resources are largely cooperative in nature across a wide range of issues including water quantity, water quality, management, and energy generation (Yoffe et al., 2001).

An interesting nuance to this discussion is the ways in which water can be used as a tool of nations. This notion has historically been constrained by research that focuses or leans heavily on the conflictive aspects of shared water resources — when water is a tool of war, usually as a result of scarcity. For example, the Islamic State of Iraq and Syria took control of the Tabqa and Mosul dams in 2013 and 2014, respectively. Recent scholarship, however, has taken a look at how water can be used as a tool of soft power, a bargaining chip. Chellaney (2015) notes that such interactions can bring multiple parties to the table and produce water treaties codifying agreed-upon rules for navigation, economic use, infrastructure development, and territorial demarcation.

These represent some of the broad characteristics and foci of research of interactions around shared water resources. It is important to identify trends in past scholarship to establish a baseline for discussing this issue further in the context of the Penobscot River and Aral Sea. Also important in this discussion is a fundamental knowledge of how past scholarship conceptualizes the relationship between conflict and collaboration, the two primary dimensions that many experts and professionals use to judge the nature of international relations.

The relationship between conflict and collaboration

Hydrosecurity can be analyzed in multiple ways. It can be an economic, political or military issues. In most analyses, a common way to frame hydrosecurity is how much it involves conflict or cooperation, two terms which are helpful in gaining a sense of how peaceful or threatening a decision-making process between multiple actors over a shared resource can be. While the literature on shared water resources is replete with multiple

approaches to understanding issues, *cooperation* and *conflict* are by far the dominant lenses employed by academics. Investigating how these terms are deployed operationally in academic literature is important for building a base knowledge of the importance of language. Additionally, untangling the words conflict and cooperation is important in understanding how actors interact in respect to their shared waters.

While often conceived of as diametrically opposed, conflict and cooperation — the two forces which usually serve as dominant lenses of analysis for water security situations — are not inherently separate concepts according to some authors. This is to say that one situation of water security can and often does involve a mixture of conflict and cooperation in one process, an idea which did not receive widespread attention in academic literature in the 20th century. Now, the idea that there is more nuance to the discussion of how actors behave in hydrosecurity situations is not only an increasingly prevalent theme but one that can lend itself to correctly understanding the nature of these events.

Zeitoun and Mirumachi (2008) argue that conflict and cooperation are in fact inseparable, blurry terms. To conceive of interactions along these axes is reflective of outdated paradigms in the study of water security and in practical application in policy actually serves to perpetuate, or at least ignore, real issues. This “either/or” mindset leads to problematic understandings that all cooperation is good and all conflict is bad. In reality, “Token cooperation’ ... may serve to veil or perpetuate conflict. Coercive cooperation can deepen conflict” (Zeitoun and Mirumachi, 2008).

An offshoot of the either/or mindset is the propensity to think of one process — conflict or cooperation — as dominant over the other. In academic rhetoric, especially in

the 20th century, conflict is often portrayed as a major potential outcome of any given water resource decision making process. “The potential for acute interstate conflict in international river basins arises because transboundary water resources, especially rivers that transcend national borders, evoke to major concerns of the riparian states: *sovereignty* and *territorial integrity*” (Elhance, 1996). Older literature on hydrosecurity does not mention that the converging interests of sovereignty and territorial integrity also open up the space for cooperation between states. This value is relegated to a secondary, unmentioned position. On the other side, recent work attends to cooperation as an important outcome, equal in weight to conflict (De Stefano et al., 2010). This conception is representative of more recent modes of thinking on this subject.

If a prevailing issue of analysis is treatment of conflict and cooperation, then how do we fix the issue? One method is by coming up with new models for analyzing decision making processes around shared water resources. The Transboundary Water Interactions Nexus (TWINS) is one such answer. According to Zeitoun and Mirumachi (2008), “Transboundary water interaction may be understood, examined, analysed and explained by considering positions on a two-dimensional matrix rather than at discrete locations on a spectrum” (p. 307). In this system, the variables of conflict and cooperation are considered together as part of the same process. The four predominant categories identify differing degrees of positive and negative outcomes, with the most positive being a process which involves low conflict and high cooperation and the most negative involving medium-to-high conflict and low cooperation. All points in between are accounted for. One can see how this approach seeks to do away with the traditional either/or thinking exhibited in models like the modified Basins at Risk (BAR) project

system of ranking cooperation and conflict two dimensionally (Yoffe et al., 2001). Under BAR, the most intense conflicts are assigned a value of -7 and imply a “Formal declaration of war”; a value of +7, on the other hand, means “Voluntary unification into one state.” Some problems arise when assuming that the maximum degree of cooperation means establishing a new unified state and the highest degree of conflict means war. To think this way is to suggest that war is the most damaging form of conflict, for example, and therefore downplay other security conflicts as less severe. In reality, more nuance is needed in the discussion of the relationship between conflict and cooperation, and the models one uses to analyze resource situations must address this fact.

There are multiple ways to think of conflict and cooperation. While past scholarship emphasized the dichotomy of the two, it is increasingly common for academics to recognize their inseparability. These concepts, according to recent literature, are not as inherently opposed as they may seem; in fact, many argue that nearly every instance of two actors interacting over shared water resources involved both cooperation and conflict to some extent. Even if conflict and cooperation are inseparable, however, it is important to be able to identify how the former arises. If we can determine what gives rise to conflict then we can attempt to eliminate its roots.

Roots of conflict

One of the most important areas of focus of research in international resource security is trying to identify potentially difficult situations. This usually involved developing a set of indicators and a system that can be used to rank different areas of the globe in terms of their potential to devolve into conflict. The most important issues in leading to water security conflict vary by methodology, area of analysis, and scale. These issues can be considered as those whose history indicates they are the most prone to generating a relatively high level of conflict when confronted. This relativity is key to emphasize because, as will be seen later on, the degree of severity of water resource security issues as measured by the BAR system, for example, is not as severe as it is for, say, a threat of terrorism. However, this is not to say that these relatively non-violent confrontations are necessarily less of a priority.

One category of researchers see roots of conflict or potential hot spots of water resource interaction in aspects of the landscape or physical characteristics of a given region. This determinist idea does not locate the causality of hot or cold interstate relations solely in the features of a landscape but rather emphasizes that people making decisions about their hydrological resources are, to a certain extent, confined in their options by the nature of the those resources. Gleick (1993) was one of the first to articulate this stance, addressing specifically the connection between conflict and shared water resources and how, to a certain extent, environmental indicators in tandem with other factors can predict severity of conflict.

The first box to be checked indicating a potential conflict between states is, intuitively, that the states at hand have some sort of mutual interest in a single source of

water (Ribiero and Sant'Anna, 2014). At a base level, this takes the form of two states' abutting a river, reservoir, or large body of water. Within this relationship dynamic there can exist different varieties with corresponding countable traits. In riparian relationships, for example, both the upstream and downstream states claim sovereignty over the water resource, often resulting in deadlock negotiation (Mirumachi and Allan, 2010). As will be seen later on, the nature of the Aral Sea basin represents a specific type of hydro-resource relationship owing to its political and geographic features.

A potential blurring of event source occurs when the origin of conflict is attributed to man-made objects, usually in the form of infrastructure, whose presence in the environment is neither permanent nor temporary. Such objects and their effects can produce further changes in the material nature of the environment, thereby becoming themselves agents of change. A dam, for example, is not only the response to human needs in a hydrological system; it is also the initiator of changes in sediment, flows, migrations, and more. The Kara-Kum Canal, for example, is a source of contention between Turkmenistan and Uzbekistan. The former sees the canal as integral to "national survival" and plans to lengthen it; on the other hand, Uzbekistan opposes expanding the canal, which they see as an inefficient man-made river that contributes to the degradation of the Aral Sea (Micklin, 2002). All this should be considered separate from interstate relations, changes in which can rarely be traced back to one factor of the consensus or disagreement over some aspect of the environment. In these relations, other elements outside the realm of natural resources are at play.

On a macro level of analysis, one can also understand conflicts and cooperations over shared water resources as issues of sovereignty. Non-land political boundaries are

historically problematic, and conflict can arise over water when states attempt to negotiate their claims of sovereignty and identity (Ribeiro, 2012). If a resource becomes scarce, a country may be perceived that as an infringement on its sovereignty and conflict can arise (Ribeiro, 2014).

It is important to note that, like many theories of how water conflict and cooperations come to rise, the idea that physical characteristics of a region or landscape influence relations there accurately recognizes that other more immaterial processes are at play. De Stefano et al. (2010) argue that infrastructure and water quantity in a given area are the two most controversial issues between actors. They also name “joint management, flood control and technical cooperation” as elements that often are involved in “positive interactions” (De Stefano et al., 2010). Other researchers place even more emphasis on the decision-making process over the physical properties of a case, arguing that it is less the physical characteristics of a system and more the response of political actors and policy makers that either leads to or prevents conflict. Most of the parameters regularly identified as indicators. Wolf et al. (2003) say: “[M]ost of the parameters regularly identified as indicators of water conflict are actually only weakly linked to disputes, but that institutional capacity within a basin, whether defined as water management bodies or treaties, or generally positive international relations are as important, if not more so, than the physical aspects of a system” (p. 29). The capacity to adapt — and, additionally, how an actor chooses to respond — in this case is seen as more determinant of if conflict will occur or not.

It is important to accept that all of these factors, to some extent, play a role in leading to conflict. The sheer number of variables that researchers use and the relative

inability to come to a consensus on which are the most inflammatory demonstrates that there is really no one root cause of the issue at a macroscopic level of analysis. Only when one zooms into the regional level can generalizations be made with some certain accuracy. Now that I have identified some general trends in past scholarship in hydro security, cooperation, and conflict, I look to establish the two cases in which I intend to apply these insights.

The Aral Sea context

The Aral Sea is located between the states of Kazakhstan and Uzbekistan in Central Asia. Due to Soviet water management policies, the Aral Sea shrunk to roughly 10 percent of its original size in the past half century, leaving only relatively small basins of water in the west and northeast respectively of the plain where the sea once lay. The eastern portions of the former Aral Sea are now referred to as the Aralkum Desert. What was once the fourth-largest lake in the world is now divided into a few relatively small bodies of water, but nonetheless security issues persist. The Aral Sea is still an integral component of the national security strategy for many countries in Central Asia.

Since at least the 19th century, humans have theorized ways to harness the Aral Sea's massive resource potential. Writing in 1882, Russian geographer and climatologist A.I. Voeikov wrote: "The existence of the Aral Sea within its present limits is evidence of our backwardness and our inability to make use of such amounts of flowing water and fertile silt, which the Amu and Syr rivers carry. In our country, which is able to use the gifts of nature, the Aral Sea would serve to receive water in winter [when it is not needed

for irrigation] and release it in summer during high flow” (Glantz, 1999, p. 157). From the time of the U.S.S.R.’s formal establishment in 1922, the lands around the Aral Sea were seen as optimal areas to invest in heavy irrigation, particularly cotton which was exported throughout the Soviet republics. It was only during the 1960s that people started to make substantial measurements of the basin and devote significant scholarship toward its study. Coincidentally, this was also the time when the most intense Soviet irrigation projects were undertaken in the country. Glantz (1999) notes that in 1959, when construction of the first stage of the Karakum Canal began, the surface area of the body was 66,000 km². In comparison, by 2014 all parts of the now largely disconnected lakes had a total surface area of 6,990 km² (Micklin, 2016). Water management projects continued and expanded through the rest of the century pursuant to the Soviet belief that, as Glantz (1999) puts it, “the increment in the output of agriculture and animal husbandry in the Aral Sea basin as a whole would be much higher, in terms of value, than the total damage caused by the desiccation of the Aral Sea” (p. 166). Time proved this logic wrong in the eyes of the Central Asian states.

The attitude that the outright depletion of the Aral Sea’s resources with little concern for the desiccation of the body of water was permissibly began to change toward the end of the 20th century. After independence, Kazakhstan began to attempt to restore the northern Aral Sea in the 1990s, eventually leading to a World Bank-funded \$85-million dike construction project. In the 1980s, the Soviet Union began a program to rehabilitate major wetlands, a process continued by Uzbekistan today. Still, as a result of various countries’ policies, the Aral Sea continues to face obstacles to being restored to even a fraction of its pre-1960s ecological state. Micklin and Aladin (2008) note that, at

the time, four of five former Soviet republics in the Aral Sea basin intended to expand irrigation, which accounts for 92 percent of water take away from the lakes.

After the collapse of the U.S.S.R., the Aral Sea region saw a great deal of cooperation among its states. A basin that was once governed by one body was suddenly divided in terms of interests among five states: Kazakhstan, Kyrgyzstan, Tajikistan; Turkmenistan, and Uzbekistan. Beginning with the creation of the Interstate Commission on Water Coordination (ICWC), the states entered an unprecedented era of collaborative management of shared waters. The ICWC oversees, among other things, states' use of water for agriculture, and its leadership is multinational. However, emblematic of Zeitoun and Mirumachi's (2008) idea that conflict and cooperation intersect in instances of international water events, the ICWC has seen internal disputes arising from the allocation of water to states (Micklin, 2002). This organization is one example of the kinds of actors that are involved in modern-day hydrosecurity negotiations around the Aral Sea. Others include the state governments themselves and international institutions, like the World Bank. This organization specifically has become one of the most active entities in international security relations in the region. The World Bank's involvement in the Aral Sea region highlights another important force: the role of economic interests. Musabekov et al. (2018) emphasize that for reasons of economic exploitation and national interests, many other nations outside the immediate region are concerned with its policy, such as Russia and China, countries who trade with those in the region. The economic factor again includes elements of conflict and collaboration, and its consequences are also felt in other sectors of society. Through analysis of the economic

interactions of the region, one sees another example of how these countries interact in complex reactionary and proactive ways regarding their shared natural resources.

While only a few nations touch the Aral Sea, many countries of Central Asia have a say in how it is managed and what policy toward the body of water should look like. The international security situation of the region is highly complex, involving a high degree of simultaneous cooperation and conflict in its various decision-making processes. These nations have to some extent viewed the ecological degradation of the past and attempted to collaborate to create a more sustainable future. But still the economic, agricultural, and national needs of some countries have outweighed the desire to collaborate or pursue a collective good based on principles of sustainability. Dynamics within the region, then, are complex and multi-faceted, requiring a deeper level of analysis to fully understand and characterize. How these relations fit into the wider global phenomenon of hydrosecurity relations is also an important insight to pursue through case study methodology.

The Aral Sea represents a very interesting region of the globe where the classic story of environmental issues mixing with political and economic plays out in an extreme degree. Many would argue that the degradation of the Aral Sea was one of the greatest human-caused environmental tragedies of the 20th century, and today nations of the region must deal with the fallout of decisions made in the past. It is important to recognize how distinct this context is when moving to the next case, the Penobscot River, which many believe to be one of the best examples of successful cooperation around a river system.

The Penobscot Context

The Penobscot River runs 109 miles from the interior of Maine to the state's rocky coastline, eventually meeting the sea in Penobscot Bay. A feature of the landscape of great cultural importance, the river has been and remains an integral part of the identity of the indigenous Penobscot Nation whose members currently reside on an island in the river near Old Town, Maine. Development of the river picked up in the 1800s with the rise of the logging industry in Maine as people began to float logs down from the forests of the center of the state to lumber mills downstream. It was also during this time that companies began to dam the river, something that the Penobscot Nation historically opposed. Use of the river in the 20th century shifted more toward paper production with the construction of many paper mills, and hydropower generation continued. Finally, in the early 21st century, the Penobscot River Restoration Project (PRRP) began. The PRRP, which officially ran from 1999 to 2016, was the joint venture of the Penobscot Trust — a coordinating non-profit group designed to organize efforts around the project — the Penobscot Nation, a hydropower company, state and federal agencies, and conservation groups. The project resulted in the removal of two dams on the river, improvements to others, and changes in hydropower generation.

Recent scholarship about the Penobscot River, and in particular the PRRP, emphasizes the abundance of contending interests around the river and how those interests were accounted for in decision-making processes. Roy et al. (2018) discuss the “balancing of trade offs” between river restoration, hydropower production, and cost. In the context of the PRRP, the authors emphasize that what people generally conceived of as opposed tradeoffs were able to be successfully negotiated by the various actors of the

project. The PRRP resulted in an increase in sea-run fish populations while maintaining a similar level of hydropower generation that existed before the Penobscot Trust bought and removed dams on the river. Other research on dam removal projects in a general sense highlights the complexities inherent in removal of these infrastructure works due to, again, the need for stakeholders to make decisions between economic, environmental, and social tradeoffs (Baish et al., 2002).

Of these, one of the greatest interests at play during the PRRP was the cultural relevance of the river to the Penobscot Nation. Ever since it was first dammed in the 1800s, the river has been the subject a battle between the Penobscot Nation and various governmental agencies and energy companies. The disagreement over the development and status of the river highlights traditional issues of sovereignty and territorial integrity that arise between actors when they share natural resources (Elhance, 1996). This disassociation of the river from its traditional custodians highlights issues of colonial heritage that have resulted in other issues of sovereignty and legitimacy, such as the Penobscot Nation's lack of ownership of many of its traditional objects of material culture (Anderson, 2018). These issues demonstrate the vast amount of contending interests at play in interactions over water resources which are not only limited to economic and environmental factors.

In news media and public discourse, the PRRP is often described as a successful project. This has been reflected in research in multiple dimensions. First, the project resulted in an increased habitat accessibility for fish in the Penobscot River (Stich, 2014). Many citizens around the state of Maine have called the effort a fish-oriented project for this very reason, and restoring this habitat was one of the original goals of the project.

Next, the ability of the PRRP to bring multiple actors is often cited as one of the reasons it was so successful, with the respect and accessibility to the project of all stakeholders being a factor that led to favorable outcomes for all. Particularly, it was the project's deference to the Penobscot Nation, a group which had historically been at odds with the hydropower companies who own dams on the Penobscot River, that made it such an unprecedented collaboration (Frederick, 2006). Both of the above examples demonstrate how the PRRP's accomplishments were multidimensional and are perceived as successful not only in *what* the project achieved but in *how* it achieved those things too.

Research on the Penobscot River can help us understand it in multiple ways. In particular, the major threads of scholarship related to either the PRRP or the river itself focus on what led to the perceived success of the project, including the ability of the project to engage stakeholders in unprecedented ways, the balancing of tradeoffs, and the restoration of habitat for wildlife. The literature also emphasized the cultural significance of the river to the Penobscot Nation which highlights issues of sovereignty and territorial integrity that exist in similar instances of interactions between different actors regarding water resources. This same topic plays an important role in comparisons between the Penobscot River and Aral Sea, a necessary component of this project for which the next section, which addresses scale, is also helpful.

Issues of scale

In comparing the Aral Sea and Penobscot River it is essential to consider how past research can teach us how to address differences of scale. The two cases are inherently different even from a bird's eye view, with one concerning actors across thousands of

miles of Central Asia and the other concerning actors within the state of Maine in the United States. Upon a first glance, there appears to be little reason for comparing the PRRP, a process that while involving multiple constituent actors was contained within the state of Maine, and similar decision-making processes regarding the Aral Sea, which are overwhelmingly transnational in nature. But research tells us that cross-scale comparisons can enrich insights in social sciences (Vervoort, 2012). There are clear differences between these cases in numerous ways, and past research on issues of scale in the multiple dimensions I analyse in the context of these cases can help navigate them.

First, it is necessary to define the main term we are working with: scale. Gibson et al.'s (2000) definition is the most commonly used and defines scale as “The spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon.” This project adopts the developed idea that these “dimensions” should be a dominant vector of analysis (Vervoort et al., 2012). Approaching scale this way emphasizes the commonalities between the two cases at hand without mirroring the analysis in consideration of the differences of geography and type of decision-making entity. The dimensions of these cases are what draw a thread between them, and for that they take front seat.

For this study whose approach is complex and rather unorthodox, more nuance is needed in the discussion of scale. In broad terms, dynamic regions involving a confluence of social, economic, ecological, governmental, and legal actors require a relative scale of analysis. In contrast to absolute scale, which takes a literal approach to geography (meaning that analysis of the PRRP would be confined to the boundaries of the river banks), relative scale considers space a fluid, dynamic concept which may mean different

things to different people (Gibson et al, 2000). Past scholarship indicates that a flexible use of scale allows for the opportunity to bridge gaps between disciplinary approaches (Vervoort et al., 2012). Applying this same relative scale of analysis to both regions allows for greater flexibility in cross-examining results.

Geography is only one differing feature of these two cases. Involved in each scenario is a vast and diverse cast of actors of varying sizes, from the Penobscot Nation of Maine to the state of Uzbekistan. How these conglomerate entities make decisions is again a question of scale. From the household to the international level, different entities' decision making is confined by the scale at which it operates (Gibson et al, 2000). Later on, this issue of scale will come into play as I compare the ramifications of decisions made in the Penobscot and Aral Sea contexts.

In the context of this study, one of the most important considerations related to scale is how phenomena and processes at different scales should be cross-analyzed. What sorts of considerations need to be made? What are the implications of such analyses? This project set out with a sense that attempting to answer these questions would provide additional insights into the nature of decision making around hydro resources. Much of the literature that addresses phenomena at different scales looks at how scales intersect in one situation. How, for example, do trade, climate change, and governance operate simultaneously on multiple scales? (Verburg et al., 2013). Researchers like Cash et al. (2006) delve into the theoretical and recognize that interactions can occur across or within different scales and note that such cases are highly complex. Researchers also recognize that transboundary water issues operate across many scales, from the household to international. Changes in national water policy, international conflict, and

cooperation can affect individuals, making them less or more vulnerable to threats to their livelihoods, or directly threatening those livelihoods themselves (Warner and Johnson, 2007). So far, few cross-analyses have been conducted on cases of different scales, but some of the same trends can be seen across similar situations operating on different scales, indicating that it is possible to co-analyze the two.

While research into the comparability of such cases as I am dealing with here is lacking, there is a broad range of literature addressing issues of scale in decision making between different actors, natural resources, and geography. These issues are important ones in the contexts of the Aral Sea and Penobscot River, two cases which are different in so many ways. In this section I reviewed literature that focused on the definition of scale, two primary types of scales, what constitutes a difference of scale, and how scales intersect. Later on, I will use these insights on scale to set the foundation for establishing connections between the two cases under the scope of this project.

CHAPTER THREE

METHODS

With the understanding that qualitative analysis can yield incredibly rich results, particularly in interdisciplinary studies, I set out to use common tools of case-study analysis in this project. Previous research on the Future of Dams Project taught me the value of coding as a method of analyzing something when you are not certain of the answer you are looking for. I was certain that I was interested in investigating the nature of cooperation and successful outcomes around international relations concerning water resources, but I did not have specific testable hypotheses. This coding methodology provided the opportunity to glean insights that I would not have been able to account for beforehand. It also allowed me to focus in on aspects of negotiations between actors that, I believed, could yield the most significant understandings. This process did provide significant results in a way that other methodologies may not have. Thus I used an overarching case study methodology (Yin, 2014), document analysis, and qualitative coding for my primary methods (Creswell, 2014; Seidman, 2006).

The methods used in this study were based on my previous work in qualitative research. I had previously helped conduct a media discourse analysis of newspaper articles related to the Penobscot River. Some products of that research carried over into this project. The database of articles I used for the Penobscot River, for example, was originally developed for use in a media discourse analysis about dam removal as one subsection of this overarching investigation into decision making around dams. My previous research experience also informed this research in other intangible ways. A process of

inter-coder reliability that I conducted as a part of the project helped me refine my coding skills as well as learn how to develop codes so that they support my research questions. Similarly, having done previous work in iterative coding, I was aware of what kinds of themes could emerge from having a dynamic codebook and general set of questions, not hypotheses. Therefore, I developed my codebook based on the terms that I believed would point me toward emergent themes which I only had a vague or abstract sense of coming into the project, such as how collaboration and reconciliation of tradeoffs can lead to success. Through my previous work, I was also made aware of how to structure a database of newspaper articles, something which helped tremendously when I attempted to emulate for the Aral Sea context portions of the corpus of Penobscot articles I transferred from the previous project.

Constructing these parallel databases was the first step in this process. These articles as a collective represent the major artifact of study at hand. The database used for this project was Nexis Uni, a compilation of over 15,000 journal articles, news artifacts, legal documents, and business sources developed by LexisNexis. For this project, two databases of articles needed to be gathered: one related to the Penobscot River context, and one related to the Aral Sea context.

The Penobscot River articles were gathered first as a component of the Future of Dams project over a year ago in preparation for a media discourse analysis about dam removal. For this previous study, researchers searched for news articles on Nexis Uni (then called LexisNexis) using the terms “dam removal” and “removal the dam.” Database searches were constrained to between April 1986 and July 2016 — a timeframe which was roughly reflective of the official lifespan of the PRRP. From this search

process a total of 1,480 articles related to dams and dam removal were yielded. These results were then ranked in relevance to the PRRP based on the appearance of 10 phrases: “penobscot river,” “restoration project,” “penobscot restoration,” “penobscot river restoration project,” “restoration trust,” “penobscot river restoration trust,” “penobscot nation,” and “penobscot indian nation.” This ranking was indiscriminate, meaning no search term was ranked more highly than any other, and exclusionary because it did not include many other phrases that could have been related to the Penobscot River. From this, the top 78 results were taken, this being a reflection of the number of articles gathered in the search for Aral Sea-related articles, the rationale for which I will discuss a bit later on. I chose to analyze only the top 78 articles related to the Penobscot in order to help create parallel conditions in each dataset, meaning that both sets of articles were from the same period of time, were similar in sample size, and included similar subject materials (namely cooperation or conflict over water resources).

At this point, it should be noted that the time constraints I used in this project deserve flagging as something to consider going into the analysis. I stopped collecting articles at the end of 2016, but since that time there have been many developments in the Penobscot context. The river is still undergoing changes based on that project, some of which are unexpected. I will explore this potential limitation in more depth later on in the paper, but for now it is simply important to emphasize that these articles end at 2016 and therefore may not reflect current trends in public discourse and scientific research around the Penobscot’s restoration.

For the second component of the cross-case study, I used similar methods of collecting articles. Previous general searches for news articles about international

relations around the Aral Sea yielded an immense amount of articles, and since I was interested primarily in discussions of cooperation, negotiations, and success, I decided to narrow my search with three terms: “Aral Sea,” “Conflict,” and “Cooperation,” from articles published between Jan. 1, 1996 and Jan. 1, 2017 (roughly congruent with the end date for the gathering of Penobscot River articles). This search yielded 78 results in the form of news articles and web-based publications. Even though the majority of them came from newspapers abroad, these articles all appeared in Nexis Uni searches in English. I did no independent translation.

The next step in the process was to code the articles, and for that I needed to develop a rudimentary codebook which I built based on the literature review and theoretical framework described above. Nine of the same codes were applied to each set of 78 articles: “Challenges,” “Cooperation,” “Conflict,” “Codified agreements,” “Failure,” “Leadership,” “Contingency,” “Infrastructure,” “Management,” and “Success.” I developed these codes based on insights into the coding process I learned from my previous work in qualitative research. For example, something like “leadership,” I found, could help one get a sense of power dynamics in a decision-making process. From this previous process, I also saw two primary sources of justifying codes: literature and newspaper articles. The first prescribes theoretical justifications for what themes one might see emerge in coding by discussing major issues in a given field. Examples of this can be found in Table 1. The second method substantiates a code’s validity with themes directly seen in newspaper articles; inherently, this type of code is somewhat iterative in nature. In my study, I used these same systems of justification, meaning each code was established based on insights from literature or themes I saw emerge from the articles. I

then applied these codes based on dominant themes that I saw in a paragraph, indirect, and direct references to the codes or their definitions. These are expressed in Table 1 below. “Management,” for example, was developed as a code based on previous research into how different styles of management lead to different outcomes in decision-making processes concerning water security (Baaker, 2012). The interaction of these codes with each other, their prevalence in the articles, and what sorts of themes emerged broadly across the two cases were major focuses of the coding process.

Inter-coder reliability is an important component of qualitative studies like this. Because I was working independently, my capacity to verify my methods and findings against those of a collaborator were constrained. I had to make do with the context of my project, knowing, generally, the kinds of themes one needs to look for in ascertaining reliability, based on my previous work in discourse analysis and coding of news articles. The primary way that I did this was by periodically checking my findings from coding with my advisor, Professor Bridie McGreavy, who would give me feedback on my interpretations. During bi-weekly meetings, we would discuss my underlying rationale for including a code in this study, how the code was applied, and what I was learning in the application of that code. My findings were supported through this format. I received regular confirmation that the themes I was seeing emerge from my databases of articles were consistent with what I expected to find based on initial research questions, past scholarship, my studies of Eurasian affairs, and my past engagement with members of the Penobscot Nation and stakeholders in the PRRP. For example, the coexisting nature of conflict and cooperation in one decision-making process was a major touchstone of literature I examined for this project. I observed this theme emerge in both Aral Sea and

Penobscot articles as I began to read and code them, and when I checked with my advisor I was given confirmation that pursuing this thread more deeply would be valuable. For these reasons, while my coding did not undergo the rigorous process of inter-coder reliability that might be necessary in similar projects, it nonetheless had mechanisms to verify the validity of methods.

Table 1. Definitions and justifications for codes.

Code	Definition	Justification
Challenges	Events, objects, entities that are framed as inhibitors or obstacles to overcome in a decision-making process.	Included because of references to future and past challenges in both sets of articles.
Cooperation	Where one or more actors come together to make a collective decision or engage in a collective process where everyone is able to pursue, to varying degrees, their individual goals.	An integral aspect of decision making that appears in nearly every article about decision making around natural resources.
Conflict	Where one or more actors disagree or engage in violence as part of a decision-making process.	Gleick, Peter H. <i>Water and Conflict: Fresh Water Resources and International Security</i> . International Security, 1993.
Codified agreements	Examples of or references to written agreements, such as formal treaties or business contracts.	Included due to the presence of such agreements in Aral Sea and Penobscot articles.
Failure	Elements or examples of a process that has failed to result in a solution that all or many groups find adequate.	An integral aspect of decision making that appears in nearly every article about decision making around natural resources.
Success	Elements or examples of a process whose result is framed as being mutually favorable to all or many constituent actors.	An integral aspect of decision making that appears in nearly every article about decision making around natural resources.

Leadership	Examples of people or entities who are framed as in charge of or guiding something.	Included due to descriptions of leadership in decision-making processes in Penobscot articles.
Contingency	Uncertainty regarding outcomes of a process or events in the future.	Included due to presence of uncertainty in Penobscot articles
Infrastructure	Where examples of existing, past, or planned infrastructure are mentioned.	Articles about the Penobscot River emphasize the presence of infrastructure as a major factor in decision making.
Management	People, groups, organizations, states, or agencies who are said to be or depicted as being in charge of the administration or control of water resources.	Baaker, Karen. <i>Water Security: Research Challenges and Opportunities</i> . Science, 2012.

When coding commenced, there were a few decisions that needed to be made about how the process would look. Due to the number of articles at hand, I decided to apply overlapping codes at the paragraph level. In practice, this meant that if one paragraph, for example, contained references to management, conflict, collaboration, and challenges, the relevant codes would all be applied to the whole paragraph. Paragraphs were *not* coded for what themes emerged as the dominant angle or purpose of the selected text. Instead, the strategy I used allowed for both the text relevant to the code *and* contextual information contained in the surrounding text of the paragraph to be captured. As I will discuss below, this process yielded more contextually rich insights for many themes that emerged in this work. It is worth mentioning that both sets of articles — those related to the Penobscot River and those related to the Aral Sea — were coded with the same exact standards and the same set of codes.

Another consideration in the coding process was what is worthy of being coded. The definitions provided in the figure above helped guide the coding process and established rough criteria of sorts for what needed to be coded. By using these relatively strict definitions — which were developed at the outset and refined through the process based on the needs of the study — I was able to make judgements on what paragraphs should be coded. The results, therefore, reflect specific insights and questions that were based in literature and developed dynamically as a component of this coding process.

The methods used by this study proved to be effective in revealing insights into the nature of cooperation, international relations, and international security related to shared water resources. Coding was an effective strategy to identify themes that both the Aral Sea and Penobscot River contexts share. These themes will be discussed later on in this paper, but first, in the next section, I explain the results that this coding process produced.

CHAPTER FOUR

ANALYSIS AND DISCUSSION

Introduction

With this study I set out to investigate a few things. First, I wanted to know more, generally, about the nature of collaboration and conflict in the area of international water resource security. As global climate change threatens to exacerbate problems in areas where water is already hotly contested, it is crucial to know what practices and trends lend themselves to producing successful outcomes for decision-making processes. By the same token, we must be aware of the nature of situations that are largely mired in conflict; for to know the nature of these interactions is to understand and subsequently root out those early indicators that a situation could turn violent or, at the very least, disagreeable. This section of the study seeks to build on prior scholarship in an attempt to glean more insight into potential answers to these questions. This section is divided into four parts, with each of the last three linking a research question to results obtained from the coding process and interpreting those results. The first section provides a general overview of the quantitative results I obtained from coding to demonstrate how the codes were applied in action and what kinds of data I obtained from the process. Next, I move on to discuss some general trends interactions over shared water resources in Penobscot and Aral Sea contexts, placing an emphasis on the potential for these to be representative of greater trends. My next section investigates the nature of success and goals in decision making within these two contexts to prepare for the final component of this chapter in which I attempt to identify key aspects of these positive outcomes. While also

considering lessons from past literature, I argue that insights from these two cases can shed more light on the individual idiosyncrasies of every decision-making process over shared water resources but also point toward broader themes.

Quantitative analysis

Numerous themes emerge from the coding that give insight into the nature of cooperation around shared water resources in wildly differing contexts in the Penobscot and Aral Sea in ways that helped me address my main research questions which were focused on [insert restatement of your research questions here]. To recap, the codes used to structure the database were: “Challenges,” “Cooperation,” “Conflict,” “Codified agreements,” “Failure,” “Leadership,” “Contingency,” “Infrastructure,” “Management,” and “Success.” The following sections investigate both the quantitative and, to a greater extent, qualitative results I obtained from coding using these terms.

Coding of the Aral Sea articles yielded results represented in the figure below. Codes with a relatively high level of application (above 60 instances of appearance) were cooperation (86 instances) and challenges (66 instances). Codes with a moderate level of application (between 35 and 60) were failure (47 instances), contingency (44 instances), conflict (39 instances), success (39 instances), codified agreements (37 instances), and infrastructure (35 instances). The only codes that fell into the category of low level of application were leadership at 33 instances and management at 16 appearances.

Due to the high degree of variation between the results obtained from the Aral Sea and Penobscot articles, different scales of interpretation must be used. We must also consider proportionality and the relativity of results. On the whole, there were more

applications of codes overall on the 78 articles related to the Penobscot River. This means that a distinct range should be used to categorize the codes' level of applicability. Based on the results, I propose using the following scale to rank the prevalence of codes: a high level of application is applied to codes that appear at least 180 times; a moderate level of application is between 180 and 45; and codes with a low level of application appear fewer than 45 times.

Using this rationale, we can determine the following. For the Penobscot River coding process, the codes that had a high level of applicability were infrastructure (367 instances), success (249 instances), cooperation (182 instances), and contingency (180 instances). Codes that had a moderate level of demonstrable applicability were leadership (128 instances) and challenges (67 instances). The codes with the lowest level of applicability were failure (49 instances), management (48 instances), codified agreements (41 instances), and conflict (38 instances).

How many times each code was applied

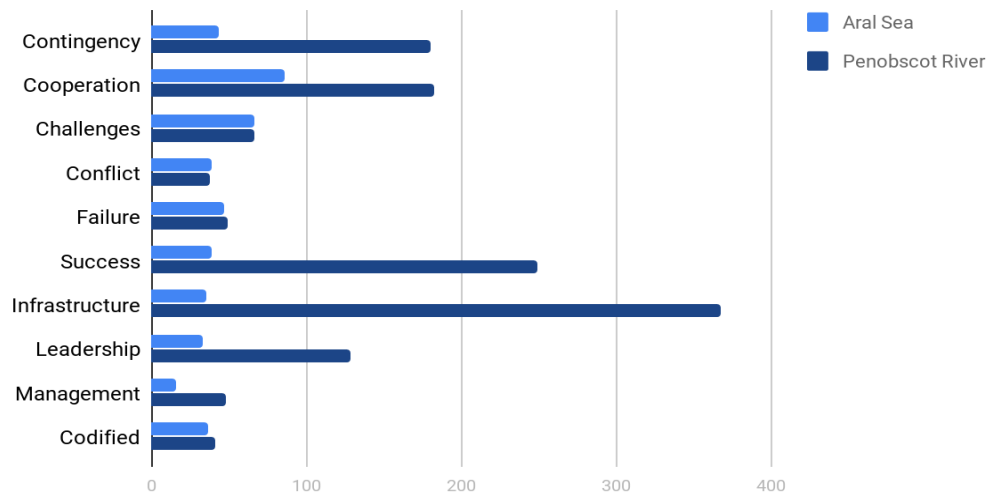


Figure 1. Frequency of applied codes.

It is also a useful to compare the number of sources in which each code appeared. Knowing such information allows for one to understand how news articles in general conceive of an issue as important or worth mentioning (Pope et al., 2006). The previous numbers indicating how many times a code appeared, while valuable, can be distorted by some articles that are longer — like long-form features — and feature more instances of the same code. Examining how many articles each code appeared in can paint a holistic picture of how certain themes manifest in decision-making processes.

In regard to the Aral Sea, the codes that I found to appear across the most articles were largely reflective of the same codes' overall frequency of application. The codes with the most appearances across articles were cooperation (40 articles), challenges (39 articles), failure (29 articles), and contingency (27 articles). Following those were codified agreements (26 articles), success (26 articles), leadership (24 articles), conflict (22 articles), infrastructure (18 articles) and management (10 articles). There are a few special cases to note, particularly where the number of times a code was applied and the number of articles in which a code appeared did not line up. Conflict, the fifth-most-applied code, was seventh in number of articles in which the code appeared. Success, also tied for the fifth-most-applied code, appeared in four more articles than conflict. The code with the fewest instances of application at 18, management, was also the code that appeared in the fewest articles (10 articles).

Frequency of articles containing specific code

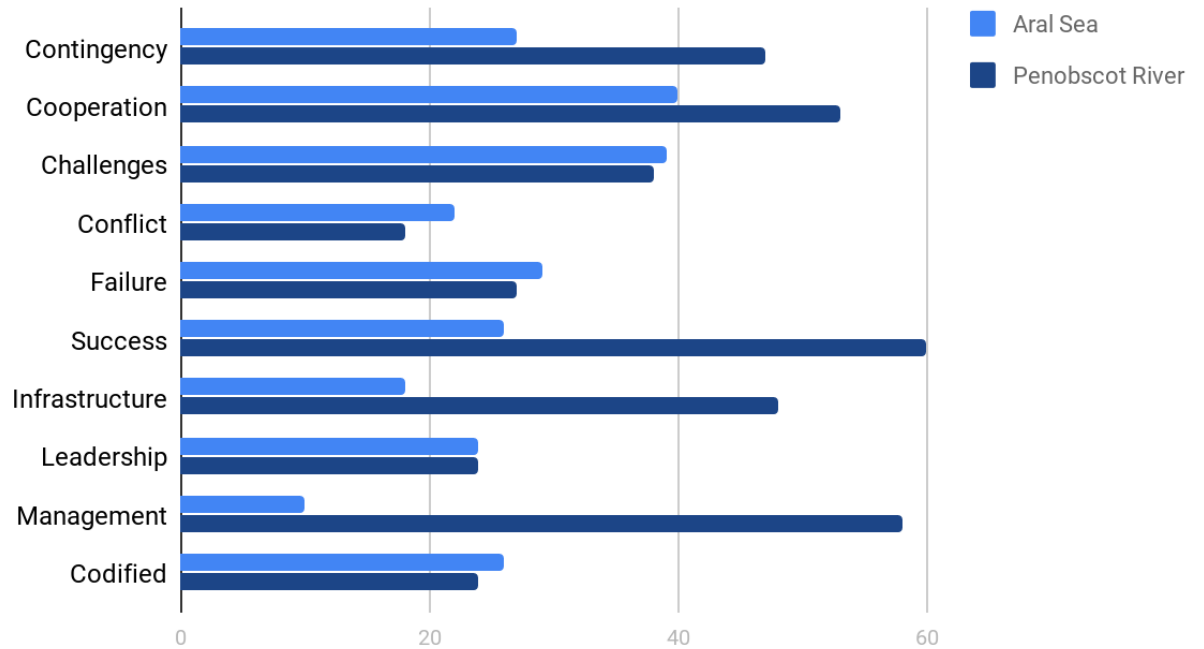


Figure 2. How many articles each code appeared in.

The Penobscot River articles also reflected the same general trend as the Aral Sea articles, with the most frequently applied codes also being the codes that appeared in the most articles. The codes that appeared in the most articles were infrastructure (60 articles), success (58 articles), cooperation (53 articles), leadership (48 articles), and contingency (47 articles). Following those were challenges (38 articles), failure (27 articles), management (24 articles), codified agreements (24 articles), and conflict (18 articles). Within this selection of coded articles there were some areas that produced interesting results related to the congruence between number of times a code was applied and number of articles in which a code appeared. Particularly noteworthy is “contingency,” which, while applied 180 times, the fourth highest amount, was only

found in 47 sources, the fifth highest amount. The number of articles in which the rest of the codes appeared closely reflects their position in the ranking of which codes were applied the most number of times.

In addition to being a helpful tool to grasp the results of the coding process, these quantitative results can also support qualitative insights. Knowing how often a code was applied can tell us something about dominant themes in news discourse (Pope et al., 2006). As such, In the following sections I draw from and use some of these results to substantiate claims about the nature of cooperation in the Penobscot and Aral Sea contexts.

How do international cooperation's focus on water security work?

The first major goal of this research was to establish a baseline understanding of one niche area of international affairs. We can think of this process as a sort of telescoping in on one issue from the macro-global view of international affairs. From the general study of global processes and their major participants — international affairs — we downsize to considering international security, the study of how states and other actors seek to assure their prosperity and survival in dynamic systems. Within this discipline there are many sub-categories relating to different aspects of security. In this study, I focus on natural resource security, and, at another level deeper, security issues related to hydro-resources (rivers, lakes, seas, and basins). Through this work, I was able to realize some key features of the nature of cooperations in this area of international affairs.

The Nature of Conflict and Collaboration

First, one must understand the nature of the relationship between cooperation and its often-employed antonym, “conflict.” The results from coding substantiate scholarship in the realm of water security that there are different degrees of conflict and cooperation (Zeitoun and Mirumachi, 2008). In the cases at hand, one may see that interactions around Aral Sea and the Penobscot River both involve conflict and cooperation to differing extents. Looking at the Penobscot, for example, one sees an emphasis on the cooperative aspects of the PRRP. It is described by one article as “[A] model for river restoration efforts around the world because it was made possible by cooperative agreement among environmental groups, federal agencies, an Indian tribe and a power company” (article *a01083*). Through the coding process it became apparent, too, that, while not to the degree of the Penobscot, negotiations around the Aral Sea are indeed highly cooperative. People there are aspiring to find optimal solutions for collective problems. At the same time, “conflict” in the Aral Sea context appears to be a looming threat, more so than in the Penobscot, with much coded text describing the “potential” for conflict in the region (*Central Asia has unrealized potential*). Some articles even attributed the desertification of the Aral Sea to the failure of nations to “cooperate” (*Creating a region of conflict*). With the knowledge that the Aral Sea region contains some potential indicators of conflict — namely sovereignty issues between upstream and downstream nations and many riparian states — it is indeed possible that conflict remains a constant source of

It is important to note that while the coding reflects a similar number of occurrences of text relating to “cooperation” in each database, the word has different

underpinnings in both. In the Penobscot articles, “cooperation” is often described as something having been achieved and therefore contributing to successful negotiations. For example, one article states that “[the PRRP] has proven that business, government and interested citizens can reach mutually agreeable solutions that benefit the community, the economy and the environment” (a00814). On the other hand, in the Aral Sea articles, “cooperation” is often an ideal, something identified as a necessary condition for success but one that has not yet been realized to its full potential. In this regard, we see many instances of language that is similar to the following:

“There must be a clear understanding that many environmental problems in the region can only be solved through the cooperation of all five states”
(Central Asia needs unified strategy on water).

“Cooperation of our countries, as the leading states in Central Asia, has a significant importance for the whole region. We are equally interested in further strengthening and steady development of bilateral interactions”
(Cooperation, based on good neighbourhood and historical friendship, develops steadily).

The ramifications of this distinction between the two datasets are significant. They tell us that actors recognize the importance of collaborating with others as a prerequisite for a successful project. They also substantiate the claim that collaborations around the Aral Sea and Penobscot River are fundamentally different in multiple ways, not least of which

is the level to which collaboration has succeeded or been implemented in each context (Glantz, 1999; Roy, 2018).

Methods and Mediums of Cooperation

Branching off the idea of implementation, it is important to understand the ways in which actors cooperate in these two cases. Articles related to the Aral Sea demonstrate a different sort of decision-making process than in the Penobscot. In this first case, much of the cooperation of the region is achieved through bilateral and multilateral treaties, forums and economic initiatives — all of which are referenced in the coding. On the other hand, the Penobscot, and by extension the PRRP, represents a very particular sort of collaboration where multiple parties were brought to the table under the leadership of the Penobscot Trust. In this process, everyone was afforded an equal amount of deference and legitimacy in the decision-making process, something that a representative of the Penobscot Nation. I will discuss this later on as an element contributing to a successful outcome, but for now we must note merely the distinction in types of collaboration of the two cases.

An area of overlap occurs with the building, deconstruction, change of management, and other alterations of infrastructure, which was the major effort of the PRRP and a solution sometimes used by Aral Sea actors. One sees a great divergence in the frequency of codes related to infrastructure, with nearly every article in the Penobscot context touching on dams in some way and only a few in the Aral Sea context doing the same. Despite this, infrastructure — particularly dams — are treated nearly the same.

These constructions are framed as sources of tensions between states, a notion substantiated by past scholarship that says infrastructure is one of the two most controversial issues between actors who share water resources (De Stefano et al., 2010). In the Aral Sea context, nations constantly engage in dialogue around problematic dams on the Amu Darya and Syr Darya rivers, which both flow into the Aral Sea, because they impact countries differently. The following quotes from articles in the Aral Sea database highlight policy differences which, in turn, lead to issues over infrastructure construction:

“Downstream countries are strongly dependent on irrigated agriculture while upstream countries are more focused on expanding reservoir capacity and hydroelectric power generation” (*Water management — greatest challenge for Central Asian nations*).

“Kyrgyzstan’ and Tajikistan’s plans for building a hydroelectric power plant have been strongly criticized by Uzbekistan and has significantly cooled relations between Uzbekistan and these two countries” (*SCO leaders support Russian initiative for Syria*).

In considering the PRRRP, we see that even though the actors are different — this time representing the interests of an energy company, government regulators, and indigenous nation — the nature of dialogue around these dams is the same. The articles indicate that people implicitly voice similar grievances over infrastructure, namely that dams serve the interests of one group (power companies) and not another (the Penobscot Nation).

“People who had been fighting each other for many decades set that aside to focus on the common good, said Laura Rose Day, executive director of the Penobscot River Restoration Trust” (a00983).

As the source of issues, infrastructure projects can provide an opportunity for nations to collaborate and discover common solutions. This manifested with the PRRP in one case and, in another, numerous forums, treaties, and discussions.

The relationship between conflict and collaboration

Another important feature of these interactions to note is the degree to which cooperation and conflict are intertwined in decision-making processes about shared natural resources. Past literature recognizes that, despite common conceptualizations, conflict and collaboration are not diametrically opposed terms (Zeitoun and Mirumachi, 2008). We see examples of both conflict and collaboration existing simultaneously in both the Aral Sea and Penobscot cases. In 1992, for example, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan signed an agreement to “manage and protect water resources”:

“They tried to solve the environmental problems and foster social and economic growth across the region by establishing the Interstate Commission for Water Coordination of Central Asia and the International

Fund for Saving the Aral Sea. However, finding middle ground was not easy due to conflicting interests among the countries located upstream along the rivers and downstream toward the sea itself” (article *Environmentalists head to rescue of marshes*).

This is a theme persistent throughout the articles of the database. We see numerous other cases of conflict existing within a framework of cooperation, or some other permutation of the symbiotic relationship between the two. The Penobscot context exhibits this trend as well. In one area that could have been affected by potential dam removal, “Area residents who spoke said they were opposed to the plan, which they fear will allow free range of invasive species such a pike (a00683). What is interesting to note is that this dissent occurred at a public hearing within a project that purposefully sought to be transparent with affected citizens. In the PRRP, Mainers were consulted and listened to — maybe not given the same decision-making authority as other actors, but certainly not excluded as collaborators.

Why is it important that we recognize the coexistence of cooperation and conflict? Past literature emphasizes that this is not such an intuitive concept for many who craft policy and report on current events, and indeed it used to be uncommon for scholarship on hydrosecurity to characterize interactions this way (Zeitoun and Mirumachi, 2008). Indeed, the words themselves seem to conjure up characterizations that are mutually exclusive. In reality, manifestations of both collaboration and conflict can exist simultaneously in one decision-making process, and these in turn can exist in different degrees of severity. With this knowledge, measuring with certainty the overall nature of a

process — whether it is collaborative or conflictive — becomes an ever more complex endeavor, and attempting to accomplish such a task can actually serve to obfuscate the reality of many situations, which cannot be boiled down into one of two simple black and white categories. We must understand that the relationship between conflict and collaboration — when we confront it in the context of decision making over shared natural resources — is inherently more complex than our avenues of understanding international affairs usually suggest.

The above do not represent an exhaustive or intensive examination of the characteristics of cooperations around shared natural resources. Instead, what these cases present us with are two valuable and distinct examples of how collaborations worked for the Aral Sea and Penobscot River in a constrained time frame. Based on this assessment, one can begin to postulate the existence of some overarching trends for processes, negotiations, and events of a similar type. Such trends may include: the extent to which “cooperation” in practice does not mean the same thing across different contexts; the varied ways in which different groups of actors cooperate; the effects that infrastructure has on a decision-making process and, conversely, the effects a decision-making process has on infrastructure; and the tendency to view conflict and cooperation as polar characteristics. In the next section I build from these insights slightly in an attempt to establish a baseline working definition of “success” in natural resource decision making. Understanding different parties’ goals can help us make sense of these trends and consider *why* they occur.

What, in the context of international cooperations focused on water security, does peace mean?

Establishing an operational definition of “success” is an integral part of this research and something that the coding has provided insight on. When we talk about success in the case of collective decision making around natural resources, it often brings a complex set of dilemmas to the table. Different actors have different interests; the goals of state A may be distinct from those of state B. Furthermore, there are different levels of responsibility and capacity in any collective group, meaning that when a solution is found further issues may arise over its implementation. And this is to say nothing of the potential unforeseen consequences of any large-scale decision. Because this research operates in the context of *security*, it is appropriate to say that success means the adequate satisfaction of all parties’ needs in a way that creates, sustains, or opens the door for peace, a notion that is reflected in the coding. Understanding what peace means in the context of these interactions is important because it can give insight into the elements of processes that produce optimal outcomes for all and contribute to success (De Stefano et al., 2010).

How scholarship and news define peace

Peace is an inherently difficult concept to define (Xuetong, 2004). From the members of the Penobscot Nation to energy companies in Maine to the governments of Kazakhstan and Russia, all the different actors I consider in this research have distinct aims and goals. Realizing those goals represents an important component of each actor’s strategy or policy in regard to a certain issue. In the context of the Penobscot, the goal of

the Penobscot Nation was to restore the natural flow of the Penobscot River, a sacred and culturally important feature of the landscape. We can consider a vastly different example in Kyrgyzstan and Tajikistan's concern over the "'inefficient use' of water resources in the region" by upstream neighboring countries (article *Central Asia countries discuss water at Dushanbe forum*). Their goals were to develop cooperative management practices to mitigate the issue. In both of these cases, however, merely realizing the goals does not constitute peace; there is nothing that inherently links collective security and the fulfillment of each individual's aims.

As demonstrated by the databases of articles, peace is not just the realization of aims. It is the realization of individual interests in a way that does not impinge on those of others *and* supports a nonviolent environment in which actors do not feel they are threatened by others in the group. It is a collective pursuit (Xuetong, 2004). While peace may mean something different in each context, it nevertheless exhibits similar features in regard to how actors pursue it collectively. This notion is substantiated by article related to both cases. "Success" in articles related to the Aral Sea, for example, emphasizes acquiescence of personal interests in the name of collective ones. Consider the following example:

"Uzbekistan does not allow the implementation of plans for construction of giant dams and large hydropower plants on the tributaries of the Amu Darya and Syr Darya... These projects can lead to the disruption of the natural flow of these rivers, further deterioration of the situation with

water supply in the lower reaches” (*Head of delegation of Uzbekistan makes speech at OSCE Ministerial Council session*).

The Penobscot articles are certainly more explicit in their emphasis on *give and take* and *deference*:

“‘It’s important that everybody knows what an uplifting experience it has been for the tribe to be part of a project where we were given a lot of deference and our opinions were valued. The cultural aspects of the Penobscot River were really taken into account,’ Francis said” (*a01466*).

“‘[It’s] a little bit of give and take. We need to work with hydroelectric facilities to come up with reasonable alternatives” (*a01396*).

In both of these cases, we see a high premium placed on negotiation of interests, acquiescence, concession, and reconsideration of individual aims in order to better pursue collective aims. These all point to the conclusion that, in the pursuit for peace and collective security, actors are often willing to negotiate their interests and the pursuit of them. It is important to note that I made these observations largely from sections of text coded with “success” which, therefore, implies that many identify the pursuit and achievement of collective security as a positive and successful thing. Peace is a collective ideal.

Operationalizing Peace as an Outcome or an Ideal

The other side of the coin in this discussion relates to how peace is achieved. Here, the cases present two contending approaches. In the context of the Penobscot River, a suitable, successful outcome was achieved for all participants involved. Indeed, the PRRP is often regarded as a great success, both by observers and participants, for the fact that it 1) reconciled differences between its constituent groups; 2) achieved desirable outcomes for both; and 3) contributed toward not just the fulfillment of individual interests but also regional habitat sustainability. It is not controversial to say that the project was a success for the people involved, and the tone of nearly every article overwhelmingly points toward this conclusion. The project had a definite endpoint, accomplished its original goals of restoring the river through dam removal, and the parties involved accepted its end result as satisfactory. This notion of success and a peaceful outcome is different than what the Aral Sea contexts presents us with.

In the second case at hand, peace is not something that has been achieved, at least not in the timeframe to which the articles were constrained. This implies a different concept of success and security than the Penobscot River, whose cooperative process at the time of study was officially completed. The operational definition of peace in this case must recognize that it is an ideal. Regional security is an aspiration, something desired. Many articles express this contingency using language that describes the “potential” of regional actors to figure out collective solutions, the active and continued presence of problems, and the explication of what steps need to be taken to remediate them. Consider the following examples as they express uncertainty over future outcomes and indicate unfulfilled ambitions:

“Dams — provided they are adequately sized and designed — can contribute to human development by fighting climate change and regulating water supply. Yet in a new context of scarcity, upstream infrastructure projects on international rivers may impact water quality or availability for neighboring states, thus causing tensions” (*Climate change raises threat of water wars*).

“Kazakhstan is considering the possibility of determining the establishment of mechanisms for monitoring and preventive responses to environmental threats as measures to strengthen regional security” (*Kazakhstan’s chairmanship to OSCE is chance for country to contribute to strengthening regional and...*).

“Tajikistan’s President Emomali Rahmon attended the event. He expressed the confidence that the realization of these goals and tasks is possible only if cooperation and mobilization of the necessary resources — human, financial and scientific — is enhanced” (*Water management — greatest challenge for Central Asian nations*).

In the first example, there is much uncertainty over potential outcomes, and the author implies that conflict may exist in the future. This both indicates that peace has not been achieved and that there are active issues that regional actors are attempting to resolve.

The second excerpt summarizes Kazakhstan's plans to innovate problem-solving techniques. In the third, the author notes statements made by the Tajik president that major collective goals are unfulfilled. These selections of text exemplify an overall tone in the Aral Sea articles that indicates uncertainty about future outcomes. The major takeaway is that, at the time of investigation, the countries of the region has not attained a relative state of collective security or peace. They do, however, desire to achieve this, and as such the articles related to the Aral Sea detail numerous forums, discussions, treaties, and instances of national representatives ranking "cooperation" as something their nations would like to engage in or maintain.

If we compare the function of collective security — peace — as a desired outcome, we are met with two different conclusions. In case of the Penobscot, the outcomes of a decision-making process, the PRRP, are visible and in many respects major decision making has ended. In the Aral Sea case, there was no such organized and successful decision-making process as the PRRP, and because of that a collective desired outcome has not been achieved. It is possible that this latter form is a more common one for interactions around shared natural resources. It is rare in international affairs that a regional decision-making process results in a success that all, including those who were not directly involved, find totally adequate. There is always give and take, concession and acquiescence. It is for this reason that many see the Penobscot context as an outlier, an innovation in collaboration. One of the major emphasis of the articles related to this context is this very notion that such success as we saw on the Penobscot River had never been achieved before in similar conditions. We must take this fact into account when evaluating the role of peace and collective security as a driving force in decision-making,

the goal everyone is working toward. It is therefore possible that the Aral Sea context includes a more traditional form of peace, because peace in many cases is not necessarily a realistic expectation. Instead, as the Aral Sea case demonstrates, the very process of trying to achieve peace can yield positive results for collective security, even if a finite result is not achieved (as it was in the PRRP). Treaties and forums can represent milestones along this road toward the ideal. Rarely, however, are they as terminal as in the case of the Penobscot.

In this section, I discussed two major elements of peace: its collective nature and role as an ideal in decision-making. Based on articles related to both cases at hand, I came to the conclusion that peace must be thought of as something achieved through concession, negotiation, and acquiescence. In other words, trying to achieve peace is not necessarily the same as trying to achieve national interests. Peace involves the pursuit of individual interests in a way that supports collective security, and because these two things may at times be at odds it also involves negotiation. On the other side, I noticed a distinct difference in the operationalization of collective security and peace in decision-making processes in both cases. In the Penobscot context, peace was an ideal over the nearly 20-year duration of the PRRP, and many believe that this ideal manifested in a tangible outcome at the end. Peace was achieved. This is evidenced by the fact that nearly everyone considered the project a landmark success in collaboration to achieve collective interests. I argue that a major element of these collective interests — and subsequently a major aim of the project — was to achieve a sense of collective security in the context of the river basin. On the other side of the globe, the Aral Sea articles demonstrate a more traditional form of peace in decision making processes. Peace is abstract and hard to pin

down; it is difficult for us to judge when a decision was motivated by a desire for collective peace. However, in the context of the Aral Sea it is clear that nations have made many decisions based on the prospect of achieving national security through the avenue of collective security. (Similarly, they have historically made many self-interested decisions with less regard for the interests of others.) Because the very emphasis of the PRRP is on its role as a precedent-setting project with the potential to set the tone for future collaborations, we can assume that its success is distinct and not inherently representative of wider trends. If we consider the idea of collective security to be a desirable outcome for actors involved in a decision-making process, then we may need to look toward the Aral Sea for how that ambition has been historically operationalized and toward the Penobscot for how it may be operationalized in the future.

How do these cooperations advance peaceful outcomes for water security?

Now that I have established some general insights into the nature of collaborations in these two cases, and an operational definition of peace as a desired and achieved outcome, I will attempt to describe some of the different ways that actors in these two cases achieve peace. To understand how these cooperations can advance peaceful outcomes for water security, we can look at elements of success. In both the Penobscot and Aral Sea contexts, we seem similar trends related to how different actors cooperate. I begin by describing the fundamental state of cooperation necessary for a positive outcome; then I describe how it is important to reconcile differences in power, what framework successful negotiations should take place in, and how nations make

difficult tradeoffs between environmental, economic, and energy interests. This is not an exhaustive list of the ingredients needed for a successful cooperation, but it does represent some of the most visible that came through in the process of coding.

Cooperation and power dynamics

A high level of cooperation and low level of conflict in a decision-making process will lead to more successful outcomes. This is an intuitive point but one that deserves some treatment. Articles from both the Aral Sea and Penobscot contexts substantiate this idea and indicate time and time again that cooperation is a real benefit to achieving desired outcomes. Cooperation in this context is a baseline necessity to come to any sort of collectively desirable outcome. If one party is not consulted in the decision-making process, then that party's interests will not be considered. Both of the cases I dealt with involved a high degree of *inclusivity* in terms of who was allowed a seat at the table. Nowhere in either database did I see indications of contempt or frustration over a group not being included in making decisions. While such issues were not present in these cases, one might imagine that this kind of exclusivity presents a real issue in some other decision-making process over natural resources. For now, one should note that the cases I analyze here do involve a high level of basic cooperation in that all parties have the ability to take part in the decision-making process, something that should not be taken as a universal norm.

The political geographies of the Aral Sea and Penobscot River are unique. In both cases, there were or are strong power dynamics between the different actors of the area, with the most successful outcomes being achieved when these power dynamics were

explicitly negotiated in the process of collaboration. The Penobscot context presents us with the clearest example of this between the numerous different actors of the PRRP, including federal regulators, conservationists, citizens, hydropower companies, and the Penobscot Nation. In particular, this last group faced the greatest historical disparity in levels of efficacy and power going into the project. This is evidenced by numerous codes in the Penobscot database which describe the tribe's unfulfilled goals and disadvantages.

“For a century, the Penobscot Indian Nation has been unable to exercise its tribal fishing rights to catch fish such as Atlantic salmon because the river is virtually devoid of native sea-run fish. In various treaties, the tribe retained the right to subsistence fish for salmon and other species that are otherwise illegal to harvest” (*a00981*).

“[The Penobscot Nation's] complaints went unheeded, even when thousands of shad and alewives the following spring lingered about the new dam and died there, filling the air with a powerful stench” (*a01083*).

“In 1833, when a dam was built at Veazie for the first time to power a sawmill, the Penobscot Indians protested that the dam would destroy the annual runs of salmon and other sea-run fish” (*a01083*).

The articles frame the nature of the relationship between the Penobscot Nation and power companies as one of opposing interests. The power companies built dams, the

Penobscot Nation vocally opposed them, but at the end of the day it was the former who won out. We see that a major element of the success of the project was its ability to level these power differences between various actors, represented in the Penobscot Nation's vocal exuberance at the outcomes of the project and the articles' emphasis on bringing everyone to the table for discussions as equals:

“Restoration advocates said the changes were a first step toward a new balance between energy and ecology on the river” (*a00447*).

“It's truly a win-win situation for PPL, for the Penobscot Indian Nation, for people and businesses that will benefit from a restored fish run, and for the environment” (*a00556*).

Creating a successful outcome for the PRRP, then, was both about having a cooperative framework within which to negotiate *and* an establishing an unprecedented level of equality in decision making for all parties involved. The idea that such a dynamic leads to success when dealing with multiple parties with varied interests can also be ascertained through Aral Sea articles.

I have already established that negotiation over natural resources in the region of the Aral Sea is an active processes; even today nations continue to plan for the future and craft new policy in the hopes of achieving collectively desired outcomes. While the Penobscot context presents an example of how a decision-making process can equalize power levels, the Aral Sea can provide an example of the effects of uneven between

actors, particularly in how the geography of the Amu Darya and Syr Darya rivers creates a complex power imbalance between the upstream states of Kyrgyzstan and Tajikistan and the downstream states of Kazakhstan and Uzbekistan. One of the greatest issues riparian states face is this issue of power imbalance between upstream and downstream states, and the problem arises in the Aral Sea context because upstream states' policies have implications for those downstream but not vice versa (Mirumachi and Allan, 2010). Some articles emphasize this point as an important factor:

“Both upstream countries, Tajikistan and Kyrgyzstan, want to build major power plants on these rivers to boost their ailing economies. But downstream states, most notably Uzbekistan, fear that huge dams of the power facilities will aggravate water shortage in their territory and carry the risk of flooding border areas” (*Central Asia countries discuss water cooperation at Dushanbe Forum*).

One should note that the power disparities between the nations of the Aral Sea region are not drastic. In fact, I noticed a significant amount of discussions in international forums and other multilateral discussions. It could be that these geographically influenced imbalances even encourage Central Asian countries to hold many multilateral forums.

The dynamics of power were different in the Penobscot and Aral Sea contexts. In the former, all actors were given equal access to the decision-making process and they enjoyed a high level of efficacy. The Aral Sea context represents a process where some nations have an inherent advantage over others due to their geography and there is a high

level of cooperation; yet nations of the region understand that much work is left to be done toward achieving their collective goals. Because of these insights, it is possible to say that a major element of successful outcomes is the ability of constituent actors to negotiate and navigate their differing levels of power so that everyone has a roughly equal effective ability to influence decision making. It is important that all of this occurs in a framework of multilateral cooperation, the next element of success I will address.

Multilateral frameworks as elements of success

When talking about cooperation, it is important to identify the type of framework being used for decision-making. In international relations, states make decisions amongst themselves on a bilateral or multilateral basis, with the former involving two actors and the latter involving more than two. In the Aral Sea and Penobscot contexts, it was important that negotiations in both cases took place in a framework of multilateral cooperation, whether it was an international summit of heads of state or a meeting of the Penobscot Trust and its partners. The United Nations — the world’s largest multilateral intergovernmental organization — is also a significant player in sustainability talks in Central Asia. It is important to recognize that nations here also pursue bilateral agreements, particularly business partnerships and specific economic treaties; however, it is the simultaneous presence of other multilateral decision-making institutions that allowed these countries to pursue collective goals. In both the Aral Sea and Penobscot contexts, making decisions through multilateral organizations or forums proved to be a crucial element of success for the case of the Penobscot and continues to sustain cooperation among the nations of the Aral Sea region.

Balancing tradeoffs

The final element of success I observed relates to different parties' ability to reconcile what I perceived as major tradeoffs in sustainability decision making: environmental health energy production. These two things represent some of the strongest sources of conflict in both cases. It often seemed that environmental health was identified as something that inherently opposed economic and energy interests such that finding a solution required an innovative solution or reprioritization. When tradeoffs were balanced, actors tended to see the outcome of the entire process as favorable. Consider the following text taken from coded Penobscot River and Aral sea articles, respectively:

“When the river’s dams were built in the 1800s, Opperman said, the builders never thought about balancing energy production and habitat by taking a view of the entire river basin. As a result, the river has experienced massive declines in populations of sea-run fish such as salmon” (*a00916*).

“Kazakhstan was forced to make concessions and purchase electricity from Kyrgyzstan together with water in order to normalise the spillway of the Syr Darya, but additional volumes were lost in the Fergana Valley of Uzbekistan who did not fulfill its commitments to the passage of water to Kazakhstan” (*China compounding Kazakhstan’s water woes*).

The first quote highlights how energy production and environmental protection appear to be at odds in the Penobscot context, where these interests were eventually balanced through the PRRP. Negotiating tradeoffs in the case of the Penobscot meant increasing hydropower generation at other dams while some on the river were demolished to restore habitat. The second quote shows how the same theme applies to the Aral Sea context where energy and the environment are entangled issues; alterations to one can affect the other. I observed these themes across both databases. In terms of outcomes, I argue that the Penobscot is considered such a success in part because of its ability to reconcile these “opposing” interests and find a solution equitable to all. Conversely, nations of the Aral Sea region, I believe, are still trying to find that balance between hydropower production and environmental health. They may be moving in the right direction and enjoying milestone successes in the form of piecemeal agreements, treaties, and partnerships, but a finite success like the kind that the PRRP achieved is a long way off.

Conclusion

In this section, I attempted to identify some of the strongest themes that I saw emerge from the coding based on research questions I established at the outset of this project. In regard to my first research question — How do international cooperations focused on water security work? — I attempted to characterize the nature of cooperations in the two cases I chose to compare for this study. I found some general consistencies across both cases but also key differences that highlight larger trends. Next, I attempted

to determine an operational definition of peace based on the articles. If we consider peace — a word I use somewhat interchangeable with “collective security” — to mean the pursuit of individual interests in a way that maintains a healthy, non-threatening, and safe environment, then it is possible to clearly identify elements that contribute to the creation of peaceful outcomes which are nearly always regarded as successes. The question of how actors achieve these positive and peaceful outcomes in situations of natural resource security was something I wanted to learn more about at the outset of this project, and in the final section of my analysis I attempted to identify some feature of collaborations around the Aral Sea and Penobscot River that tended to contribute to this ideal. Such knowledge is important because it can inform policy and help us pinpoint failures of a decision-making process. The PRRP may be finished and the Penobscot River in a state of relative content, its collaboration and tradeoff-balancing mission having been a great success, but the actors of the Aral Sea region are certainly still in search of their peaceful outcome, their river restoration project on a much wider scale. In the future they may find an answer and manage to balance their sometimes-contentious interests, but for now it appears that the sheer number of actors, size of populations, and sense of high stakes makes a coherent, collective solution a distant dream.

CHAPTER FIVE

CONCLUSION

Two of my most formative experiences as an undergraduate were my studies in international security and my job as a research assistant for the Future of Dams Project. With this project, I wanted to synthesize these two important but until now unrelated ventures. I chose to compare two regional contexts — the Penobscot River and the Aral Sea — and analyze them along the dimensions of cooperation. I hoped this cross-case study would allow me to combine my work in sustainability research with my studies of political science *and* teach me more about the nature of collaborations in a sub-category of international affairs I may not have otherwise had a reason to look into. This research proved to be an incredibly valuable personal endeavor, and it yielded interesting insights into my chosen topic.

At the outset of this project, I established three research questions: 1) How do international cooperations focused on water security work? 2) What, in the context of international cooperations focused on water security, does peace mean? 3) How do these cooperations advance peaceful outcomes for water security? These questions guided my creation of a codebook to organize and analyze over 140 articles combined about the Penobscot River and Aral Sea. The Penobscot articles cover a period of roughly 20 years, from 1996 to 2016, when the PRRP ended. I restricted the frame of time from which Aral Sea articles were selected to match this. In addition to similar time frames, I organized my databases of using similar search terms related to cooperation and water and a similar number of articles, with the intention of giving equal treatment to each set. This was all done with the intention of creating parallel conditions in which to analyze the articles.

My codebook was designed around my desires for the research and substantiated from insights from the literature and a previous codebook I used for a media discourse analysis about dam removal in Maine. After a process of refining, I ended up with the following 10 codes: “Challenges,” “Cooperation,” “Conflict,” “Codified agreements,” “Failure,” “Leadership,” “Contingency,” “Infrastructure,” “Management,” and “Success.” This codebook was tailored to my personal research questions and influenced by insights from literature and a previous discourse analysis I did of dam removal in Maine. From this, I managed to draw some general themes about the nature of collaborations, success in decision making, and elements of peaceful outcomes in my analysis sections.

My three principal research questions formed the skeleton of my analysis. To lay the foundation of my analysis, I began by trying to characterize the nature of collaborations in these two cases, finding evidence to support scholarly research on the coexistence of cooperation and conflict in decision-making processes. I also found that, in these two cases, cooperation is operationalized differently in news articles, with those related to the Penobscot describing it as a past achievement and those related to the Aral Sea describing it as an ideal. Additionally, infrastructure can be an opportunity to collaborate but largely serves as a source of friction. The next section of my analysis dealt with establishing a definition of peace — which was often found to be a desired outcome when considering collective aims — so that I could analyze the elements of successful projects. I found that successful decision-making processes — the PRRP and to a lesser extent Aral Sea cooperation — shared some similar features: inclusion for all parties, successful negotiation of differences in power, multilateral frameworks, and reconciliation of environmental and energy tradeoffs.

This process was not without its challenges, and the limitations I ran into related both to my methods and subjects of study. In regard to the first point, I found an issue that arose with the method of coding. Some of the coding I did on Penobscot articles was from a previous batch of coding for a different project, one for which we used line coding instead of paragraph coding. Going into this project, I did not anticipate any issues with drawing connections between line coding and paragraph coding because what I was focusing on was not quantitative but qualitative results (meaning I was using the coding more for organization's sake to arrange similar themes in the text rather than looking for frequency of codes or any other numerical result, although those were also accounted for in chapter four). Due to this disparity in the scale of coding, I ended up with many more results for some codes than others (this can be seen in comparing the “success” code between the Penobscot [249 instances] and the Aral Sea [39 instances]). While I did not anticipate leaning too heavily on the quantitative results, it nevertheless felt like I may have been able to make more inferences based on frequency of codes and similar results had I been more confident in the way they had been applied.

Since 2016, many have argued that we need to reconsider the notion that the PRRP was a success. The fish have not come back in the numbers that experts expected during and at the conclusion of the project. One newspaper article from the Bangor Daily News in April, 2019, reported on biologists' efforts to stock salmon smolts in the Piscataquis River, a tributary of the Penobscot River, to “bolster restoration efforts” (Holyoke, 2019). In this way, my selection of dates from which to compile articles — which ended at 2016 — may not be reflective of more immediate, pressing trends in the Penobscot basin. The question of whether the PRRP was a success is being reconsidered

every day as new information comes to light. While the project may have ended in 2016, its effects are only starting to be felt, and researchers will continue to analyze river conditions for years to come. Because of this, new qualitative analyses that consider articles from after Jan. 1, 2017, may provide information that can allow us to develop a more nuanced and truthful sense of success for the Penobscot context. Future research might look to *update* this thesis by increasing its methodological scope.

The other major limitations of this work have to do with the cases I chose. It is quite obvious that the Penobscot and Aral Sea contexts are incredibly different in the scales on which they operate, the types of actors involved, and the geographic, cultural, political, and economic idiosyncrasies of the regions. Still, I wanted to see what kind of unique insights I could find by comparing two projects that do not seem like they should be compared. Treating both as international processes due to the Penobscot Nation's status as a semi-sovereign nation and similarities in the kinds of interactions in the PRRP and around the Aral Sea, I believe that I accomplished my goal and discovered valuable connections between the two. However, the differences between these two projects seems to raise more meta questions than can be answered in this thesis about how we should compare things that are not similar. This kind of cross-case study is, to my knowledge, rare, and as such there is not a lot of information regarding the kinds of techniques one should use and considerations one needs to make in conducting such research.

Despite these challenges, I believe that I produced some insights into the nature of international collaborations around shared resources that could be tested against other cases. Indeed, more work is needed to see if the trends I observed between the Penobscot and Central Asia are merely coincidence or indicative or more universal propensities in

cooperative processes. Future research could aim to do a few things. First, it could hold up these results to other case studies from around the globe and see what trends emerge. After this, it could attempt to create an operational definition of peace that fits not only the two cases discussed here but the majority of cases of natural resource decision making. Finally, more research is needed into how we should compare projects that take place on different scales. Future case studies will need a theoretical framework that incorporates economic, political, and social factors and prescribes methods to use and considerations to make when scaling observations up or down from one case study to another. This allows for more effective comparisons and more holistic results, things that are crucial if the style of this research is ever to be emulated again.

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