LOOKING TO THE FUTURE: THE INDUS WATERS TREATY AND CLIMATE CHANGE

by

NATALIE A. NAX

A THESIS

Presented to the Conflict and Dispute Resolution Program
and the Graduate School of the University of Oregon
in the partial fulfillment of the requirements
for the degree of
Master of Science

June 2016

THESIS APPROVAL PAGE

Student: Natalie A. Nax

Title: Looking to the Future: The Indus Waters Treaty and Climate Change

This thesis has been accepted and approved in partial fulfillment of the requirements for the Master of Science degree in the Conflict and Dispute Resolution Program by:

Richard G. Hildreth	Advisor
Anita Weiss	Chair
Ronald Mitchell	Member

and

Scott L. Pratt	Dean of the Graduate School

Original approval signatures are on file with the University of Oregon Graduate School.

Degree awarded June 2016

THESIS ABSTRACT

Natalie A. Nax

Master of Science

Conflict and Dispute Resolution Program

June 2016

Title: Looking to the Future: The Indus Waters Treaty and Climate Change

This thesis aims to challenge the Indus Waters Treaty. The Treaty remains as the governing authority, however there are areas in which it could be improved. One of these areas is how the Treaty will respond to climate change. I argue that due to changing environmental conditions, what made the Treaty so successful in the past will no longer be relevant in the future. This argument is supported by relevant literature reviews of journals and reports done by policy analysts, academics, and water management experts. Additionally, I address the need to mitigate for climate change by explaining the consequences climate change will have on the ecosystem and infrastructure of India and Pakistan. Finally, I examine case studies and make suggestions about the changes that can be made in order to create a Treaty that successfully mitigates for climate change.

CURRICULUM VITAE

NAME OF AUTHOR: Natalie A. Nax

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University or Oregon, Eugene

DEGREES AWARDED:

Master of Science, Conflict and Dispute Resolution, 2016, University of Oregon
Bachelor of Science, Environmental Studies, 2014, University of Oregon

AREAS OF SPECIAL INTEREST:

Environmental Conflict Resolution
Collaborative Governance

PROFESSIONAL EXPERIENCE:

Intern, Center for Collaborative Planning at California State University, Sacramento, Sacramento, California, 2016

TABLE OF CONTENTS

LIST OF FIGURES

Figure Page

CHAPTER I

THE INDUS WATERS TREATY

Historical Background

The conflict between India and Pakistan started long before the departure of British colonial rule from the Indian subcontinent, but became international after the partition. After the departure of the British Indian Empire, the Punjab was partitioned. The eastern part went to India and was to be Hindu, and the western part went to Pakistan and was to be Muslim (Khawaja 2012). The partition led to violent rioting as people found themselves on the wrong side of the religiously partitioned countries. Thus, in order to prevent becoming a minority in an area dominated by the other religion, an exodus of Hindus traveling to India and Muslims traveling to Pakistan began. The divide generated religious violence and killed approximately one million people. It also displaced around 12 million people and approximately 75,000 women were abducted and assaulted (Gonzalez Manchon 2000). The conflict grew as the partition cut across the Indus Basin separating the established irrigation systems.

During Britain's rule, the British Raj built a large canal network within the Indus Basin in southern Punjab, transforming the land of the Punjab from a desert into a one of the richest agricultural settlements. The canal irrigation, "transformed this region from desert waste, or at best pastoral savanna, to one of the major centers of commercialized agriculture in South Asia" (Muhammad, A 2011 citing Ali 2003). This canal irrigation system transformed from 3 million acres in 1885 to 14 million acres by the end of British rule in 1947. The agricultural vitality necessitated the need for a railway system to increase the production and export of goods to the United Kingdom (Khawaja 2012).

Thus, the mostly rural way of life in Punjab became more industrialized (Muhammad, A 2011. citing Ali 2003) which greatly improved the socio-economic state of the Punjab.

However, conflict escalated in the early 1900s when the Muslim League in the Indian Congress began advocating for Indian self-government. The Hindu majority leaders did not agree and the Muslim-Hindu relationship began to disintegrate. In 1935, the Government of India Act approved the Indian self-government and put water under provincial jurisdiction. The Punjab proposed extensive development along the Sind border and the Sind appointed a commission to study the Sind's concern. The judicial Commission called for integrated management but its report was found unsatisfactory by both the Sind and the Punjab. A draft agreement was produced, but again, neither of the provinces accepted the terms and conditions. It was referred to London for final decision in 1947 (Wolf & Newton n.d.). However, before the final decision was made, the British Indian Empire partitioned the subcontinent into the Union of India and the Dominion of Pakistan in August 1947.

Consequently, the Indus Basin and its cherished canal system were now divided between two states. The geographical split dictated Pakistan as the lower riparian state and the flow of water into Pakistan was now dependent on India. To protect the flow of water, the Chief Engineers of East and West Punjab signed an agreement on December 20, 1947 known as the *Standstill Agreement*. This agreement "bound India to allow pre-partition allocation of water in the basin up to March 31, 1948" (Ahmad 2011; Wolf & Newton n.d.). India asserted that Pakistan could not claim any share of water "as a matter of right" (Wolf & Newton n.d.) and its position was reinforced by Pakistan's agreement to pay for water under the Standstill Agreement. India argued that since Pakistan agreed

to pay for water, they recognized India's water rights. Pakistan countered that they had rights of prior appropriation (Biswas 1992). The disputing claims increased the geopolitical hostility between the two countries. When the Standstill Agreement expired on April 1, 1948, India shut off partial water supplies into Pakistan affecting 8% of its cultivable area during sowing season. Additionally, the city of Lahore was deprived of its municipal water and the electricity derived from the Mandi hydroelectric scheme was also cut off. This, combined with the stresses or partition, triggered a decade-long water dispute that contributed to India and Pakistan being on the precipice of war until the World Bank intervened (Ahmad 2011; Wolf & Newton n.d.). The World Bank proposed water sharing agreements "based on three principles: (1) water in the Indus Basin is sufficient to meet the needs of both countries; (2) all tributaries in the Indus Basin should be included in the discussion and (3) the negotiations should focus on technical rather than political issues" (Yang et al. 2014). These agreements led to the ratification of the Indus Waters Treaty in 1960 (Alam 2002).

The Agreement

The Preamble of the Indus Waters Treaty recognizes the need for "fixing and delimiting in a spirit of goodwill and friendship, the rights and obligations of each in relation to the other concerning the use of these waters" (Jawed 1966)**.** Both countries "had recognised their common interest in optimum development of the rivers and declared their intention to co-operate by mutual agreement" (Warikoo 2005). Explicitly, the goals of the Treaty were to divide the ownership of the waterways of the Indus Basin between India and Pakistan (Iyer 2005) and regulate the construction of storage works and catchment areas (Jawed 1996).

The Treaty allocated the water from the three eastern rivers (Ravi, Beas, and Sutlej) to India and the water from the three western rivers (Jhelum, Chenab, and Indus) to Pakistan, and established regulations for each country. The Treaty laid out the regulations as such:

- Except for domestic and non-consumptive use, all Eastern Rivers "shall be unrestrictedly available to India" after the transition period. Once the rivers have crossed into Pakistan, then Pakistan has unrestricted use.
- India shall not "store any water or construct any storage works on the Western Rivers" and shall not interfere with the Western Rivers.
- "Pakistan, should it want to increase the catchment area, shall increase the capacity of that drainage to the extant necessary so as not to impart its efficacy for dealing with drainage waters received from India"
- If "India finds drainages should be deepened or widened in Pakistan, Pakistan agrees to undertake to do so as long as India agrees to pay the cost of deepening or widening" (Indus Waters Treaty 1960).

Non-consumptive use and domestic use shall be permitted "in both rivers by both countries, but such use should not in any way affect the flow of rivers or channels, to be used by the other party" (Warikoo 2005). Because the Treaty divided the water from the western and eastern rivers in an effort to maintain India and Pakistan's independence from one another, the implications of this meant that each country had the opportunity to develop individually. Long-term development and the regulation of storage and catchment areas support an increase in water flow for irrigation and agriculture.

Additionally, India and Pakistan agreed to each establish a Permanent Indus Commission, made up of one Commissioner from each country, and to appoint an engineer in hydrology and water-use. The commission serves as a channel of communication and monitors the actions and interprets the Treaty. An inspection would be held every 5 years and the Commission should meet at least once a year alternating between India and Pakistan, with the agreement to monitor each other; promote cooperative arrangements for the treaty implementation; promote cooperation in the development of waters; examine and resolve any dispute pertaining to the interpretation and implementation of the treaty; and submit an annual report to the two governments (Indus Waters Treaty 1960; Wolf & Newton n.d.). Finally, the Treaty called for a method of dispute resolution over the interpretation about the intention of the Treaty. The method agreed upon is mediation through a third party and then arbitration through the Indus Commission (Iyer 2002) if mediation fails and both parties agree to proceed.

Profile of the Indus River Basin

The Indus River begins in the Tibetan Plateau in China. The climate of the upper basin is dominated by air masses that contribute to the snowfall on the glaciers whose melt define the hydrologic regime of the Indus. The Indus River then descends into Gilgit, Swat, and the Northwest Frontier Province. Before the river reaches the plains of the Indus River Basin, it is impounded behind Pakistan's Tarbela dam. The 5 tributaries originate from the Hindu Kush, Karakorum, and Himalayan glacial mountain ranges (see figure 1). About 50-80% of the total average river flows in Pakistan are fed by snow and glacial melt, with the remaining coming from Monsoon rain (Yu et al. 2013). The Beas,

Sutlej, and Ravi rivers carry heavy monsoon flow while the Chenab River is transitional. The Jhelum River has no monsoon flow (Wescoat Jr., 1991).

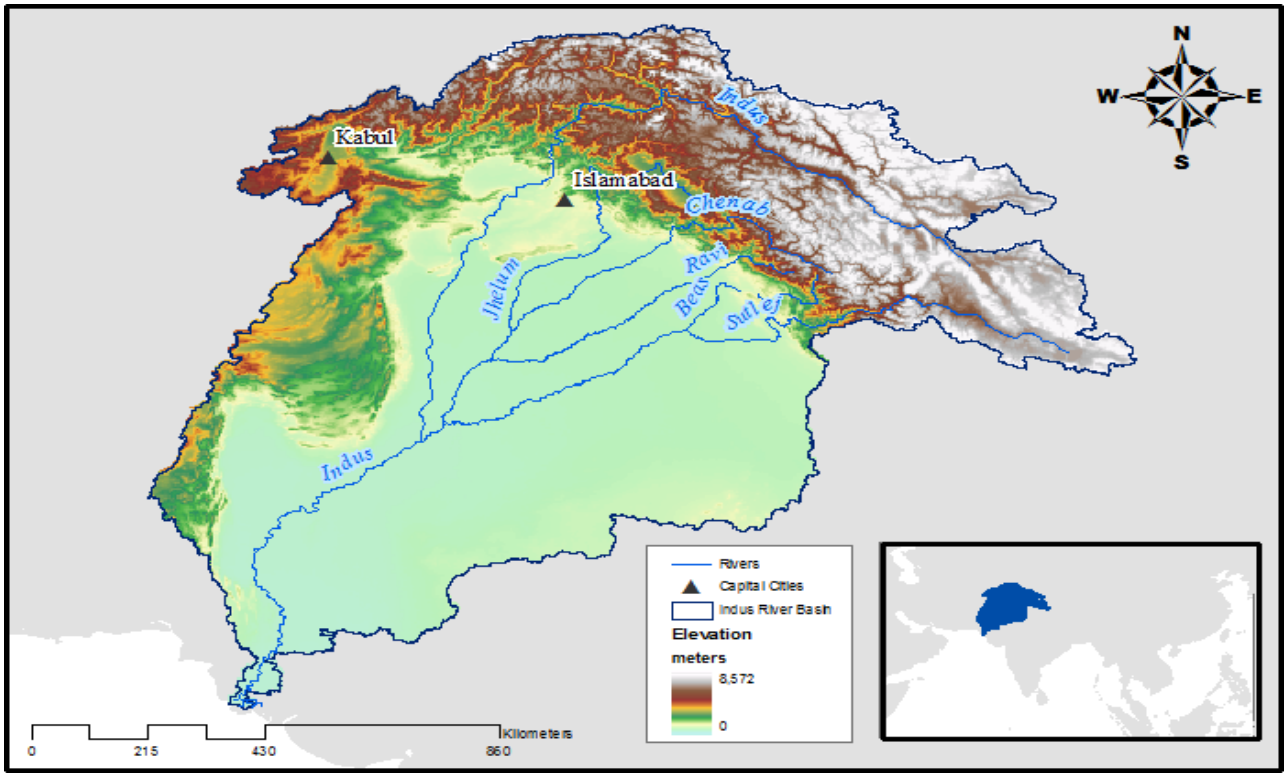

Figure 1. The Indus River Basin and its rivers.

CHAPTER II

A SUCCESSFUL TREATY

The Indus Waters Treaty exemplifies a successful mediation because it brought two antagonistic countries to a resolution. Without the Treaty, it is likely that India and Pakistan would have experienced greater conflict over the past 60 years. For example, conflicts surrounding poverty, infectious diseases, and environmental degradation are factors that, when combined with other factors such as social and political unrest, can escalate to war. The United Nations Environment Programme determined that "since 1990, at least 18 violent conflicts have been fueled by the exploitation of natural resources" (UNEP 2015). Additionally, Ken Conca and Geoffrey Dabelko highlight the large amount of research suggesting that scarcity of resources, like water, could contribute to "social instability and violent conflict" (UNEP 2015). Often times, conflicts over resources escalate into something greater. In the case of India and Pakistan, the resolution surrounding the Indus Basin came early and helped the parties avoid violent conflicts, earning it praise from mediation professionals.

Prior to the creation of the Indus Waters Treaty, the World Bank concluded that "not only was the stalemate likely to continue, but the ideal goal of integrated watershed development for the benefit of both riparians was probably too elusive of a goal at this stage of political relations" (Wolf & Newton n.d.). Yet, considering the animosity of the two countries, "it was, perhaps, the closest possible realistic solution" (Ahmad 2011). The fact that the Treaty was able to come into existence despite the odds against it is a feat in itself. The Treaty has remained the governing rule for the past six decades, and despite the numerous conflicts and two all-out wars between India and Pakistan that have

occurred since 1960 (*India and Pakistan: Troubled relations* n.d.), the Treaty has successfully prevented violent conflict over water. Zawahri (2009) credits a large success of the Treaty to the implementation of the joint commission and conflict resolution, as it supported stable cooperation between the parties (DeStefano et al 2012). The Commission has successfully helped negotiate, monitor, and manage the two parties.

The Indus Waters Treaty allowed each country to become independent of the other regarding the operation of its water supplies, particularly important given the antagonistic relationship between the two states in other domains. It made each country responsible for planning, constructing, and managing its own interests and operations within its own territory. "The independence afforded by the Treaty and assurances against the interference by either country reduced chances of disputes and tension" (Ahmad 2011). The states were given a type of free will to manage their water in ways that benefitted their own interest, allowing them to make full use of their water.

The Treaty also maintained the commercial development of the British Raj, with the goal to increase irrigation and improve agriculture. India had received three rivers and was able to construct a reservoir on the Beas River. This reservoir provided the water that was used to irrigate the desert of Rajasthan. (Jawed 1966). It was due to the conditions laid out in the Indus Waters Treaty that India was able to construct this reservoir without interference from Pakistan. Without the Treaty, India's part of the desert would have remained largely not irrigated since the partition left most canals in Pakistan (*Thar Desert,* n.d.). This was also true for Pakistan. In 1958, two years before the Indus Waters Treaty, the amount of irrigated land in Pakistan was 1.18 million hectares. In 2008 this number had soared to 14.87 million hectares (FAO. 2015). This is a huge success for the

Indus Waters Treaty and especially for Pakistan since it was worried about being subjected to its neighbor's good will. It is likely that if the Treaty had never taken place, the headwaters would have been in India's territory and Pakistan's claims to water would have been weak under the law. Irrigation is an important determinate of success because it illustrates an improvement in development and also provides for agricultural success. India and Pakistan would not have taken the time to develop in these areas if they did not have faith that the current allocated waters would be successful long-term. Both of them were able to see their Punjab regions prosper and become the respective 'bread basket' for each other because of the reliable irrigation.

Naturally, the increase in irrigated land led to an increase in agricultural production. Between 1970 and 1995, crop production in Pakistan increased 39% (FAO. 2015). This is compared to the years between 1891 and 1946 when the annual growth rate of all crop output was 0.4% for the entire Indian subcontinent, including what would later become Pakistan (Chauhan 2012). It is because of the Indus Waters Treaty that the increased irrigation led to an increase in agriculture for India and Pakistan.

Overall, the Treaty provided many opportunities for development, irrigation, and economic expansion. Without it, it is likely that these opportunities would have been harder to come by, as India and Pakistan would not have the autonomy they have now. In addition to the economic benefits, the Treaty has also prevented conflicts over water rights for over 60 years. It is evident that the Treaty facilitated the development of the countries and provided a successful tool of water management.

CHAPTER III

THE CHALLENGES OF THE IWT

The Treaty has provided peace between the two antagonistic countries. It has prevented war over water for over 6 decades and has remained in authority with little pushback. Unfortunately, nothing is ever perfect. The Treaty does have some problems associated with downstream flow, dispute resolution, population growth, and management by bordering states (Siddiqui 2015). However, despite these consequences, the Indus Waters Treaty still stands strong. While these consequences may be small and have not shown any threat to the Treaty's success, the unforeseen consequence of climate change may be the consequence that dismantles the Treaty entirely.

Consequences of Downstream Flow

The Treaty places India as the upstream state and Pakistan as the downstream state. A consequence of the down flow of water is the creation of an upstream-downstream problem. Unfortunately, this means that, regardless of the development and India's use of the waters, the water will always flow to Pakistan in diminished quality and quantity. The Treaty gives autonomy to each country, giving them the freedom to develop their nationalist agendas, as long as it does not impose on the other country. However, the term 'impose' is ambiguous and does not clarify any restrictions on water quality. Thus, Pakistan argues, the Treaty could potentially permit the allocation of polluted water into Pakistan. For example, India can "easily run Pakistan dry either by diverting the flow of water by building storage dams or using up all the water through hydroelectric power schemes" and not be in violation of the Treaty (Wheeler 2011). Pakistan is suffering from water scarcity and is claiming its upstream neighbors are

responsible for its water troubles (Wheeler 2011). Pakistan's economy also heavily depends on agriculture and relies on the Indus tributaries. Pakistan fears that the upstream dams that India possesses enable India to manipulate the water flow (Mandhana 2012). The Treaty has allowed India to build dams and storage units on its rivers without the consultation of Pakistan because the dam does not cross over into Pakistani territory. However, this has severely altered the flow regime into Pakistan (Qureshi 2011); Pakistan claims that India's dams have also diminished Pakistan's control of the Chenab and Jhelum rivers (Miner et al. 2009). This power that India has over Pakistan irritates the already antagonistic relationship between the countries and contributes to the hostility.

Consequences of Dispute Resolution

The last condition of the Treaty required the formation of the Indus Commission, which implemented two dispute resolution processes. One was to be a resolution process with a neutral, third-party and the other was to be an arbitration process. For example, a dispute arose in 1980 about India's plans to build the Wuller Barrage on the Jhelum River. Pakistan protested this claiming that it violates the Indus Waters Treaty and the case was sent to the Commission; however, the Commission failed to resolve the dispute and the project was ultimately suspended. Then in 2005, the World Bank was called to resolve a dispute surrounding the Baglihar hydropower project by India. The talks once again had failed and have yet to be resolved (Alam 2002; Wolf & Newton n.d.) The dispute resolution mechanism has been sufficient so far, but it is imperfect. The former deputy executive director of the United Nations Environment Programme, Shafqat Kakakhel, highlights the concerns with the dispute resolution system. While arbitration is

less expensive and time consuming than traditional judicial forums, it still costs substantial time and money. "The Indus Commission hasn't played an effective role as envisaged in the Treaty. All disputes have been settled by the courts of arbitration which has been highly expensive for us" (Siddiqui 2015). Finally, the Indus Commission has not lived up to its full potential. The objective of the Commission is to build development on the Indus system, but "since 1960, no projects have been submitted under the provisions of 'future cooperation'" (Wolf & Newton n.d.).

Consequences of Population Growth

Additionally, changes in population have challenged the Treaty's effectiveness. "With depleting storage capacity and increasing population, Pakistan is running fast towards the situation of water shortage and threat of famine" (Bhatti and Farooq 2014). In 1960, India had to support 449.66 million people and Pakistan had to support 44.91 million people during that same year (The World Bank 2015). However, as of 2014, India's population has skyrocketed to 1.3 billion people (The World Bank 2015) and the increase in population puts pressure on water resources (Sarfraz 2013). "The rising population means per capita water availability has fallen dramatically from 5,000 M^3 per person in 1947, to 1,080 M^3 per person during 2010" (*International Union for Conservation of Nature, Pakistan Water Apportionment Accord,* 2010); and in Pakistan, water availability is expected to fall to as little as 800m^3 per capita by 2025 (WWF Pakistan 2007).

Consequences of Simplified Management

The Treaty monitors water management of waterways in India and Pakistan but does not monitor bordering states. Unfortunately, this is a simplified approach to water

management. By only monitoring India and Pakistan, it overlooks the actions of other states within the Indus River Basin, such as China and Afghanistan. Thus, it does not put any restrictions on the bordering states that have access to the waterways. It also only covers river water and not groundwater. This is an oversight that necessitates some sort of cooperation and water sharing plan for the future.

Consequences of Climate Change

Finally, my biggest concern is that the Treaty is outdated and does not take into consideration the changing environment due to climate change. In its defense, climate change was not a prevalent topic during the time that the Indus Waters Treaty was enacted. However, the changing conditions of the rivers warrant a re-negotiation of the Treaty.

The area of the Indus River Basin totals 1.12 million km^2 and is shared among 300 million people of Afghanistan, India, Pakistan, and China. Glacial melt from the western Himalayas contribute to more than 40% of the annual water flow within the Basin (*South Asia Water Initiative's Indus Focus Area Strategy:* 2013-2017). However, predictions are that glaciers will retreat for the next 50 years increasing the flow of the rivers. The depletion of the glacial reserves will be followed by a 30-40% decrease in water flow of the River Indus, the main river of the Indus Basin tributaries. (Husain 2010). Scientists predict that climate change will also considerably affect the average rainfall in the upcoming years, leading to harsher droughts or larger floods (Cooley et al 2009; DeStefano et al. 2012). For example, Pakistan is predicted to see a decrease in number of rainy days but an increase in extreme precipitation events (Husain 2010). One of the most devastating affects of climate change is that it can reduce access to freshwater

and lead to conflict (DeStefano et al. 2012 citing CNA 2007: 13-16). The Treaty should be modified to reflect climate change because the reduction in the availability of water causes a domino affect in all sectors of life.

Climate change is crossing the threshold of irreversibility, meaning that even if the contextual factors like the political and economic causes are resolved, climate change will continue to be a burden on society (Homer-Dixon 1999). Ultimately, climate change can drastically alter the effectiveness of a Treaty if it does not adapt to the future changes. It can "affect the ability of basin states to meet their water treaty commitments" when the treaties are not set up to react to variability (DeStefano et al 2012 citing Ansink & Ruijs, 2008; Goulden, Conway & Persechino, 2009). Climate change may have negative effects that can reduce the availability of food. This will affect human and economic livelihood, health, and the environment's integrity.

It is evident that the Indus Waters Treaty is an example of a successful mediation, but it does not come without its faults. The unforeseen threat of climate change challenges the authority of the Treaty. What may have worked well in the past may not work in the future as climate change changes the conditions of the environment of the waterways. The threat of climate change warrants the need to update the Treaty to support these changing conditions.

CHAPTER IV

WHY SHOULD INDIA AND PAKISTAN BE CONCERNED ABOUT CLIMATE CHANGE?

Today, we associate India and Pakistan's relationship with the dispute over the ownership of Kashmir. In fact, most of the violent conflicts between the two states have been due to the Kashmir dispute. Because this is so prevalent, conflict over water is probably not their highest concern. However, what makes water conflict so unique is that water resources are affected by environmental and anthropogenic conditions. Two large countries like India and Pakistan will use far more water than two smaller countries. This water cannot be renewed except for when it is replenished by the hydrologic cycle. However, climate change will greatly alter that cycle. As climate change persists, so will water resource conflicts. Climate change is a stressor and "although the potential for outright war between countries over water is low, cooperation is also often missing in disputes over transboundary resources" (Wolf 2007). The longer climate change concerns are overshadowed by the situation in Kashmir, the worse the situation will be when it is finally addressed. India and Pakistan are both in a perilous position surrounding water availability. Both countries are facing a shortage of water and it is expected that they will continue to experience this. Therefore, "it would be beneficial if both countries recognized their cooperative potential and combined their resources and expertise to make mutually beneficial decisions" (Ahmad 2011).

Climate Change will Affect the Hydrologic Cycle

Climate change affects hydrologic events like precipitation patterns and runoff, which increases the vulnerability of certain regions. For example, "the volume of runoff from winter snowmelt will be determined primarily by variations in winter precipitation.

On the other hand, glacier melt water production will vary with the energy availability (changes in temperature, primarily during summer) during the melt season at the glacier surface" (Yu et al. 2013). Scientists have predicted that precipitation will decrease over the lower Indus Basin leading to drought-like conditions and an overall warming effect. While climate change predictions in this region cannot be certain, trends are predicted to continue toward this pattern (Rajbhandari et al. 2014; Cooley et al 2009). Extreme flooding in the Basin will wreck havoc on farms and communities that reside on the riverbanks. Flooding will transform the soil and make the surrounding areas more susceptible to erosion and degradation, which washes pollution into the waterways and decreases agricultural productivity (Cooley et al 2009).

Climate Change Will Reduce Water Availability

Analyses of the rate of glacial melt that feeds into the Indus Rivers Basin is limited due to inaccessibility of the rugged Himalayan mountains and high altitudes (Yu et al. 2013), but projections made by a hydrological modeling approach combined with glacier mass-balance calculations showed a best-guess glacial scenario result of a "decrease in mean upstream water supply from the upper Indus" (Immerzeel 2010). It is assumed that the bulk of the glacial melt into the Indus Rivers tributaries occurs in the ablation zone. This makes up 18% of the total flow of 110 MAF from the mountain headwaters of the Indus River into Pakistan. The most probable source of the remaining 82% of flow is melt from the winter snowpack (Yu et al. 2013). In a measurement taken by the Normalized Melt Index (NMI) over the period of 2001 to 2007, it was discovered that snow and glacial melt "is 151% of the total discharge naturally generated in the downstream areas [of the Indus]" (Immerzeel 2010) and a recent Dutch study predicted

that shrinking glaciers would reduce the flows of the Indus by 8% by the year 2050 (Mandhana 2012). This decrease in water flow is harmful because the Indus Rivers' water flow acts as the primary source of water for the downstream part of the Indus Basin (Rajbhandari et al. 2014*)*. Additionally, about one third of the renewable water resource is groundwater. The average availability is estimated at 287 km ^{3} , with about 1,329 m^3 available per capita. Climate change is predicted to reduce renewable water availability to below 750 m^3 per capita by 2050 (*South Asia Water Initiative's Indus Focus Area Strategy: 2013-2017* citing the Indus Basin Working Group 2013). The effects in the Indus are likely to be severe owing to the large population of 300 million people and dependence on agriculture within the Indus River Basin (Immerzeel 2010).

Climate Change Will Affect Agriculture Production

The Intergovernmental Panel on Climate Change (IPCC) concluded that freshwater systems are more susceptible to climate change impacts as increased precipitation and variability is projected to increase the risk of floods and droughts, which will affect food stability and water infrastructure (Cooley et al 2009; DeStefano et al. 2012). This is dangerous because Pakistan is dependent on the Indus River System and has no other alternatives if the Indus runs short (*International Union for Conservation of Nature, Pakistan Water Apportionment Accord,* 2010). Agriculture generates 23% of Pakistan's national income and about 68% of the population living in rural areas are dependent on agriculture for their livelihood" (Bhatti and Farooq 2014). The Indus River System, which brings about 154.3 MAF of water annually (Bhatti and Farooq 2014), is a necessary component for irrigation and agriculture for 300 million people within the Indus River Basin.

Climate Change Will Increase Environmental Scarcity

Environmental scarcity refers to when the availability of a resource declines or when quality of a resource is diminished. One of the most dangerous types of scarcity is a scarcity of water, considering that water is a vital resource to sustain food production.

Environmental scarcity interacts with other factors to generate violence. For example, "It often acts as a deep underlying stressor of social systems, and it produces its effects by interacting with other contextual factors unique to the society" (Homer-Dixon 1999). The interactivity of the system justifies a closer analysis. In an interactive system, none of the causes are sufficient but all are necessary. The system is linked together so that not one cause can produce the event itself. Thus, it is not poor politics that cause violence because even great governments can experience violence; rather, it is the interaction of both politics and environmental crisis that lead to violence. Environmental scarcity indirectly affects society as it often acts as a stressor that manifests conflict into violence.

India and Pakistan are also subject to greater segmentation of society existing along ethnic cleavage. The conflict between India and Pakistan has existed since the departure of the British, and scarcity will aggravate the divisions and encourage competition among groups. In this case, India and Pakistan now have an additional fight of sharing diminishing water resources. Even though they have the Treaty to help allocate water, diminishing resources complicates it. As water availability decreases, it is likely that the countries will compete with each other in order to secure the water to which they are both entitled. Additionally, both countries are plagued with hawkish and psychological biases. Each party has a tendency for suspicion and hostility to the other

(Kahneman and Renshon 2009), which exacerbates division and competition. Each country also has pre-existing perceptions of the other due to their unfortunate history. The countries view each other as competition and as enemies. For example, "In divided states where people have experienced conflict, both sides hold onto their perception of the other as the enemy" (Johnson 2007). Their biases toward each other create misperceptions of the others' intentions and reinforce the existing conflicts. Adding the past conflict between India and Pakistan with the current conflict of water scarcity in the Indus Basin could ignite serious conflict.

While literature (Homer-Dixon 1991; Sprout & Sprout 1957; Wolf 2007) argues about the likelihood of an outright war, they can agree that environmental stress does perpetuate violence. Ultimately, water is used for all aspects of life and its use is multi-objective. "The chances of finding mutually acceptable solutions drop precipitously as more actors are involved" (Wolf 2007). The chances decrease even more so as water quantity decreases. Climate change will affect the amount of usable water, damaging agriculture, industry, and human health.

As climate change persists, there are obvious and drastic consequences. The biggest consequence being that water quantity will diminish. The amount of water available for agriculture and livestock will decrease, the health of the water will diminish, and typical weather patterns will change. It is necessary to take the threats of climate change seriously because water is the backbone to life in India and Pakistan. The Indus Waters Treaty needs to be re-negotiated to accommodate for the changing conditions. It is likely that climate change will bring a new set of water-associated conflicts and the Treaty needs to be ready to mitigate for these new conflicts.

CHAPTER V

MODIFYING THE IWT TO ADAPT TO CLIMATE CHANGE

What Does a Successful Treaty Look Like?

A successful treaty responds to potential problems. In the case of the Indus Waters Treaty, any changes made should mitigate for water availability, flooding, and its corresponding consequences. There are four categories of mechanisms that can be incorporated into existing treaties to make them more responsive to these issues associated with climate change. They are: (1) flexible allocation strategies; (2) drought provisions; (3) amendment and review procedures; and (4) joint management institutions (Cooley et al. 2009). The scope of these mechanisms can provide the flexibility needed to accommodate for climate change.

Flexible Allocation

To successfully accommodate for climate change, the Treaty needs to be resilient and flexible. DeStefano et al. (2012) asserts that a resilient treaty responds to two major factors: allocation and variability management. A treaty needs to have a mechanism in the agreement that stipulates water quantity because it offers some certainty in the uncertain future of climate change. The Indus Waters Treaty does dictate an allocation agreement, however, the problem is that the agreement is not sustainable for the increasing populations and the decreasing resource. Thus, many agree that treaties that "exhibit flexibility are likely to be more suitable for dealing with water variability" (DeStefano et al 2012 citing Drieschova, Giordano & Fischhendler, 2008; Wolf & Hamner, 2000). A treaty with flexible allocation mechanisms recognizes that water allocations may have to be reduced to match water availability (DeStefano et al. 2012

citing McCaffrey 2003).

Drought Provisions

A resilient treaty should also have a system of variability management in place. "Variability management stipulations are designed to deal with climatic extremes such as droughts and floods or other specific variations" (DeStefano et al. 2012 citing Bakker 2006). Thus, the Treaty may respond to this similarly to how it responds to allocation. A treaty needs to be flexible to deal with the reduction in available water due to drought.

Review Procedures and Joint Management

The final two mechanisms already exist in the Indus Waters Treaty. A successful Treaty needs to have a system of conflict resolution, such as third-party involvement or arbitration, in place to review the parties' actions. It provides a forum for communication and information, which is invaluable when there are disagreements about the interpretation of the Treaty (DeStefano et al. 2012 citing Drieschova, Giordano & Fishhendler 2008). Conflict Resolution increases the level of confidence of the parties, ensuring that their needs will be heard in a fair environment (DeStefano et al. 2012). Finally, a treaty needs management institutions that facilitate the conflict and dispute resolution process. Joint commissions like the Indus Commission and other river basin organizations may contribute to the effective management of the parties (DeStefano et al 2012).

Making a Successful Treaty a Reality

As mentioned above, there are four mechanisms of resilient and responsive treaties. The Indus Waters Treaty already has two of the mechanisms in place, but needs modifications to include flexibility and variability management in order to become

resilient. These mechanisms also need to respond to the problems associated with the existing Indus Waters Treaty.

A treaty with flexible allocation mechanisms recognizes that water allocations may have to be reduced to match water availability (DeStefano et al. 2012 citing McCaffrey 2003). It would address the disproportionate division of water and require the parties to re-allocate the water to accommodate for downstream flow. If the parties agree to this, there are arrangements that can accommodate for flow variability. A treaty may require that the upstream state, " to deliver a minimum flow to a downstream riparian state in order to maintain human health and key ecological functions" (Cooley et al. 2009). For example, water allocation in the Indus Basin gives India and Pakistan three rivers each and the allocation remains fixed. So if the water flow in one of Pakistan's rivers declines dramatically, Pakistan would be left with a smaller amount of water available than India. However, flexible allocation would provide water based on flow variability; so in this case, India would have to deliver water to Pakistan to make up for their loss. Thus, each country would be provided for no matter the changing conditions. Flexible allocation ensures a fair distribution of water.

Flexible allocation can also account for the population growth. The problem with the Indus Waters Treaty is, with climate change there may not be enough water to support the population. By amending the allocation provisions, water can be shared or re-divided to provide for both the large populations of India and Pakistan. The allocations should not be fixed and should change to fit the fluctuating availability.

Variability management for extreme weather events caused by climate change can come from the allocation mechanism suggested above, tighter irrigation procedures,

reservoir releases, and data sharing (McCaffrey 2003; Turton 2003). In addition, treaties can mitigate flood issues by establishing flood-warning systems to riverbank communities and by creating infrastructure like floodwalls and levees (Rossi et al 1994). States can also create flood management teams to develop protocols that can be integrated into transboundary agreements. The teams could work under an already established commission, or a new commission could be created in support of the treaty. The same can be established for dispute resolution and the amendment process. For example, within the Colorado River Basin, amendments are made using "minutes" that must be approved by all the states (Cooley et al. 2009). The joint commission for the Colorado River Basin acts as the body that makes amendments to the treaty to account for changing hydrologic and social conditions. Ultimately, a flexible management structure is one the changes to respond to public need, basin priorities, new information, and water variability.

The Treaty needs also needs to address water quality and pollution. While not much can be done to stop the pollution already done by climate change, measures can be taken to reduce the amount of anthropogenic pollution. Reducing pollution would require a creation of standard environmental regulations. These regulations would limit the amount infrastructure development (i.e. dams) that can be placed within the Indus Basin. While these dams often produce hydroelectricity, they are often damaging to the environment. These regulations can be created with the help of decision-making tools.

Including Other Players

Another change that can be made to improve the Indus Waters Treaty is to include other bordering states. As mentioned earlier, the Treaty "does not call for management

for catchment areas that are located across the border and infiltrating toxic industrial waste" (Siddiqui 2015). China constitutes 8% of the total Indus River Basin (FAO 2015). However, "China is not party to any variability-related treaties and constitutes significant portions of these basins" (Stefano et al. 2012). It is necessary to include China as a party because the headwaters of the Indus and the Sutlej rivers originate in China in Western Tibet, and the total inflow from China into India is 181.62km^3 (FAO 2015). China has access to the headwaters and has the ability to build harmful infrastructures like dams that contribute to the degradation of the river ways. The Indus Basin is interconnected. China is an upstream riparian and is able to pursue its interests with no consideration to the downstream effects of water flow. If China leaches pollution into the headwaters, that pollution will settle downstream into India and Pakistan.

Fortunately, the South Asia Water Initiative has taken notice of this problem and has begun to facilitate cooperation with all states within the Indus River Basin. It is with this understanding that "government officials and academics from four South Asian countries that share the waters of the Indus (Afghanistan, China, India and Pakistan) undertook a joint study" *(South Asia Water Initiative's Glacial Monitoring Study* n.d.) of the Glacial Retreat in the Tropical Andes Project. The goal was to learn about successful management projects and foster cooperation around managing mutual water resources. George Verghese from the Center for Policy Research in New Delhi, a member of the delegation, said, "Joining hands and working together to manage our glaciers is the key to social and economic prosperity in the region" (*South Asia Water Initiative's Glacial Monitoring Study* n.d.). It is in the best interest in the vitality of the waterways to include all the states with the Indus Basin in joint management because they are part of the

interconnected web of the Indus Basin. Responsibility should be based on the whole Indus rivers system, not just partially. Finally, since China is a neighbor to both India and Pakistan, it is also in China's geostrategic interest to negotiate and develop a hydro-political relationship with its neighbors. Although China is an economic powerhouse and can use its strength to have the upper hand (Ho 2015), careful negotiations can be made to convince China to use it economic strength to invest in environmental technologies in order to ensure river health for both itself and neighboring states.

Decision-Making

It would be beneficial if both countries abandoned the notion that water use and management should exist as independent rights of the state. Rather, the countries should think of water management as a joint responsibility. This would require the states to make mutually beneficial decisions. Mutually beneficial decisions can be made with the help of decision-making models and climate scientists. Climate scientists can produce reports called Environmental Impact Assessments (EIAs). The Department of the Environment, UK defined EIA as, "A technique and process by which information about environmental effects of a project is collected, both by the developer and by other sources, and taken into account by the planning authority in forming the judgment on whether the development should proceed" (Fischer 2014). A large part of contention for India and Pakistan is the construction of hydropower dams, canals and water storage, which alter the use of the Indus Basin's waterways. Having a team of scientists present an unbiased report like an EIA, combined with the information presented by engineers, can help the parties make clearly informed decisions. EIAs are a method of understanding the cost-benefit analysis of investing in engineered structures along the waterways. The Indus

Waters Treaty allows each state to develop, but requiring EIAs via treaty amendment will highlight the consequences and benefits of each project. It forces the parties to get into the mindset of acknowledging the consequences and encourages educated decisions. This is small step in the right direction of thinking about the Indus Basin as a whole system rather than ownership of individual rivers.

Another route of decision-making is a Relevant Factors Matrix (RFM). The RFM "details the range of factors relevant to assessing a transboundary State's entitlement to the uses of the waters of a transboundary watercourse (TIWC)" (Wouters 2013). It determines what is equitable and reasonable use of transboundary waterways. Each factor is weighed against each other and prioritized according to importance by the State. The factors are divided into 6 categories.

- Category 1: ("What") sets out the physical context of the waterway?
- Category 2: ("Who") details the population dependent on the waterway?
- Category 3: ("What uses") identifies the uses and economic demands?
- Category 4: ("What impacts") details the consequences of the uses?
- Category 5: ("What options") considers alternative uses and sources of water?
- Category 6 is reserved for other relevant factors that may be necessary for decision-making (Wouters 2013).

These decision-making models act as catalyst for integrated decision-making. They are comparative models that present the opportunity to perform a cost-benefit analysis. Additionally, they educate the states about possible consequences and provide an opportunity to discuss alternative options.

CHAPTER VII

IMPROVING UPON THE INDUS COMMISSION

Based on the preceding arguments, it is vital that the global community consider the importance of revisiting the Indus Waters Treaty. The threat of highly contentious social conflict combined with the reality of changing environmental conditions makes India and Pakistan vulnerable to resource conflict in the future. Additionally, as new issues emerge, new approaches to multilateral agreements may be necessary. However, efforts should be made to make these older agreements more coherent. One way to do this is to build upon already existing mechanisms. In the case of the Indus Waters Treaty, it already has a conflict resolution and commission mechanism in place. Building upon theses successful mechanisms can improve the resiliency and are easier to implement than creating new mechanisms.

Establishing the Commission as a Method of Facilitation[1]

The Indus Waters Treaty calls for mediation when disputes arise; but if the parties cannot come to an agreement, then the dispute is arbitrated by the Commission (*Indus Waters Treaty* 1960). But arbitration is costly and does not favor mutual success. Arbitration is usually a win-lose dynamic and a decision that favors one party over another can increase animosity between the groups. I do not deny that arbitration is an appropriate option for dispute resolution, but a situation like what exists between India and Pakistan may require something more to foster a working relationship. The first step towards this goal is for each party to participate in open and informed dialogue by any means available.

[1] Facilitation and other conflict resolution practices are only possible if both parties agree to participate in the process. The following paragraphs are written as if both India and Pakistan have agreed to participate.

Commission Members as Facilitators

While mediation is a sufficient way to resolve conflict, it is not as robust as facilitation. For example, "In mediation, the goal is to get to an agreement. In facilitation, it is to assist a group in accomplishing the content of their work" (Fleischer & Zumeta 1999). Facilitation is most closely associated with problem solving in public policy, but it can be applied to other cases. For example, the benefit of using facilitation in the case of renegotiation the Indus Waters Treaty is that it not only can help mitigate specific problems associated with climate change, but it can also help develop a framework for solving future problems. For example, facilitation can help the parties re-divide the waterways so that they are shared more evenly. Additionally, it can help develop criteria for how to assess and solve problems that arise in the future by creating a "plan of implementation" (Fleischer & Zumeta 1999).

It would be beneficial if the Commission was adapted to act more as facilitators in order to create informed dialogue and consensus building. Thus, the Commission would undertake projects of "future cooperation" (Ahmad 2011). For example, a facilitator would consult with each party to help them utilize the water judiciously in order to prevent conflict. They would also help the parties create a plan for the future considering the effects of climate change. Mediation, on the other hand, would be called in to mediate water disputes once climate change has altered the conditions of the waterways. Facilitation can more easily be modified to be proactive while mediation is more prescriptive.

Commission Members as Experts

If the Commission were to change roles, the Commission would be a joint body and "may be formed either independently or within the ambit of the Permanent Indus Commission, to work out modalities and scope of joint cooperation" (Ahmad 2011). The body may be composed of "apolitical or technical experts" and "tasked to find avenues for mutual cooperation" (Ahmad 2011). The benefit of having apolitical or technical experts is that they are neutral and do not represent a certain party. They exist to provide technical expertise, information, and consultations.

The Commission, as is stated in the Indus Water Treaty, appoints engineers in hydrology and water use to help the parties make more sound decisions. However, "there is a need to strengthen the capacity of the Commission and its staff" (Siddiqui 2015). This could be done through the inclusion of third sources like "NASA scientists, Institute of Oceanography, and Chinese experts having scientific competence on such issues" (Siddiqui 2015). The benefit of a Commission is that they can play a variety of roles. They can establish flood management teams, oversee an amendment process, and provide expertise as described earlier. In addition to the experts already mentioned, it is necessary that the Commission include climate change experts. In 2010, the International Commission for the Protection of the Rhine developed a basin-wide adaptation plan with help from their climate change expert group (Cooley et al. 2009). The team helped facilitate a shared understanding of the possible consequences of climate change and develop a mitigation plan. Including climate scientists on the Commission provides the catalysts for change within the Treaty. They provide immediate access to education and can help develop mitigation options that fit within the framework of the Treaty.

Commission Members as Interpreters and Decision Makers

I believe that it should be the responsibility of the Commission to follow the legal principle of "equitable and reasonable use" as presented in Article 5 of the 1997 UN Watercourses Convention (UNWC) (Wouters 2013). As stated in Indus Waters Treaty, the purpose of the Commission is to provide communication and interpret the Treaty. However, since the Treaty was adopted in 1960, the UNWC has presented new procedural rules such as the principle presented above. Because these rules formed post-Indus Treaty, the Commission does not have to abide by the UNWC. However, it would be beneficial to apply Article 5 because this rule focuses on the use of waters rather than the apportionment of water. All factors when evaluating equitable and reasonable use are to be considered on the *basis of the whole* which follows the International Law Association Helsinki Rules, "thus all relevant social, environmental, economic, and hydrographic factors are to be identified, given due weight, and evaluated together" (Wouters 2013). When a "conflict-of-use" arises, "vital human needs" and "vital environmental needs" shall be afforded first and second priority (Wouters 2013). The Commission should transform its body to prescribe to the modern regulations if it wants to protect the future of the Indus Basin.

Finally, one of the benefits of having the Commission act as facilitators is that the agreements are non-binding and do not undermine the authority of the Indus Waters Treaty. Facilitation is a self-motivated process so it only works if both parties are willing to cooperate. Thus, if India and Pakistan both agree to participate in facilitation in good faith then it is possible that they could create a resolution that both parties are happy with. However, any agreement (even if it was consensual) is not the end-all-be-all. Each party

still maintains their rights and authorities that the Indus Waters Treaty grants them. This is highly favorable to parties as it often reassures them that facilitation is not an adjudication process. It may be that India and Pakistan resort to resolving their differences with the Treaty, but facilitation gives them the possibility for a more favorable outcome. Facilitation provides an open forum for dialogue and encourages the sharing of information. Additionally, it provides a space to solve existing disputes but to also establish plans for the future.

Examples of Successful Facilitations

A benefit of facilitation is that it makes communication between parties easier. Facilitators help the parties communicate respectively and provide the framework for discourse and building amicable relationships. Additionally, facilitation focuses on areas of mutual interest to help find common ground. It attacks problem solving by encouraging mutual benefits, creativity, and educated decisions. Facilitation is also flexible. It can focus on very specific issues or it can be expanded to include a broad scope of issues. Finally, facilitation is a method of dispute resolution that focuses on collaboration and consensus building (Spangler 2003). By modifying the Commission to prescribe to a facilitative process, the Commission acts in good faith, provides a well-rounded education, and acts for the good of the whole. The following case studies exemplify the importance and success of applying facilitative tactics.

Case Study example: Zambezi River in Africa

About 30 million people live in the Zambezi River Basin as it is shared by 8 countries including: Angola, Namibia, Botswana, Zimbabwe, Zambia, Tanzania, Malawi, and Mozambique. Zambia and Zimbabwe created the Zambezi River Authority (ZRA) in

1987. The ZRA was comprised to act as the body responsibly for managing Kariba dam. The Zambezi River is also covered by legal framework under the SADC Revised Protocol. "The SADC Revised Protocol promotes a basin-wide approach to water management, encouraging 'close cooperation for judicious, sustainable, and coordinated utilisation [sic] or the resources of the shared watercourses'" (Wouters 2013). Recognizing the importance of protecting the waterways, 7 out of the 8 countries in the Zambezi River Basin signed the Agreement on the Establishment of the Zambezi Watercourse Commission (ZAMCOM Agreement). According to the ZAMCOM Agreement, the Commission applies facilitative practices by "provid[ing] a platform for on-going discussions and negotiations on issues relevant to the management of the Zambezi, including flood mitigation, climate change adaptation, joint infrastructure development and management, and environmental protection" (Wouters 2013). Even though Zambia is reluctant to ratify the ZAMCOM Agreement, all the countries continue to cooperate on an informal basis (Wouters 2013).

The message to take away from this case study is that mutual interest can encourage cooperation. Zambia is hesitant to ratify the Agreement but still works to cooperate based on the mutual interest of building infrastructure and providing flood control. Establishing a Commission like the aforementioned encourages communication and education both pre and post-conflict. ZAMCOM provides the platform to communicate both parties' concerns and recognize their mutual interests. Additionally, ZAMCOM is established in such a way that it encourages forward thinking. The current Indus Commission meets every year to discuss, usually, proposed dam and hydroelectric projects. However, these infrastructure developments are usually spearheaded by only

one state. Because the Indus Waters Treaty grants each country exclusive use of the waters its own territory, conflict often arises when the other country expects the consequences of a project to affect their waterways. For example, the 109th Commission meeting discussed India's proposed projects on the Chenab River in which Pakistan questioned the design in regards to spillway, pondage, and water intake (*Pakistan's Indus Waters Commission Visited India* 2013). By following in the footsteps of ZAMCOM, the Indus Commission can be encouraged to discuss joint, rather than independent, infrastructure development. This can encourage the countries to think about water as a shared resource rather than a partitioned resource as it is presented in the Indus Waters Treaty.

Case Study example: Niger River in West Africa

The Niger River is the largest waterway in West Africa. It passes through 4 countries (Guinea, Mali, Benin, and Niger) and its tributaries extend into Burkina, Faso, the Ivory Coast, and Cameroon (Wouters 2013).

In 1963, the Niger River Commission (NRC) was established in conjunction with the 1963 Act of Niamey. Later, the 1964 Agreement was created to complement the 1963 Act. The 1964 Agreement agreed to monitor and coordinate navigation activities along the river. However, the Niger Basin Authority (NBA) replaced the NRC during the 1980 Convention in response to amendments made to the 1964 Agreement. The NBA established a broader mandate. Its task is to "*promote cooperation between the member States and to ensure an integrated development on the Niger Basin in all fields through the harnessing of its resources*" (Wouters 2013). Its functions to regulate water levels, establish flood control, prevent droughts, and protect and preserve the environment is

implemented through the NBA mandate rather than through provisions contained in the 1980 Convention. The 1980 Convention was later replaced with the Revised Convention on the Niger Basin Authority of 1987 (Wouters 2013).

There have been numerous modifications since the original treaty in 1963. The Niger States adopted the Paris Declaration in 2004 for developing and implementing a Shared Vision, which included a Development and Strategic Action plan, Investment Programme, and a Niger River Basin Water Charter. Then in 2011, the Niger basin States adopted the Bamako Declaration, which featured facilitative practices like collaboration and flexibility. It contained a "set or recommendations aimed at improving and strengthening inter-State water-related collaboration" (Wouters 2013). As needs changed with the Niger Basin so did its legal regime. It has been continuously evolving for the past 50 years. The NBA has also recently been called to become even more comprehensive in response to climate change impacts (Wouters 2013). The Niger River is a great example to follow because it illustrates that an evolving regime is possible. It highlights my assertion that modifications and amendments to treaties can be successful.

Case Study example: Mekong River in Southeast Asia

Water governance in the Mekong River highlights the connections between the impacts of decisions and multi-stakeholder interests. The river winds its way through Myanmar, Laos, Thailand, Cambodia, Vietnam, and China's Yunnan Province and supports about 260 million people. Water governance in the Mekong River is particularly challenging due to "the complexity of societies, economies and ecologies" (Dore et al. 2012). Water resources are used to support agriculture, energy, irrigation, and supply water to thirsty communities but "spatial differences in wealth, job opportunities,

resource endowments, environmental degradation, business regulation, law enforcement, and political freedom" result in complex challenges and add pressure to natural resources (Dore et al. 2012). However, changes in demographics, needs, and concerns drive a change in water governance discourse.

In 1995, the Mekong River Agreement was established. It mandates inter-governmental management for the mainstream, tributaries, and lands of the basin within the Mekong River territories. Article 1 of the Agreement "commits the four member countries to cooperate in all fields of sustainable development, utilisation, management and conservation of the Mekong River Basin in all fields such as irrigation, hydropower, navigation flood control and fisheries" (Dore et al. 2012). Discourse is a large part of water governance in this region because it provides a framework for narratives, intentions, and discussions. Discourse has also supported communication in different arenas of political and decision-making power. It recognizes spatial scales like "domains of administration, hydrology, economy and ecosystem" (Dore et al. 2012) and the levels of interests. As a result, the actors participating in the discourse understand the multi-dimensional framework of water governance.

The lesson to take away from water governance in the Mekong River is the opportunity to facilitate platforms of communication. The stakeholders are as diverse as their interests but the platform for public deliberation is improving; and "improvements in Mekong River Commission forums is resulting in more participatory analyses of project merits" (Dore et al. 2012). Decision-making can be improved by encouraging discourse and the participation of varying perspectives. The benefit of having multi-stakeholder platforms is that it provides the opportunity to explore alternative

developments and assess the impacts. Additionally, discourse builds trust and cooperation for actors to work together.

CHAPTER VII

REALITY CHECKING AND CONCLUSION

A Good Foundation

Geoffrey Dalbelko presents the idea that environmental conflict can facilitate interstate cooperation. The UN Environmental Programme's Post-Conflict and Disaster Management Branch (PCDMB) has begun a program called "environmental diplomacy" which capitalizes on cooperation in times of conflict. The cooperation spurred by environmental conflicts can be "use[d] as the basis for confidence building rather than merely engendering conflict" (Dabelko 2015). Instead of countries gearing up towards war in times of scarcity, programs like these encourage environmental peacemaking (Dabelko 2015). The United Nations Environment Programme explains that environmental conflict can be a peacebuilding tool through the opportunity for dialogue and confidence building.

Feasibility

But is this new framework for agreements even possible between India and Pakistan given their history of non-cooperation? I admit that my enquiry is problematic. The problem is that the resolutions mentioned can only be feasible if both parties agree to incorporate them. These ideas cannot become a reality if one party refuses to participate. Unfortunately, it is possible that one or both of the parties may refuse to change because the risk is large. For example, water availability can be used as leverage in water scarce countries. A change in water supply can mean a change in security. A state may feel threatened if it has to share water proportionately because this eliminates the possibility of one state having more water, and thus more power (Homer-Dixon 1999). Additionally,

a state may prefer to keep the Indus Waters Treaty as it exists because it provides a freedom to develop infrastructure; where if they have to cooperative, then the development of new infrastructure may suffer. Finally, the uncertainty of the future state of the waterways may be intimidating. The effects of climate change are not certain so the success of the steps taken to adapt to climate change cannot be certain. The Commission may also feel hesitant about undertaking new responsibilities. A proactive approach is daunting and the parties may feel more comfortable remaining prescriptive.

However, I argue that change is possible because these suggested resolutions work within the framework of the Indus Waters Treaty, not against it. The benefit of transforming the Commission into facilitators is that it does not exempt the Commission of its original dispute resolution duties. It merely extends the responsibility of the Commission. That being said, it seems liked that both parties would have an easier time agreeing to adapt the scope of responsibility of the Commission than to agree to dissolve the entirety of the Indus Waters Treaty or re-allocation of the waters. Additionally, changing the standards for the Commission also does not discredit the Treaty. The rights as stated in the Treaty are still enforceable. For example, India will still have the right to the rivers allocated to it and Pakistan will still have the right to its allocated rivers (*Indus Waters Treaty* 1960). This can be presented as a reassuring incentive.

We also have a better understanding of how important it is to take care of the environment. The idea of environmental sustainability has gained popularity over the years due to the growth of environmental education in western countries. Now, other countries are investing in the future and taking the measures to ensure a healthy

environment for future generations. The momentum of environmentalism can slingshot forward the idea of renegotiating the Indus Waters Treaty to adapt to climate change.

Finally, integrated water resource management and climate change adaptation have gained popularity on the international policy agenda; including the UN Roundtable on Water Security, the World Economic Forum, and the UNECE Water Convention Meeting of the Parties (Wouters 2013). The Organisation of Economic Cooperation and Development (OECD) reports "the need for improved governance and policy coherence" (Wouters 2013) for water reform. The reality of cooperation relies on effective governance and well-functioning institutions. Without it, these reforms are prone to social and economic corruption. The Director General of the World Trade Organisation echoed this sentiment emphasizing that "global governance must be anchored in laws and regulations accompanied by mechanisms for their enforcement" (Wouters 2013). This call for increased enforcement and support from international water law warrants an exploration of the concept of obligations *erga omnes,* the duty of the States to cooperate on peaceful management (Wouters 2013). It not only warrants a legal focus but also a global community focus to manage environmental resources.

Conclusion

This Indus Waters Treaty has been a sufficient agreement to the water resource conflict between India and Pakistan in the past, but changing conditions are likely to challenge its success in the future. It has endured despite poor relations between the two countries; but it fails to consider problems associated with upstream-downstream problems, pollution, and most importantly, climate change. It is necessary that the Treaty is re-examined in order to maintain authority and to

sustain the health of the Indus Basin waterways. Climate change mitigation needs to have higher priority because climate change is likely to alter the flow and quality of water, which would create resource scarcity. Climate change consequences and the heavy dependence on water will affect the environmental, social, and economic systems within the countries; and these effects are often exacerbated in countries that have a history of social and political conflict.

Given this information, I offer suggestions on how to improve the Indus Waters Treaty. The foundations of these improvements rely on cooperation, communication and education. The best way to implement these goals is through a change in the Commission's responsibility and changing the scope of existing agreements. The case studies presented encourage the necessity for change.

My hope, if the countries do agree to extend the scope of responsibility of the Commission, is that the Commission will provide an increase in expert information to allow the parties to make more informed, well-rounded decisions. By understanding the gravity and consequences that their decisions hold, India and Pakistan can shift to making mutually beneficial decisions. This process is a small step in the larger goal of thinking about the Indus Basin as interconnected; that the waterways should be considered shared rather than partitioned. As I said, these changes would not affect the authority of the Indus Waters Treaty. The changes made to the Commission can be compared to the changes made to a co-parenting agreement. If the parties cannot agree, then the original parenting plan will be the default. Similarly, if India and Pakistan cannot agree to mutually beneficial decisions, than each country has the right to default to their rights as

stated in the Treaty. However, the future health of the Indus Basin requires a change of this mindset and I hope that the case studies presented can encourage the evolution.

Even if these resolutions seem impossible upon further examination, I hope that it has sparked a discussion for championing different avenues of conflict resolution. Even engaging in a thought experiment such as this is a step in the right direction because it opens up a forum to creative problem solving. A more peaceful world is possible but it relies on global-level change. There needs to be a shift in the political and legal mindset of cooperation being a public duty. I also hope that the readers understand the impact climate change will have on transboundary agreements and that they have gained an understanding of the importance of having treaties that respond to climate change. I encourage the readers to be critical of existing treaties and question their sustainability.

REFERENCES CITED

Ahmad, Azhar. (2011). Indus Waters Treaty A Dispassionate Analysis. *Policy Perspectives, Vol 8*, *No. 2,* pp. 73–83.

Ali, Imran. (2003). The Punjab under Imperialism, 1885-1947. Oxford: Karachi, 3.

Alam, Undala Z. (Dec. 2002). Questioning the Water Wars Rationale: A Case Study of the Indus Waters Treaty. *The Geographical Journal, Vol. 168, No. 4,* pp. 341-353.

Ansink, Erik & Arjan Ruijs (2008). Climate Change and the Stability of Water Allocation Agreements. *Environmental and Resource Economics, Vol. 41, No. 2,* pp. 133–287.

Bakker, Marloes (2006). Transboundary River Floods: Vulnerability of continents, international river basins, and countries. Unpublished PhD dissertation, Department of Geosciences, Oregon State University.

Bates, Bryson; Zbigniew Kundzewicz, Shaohong Wu & Jean Palutikof, eds (2008) Climate Change and Water. Technical Paper (6). Geneva: Intergovernmental Panel on Climate Change.

Biswas, A. (1992). Indus Water Treaty: The Negotiating Process. *Water International, Vol. 17***,** *No. 44*, pp. 201– 209.

Bhatti, Muhammad & Farooq, Muhammad. (2014). Politics of Water in Pakistan. *Pakistan Journal of Social Sciences (PJSS), Vol. 34, No. 1,* pp 205-216.

Chauhan, Narendrasinh Dr. (2012). *Note of Unit: 1 History of Agriculture* [PDF document]. Retrieved from http://www.aau.in/sites/default/files/Unit%201%20HISTORY%20OF%20AGRICULTURE.pdf

CNA (2007) National Security and Threat of Climate Change. Alexandria, VA: CNA.

Cooley, H., Christian-Smith, J., Gleick, P.H., Allen, L., Cohen, M., (2009). Understanding and Reducing the Risks of Climate Change for Transboundary Waters. Pacific Institute, Oakland, California, USA, p. 43.

Dabelko, Geoffrey D. (2015). An Uncommon Peace: Environment, Development, and the Global Security Agenda. In K. Conca and G. Dabelko (Eds.), *Green Planet Blues: Critical Perspectives and Global Environmental Politics Fifth Edition.* 244-257. Westview Press.

DeStefano, Lucia; James Duncan, Shlomi Dinar, Kerstin Stahl, Kenneth Strzepek, & Aaron Wolf, eds. (2012). Climate change and the institutional resilience of international river basins. *Journal of Peace Research 49(1).* 193-209.

Dore, John, Louis Lebel, and Francois Molle. "A Framework for Analysing Transboundary Water Governance Complexes, Illustrated in the Mekong Region." *Journal of Hydrology,* pp. 466–467

Drieschova, Alena; Mark Giordano & Itay Fischhendler (2008) Governance mechanisms to address flow variability in water treaties. *Global Environmental Change 18(2)*: 285–295.

Esman, M. J., & Herring, R. J. (2003). *Carrots, Sticks, and Ethnic Conflict: Rethinking Development Assistance*. University of Michigan Press.

Fischer, Thomas B. et al. (2014). *Environmental Impact Assessment Handbook for Pakistan.* Islamabad: IUCN Pakistan.

Fleischer, J. M., & Zumeta, Z. D. (December 1999). Preventing Conflict through Facilitation. Retrieved April 13, 2016, from http://www.mediate.com/articles/zenandflei.cfm

Food and Agriculture Organization of the United Nations (FAO). (2015). AQUASTAT website. Retrieved from http://www.fao.org/nr/water/aquastat/countries_regions/pak/index.stm

Gonzalez Manchon, B. (2000). Women and Ethnic Cleansing: A History of Partition in India and Pakistan. *Gender, Technology and Development*, *4*(1), 101–110.

Ho, Jeremy (April 2005). Why it Matters How the River Flows: The Future of China-India's Hydropolitics over the Brahmaputra River [Web log post]. Retrieved from https://blog.nus.edu.sg/uspmuse/2015/04/17/why-it-matters-how-the-river-flows-the-future-of-china-indias-hydropolitics-over-the-brahmaputra-river/

Homer-Dixon, Thomas F. *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton UP, 1999. Print.

Husain, Mahe Zehra. (2010). The Indus Water Treaty in Light of Climate Change[PDF document]. Retrieved from http://www.caee.utexas.edu/prof/mckinney/ce397/Topics/Indus/Indus_2010.pdf

Immerzeel, Walter W., Ludovicus P. H. van Beek, and Marc F. P. Bierkens. (2010).“Climate Change Will Affect the Asian Water Towers.” *Science Vol. 328, No. 5984*, pp. 1382–85.

India and Pakistan: Troubled relations. (n.d.). Retreived from http://news.bbc.co.uk/hi/english/static/in_depth/south_asia/2002/india_pakistan/timeline/default.stm

Indus Waters Treaty 1960. In International Environmental Agreements (IEA) Database Project. Retreived from http://iea.uoregon.edu/pages/view_treaty.php?t=1960-IndusWaters.EN.txt&par=view_treaty_html

International Union for Conservation of Nature, (2010). Pakistan Water Apportionment Accord for Resolving Inter-provincial Water Conflicts – Policy Issues and Options. IUCN Pakistan, Karachi.

Iyer, Ramaswamy R. (June 2002). Was The Indus Waters Treaty in Trouble? *Economic and Political Weekly, Vol. 37, No. 25,* pp. 2401-2402.

Iyer, Ramaswamy R. (July 2005). Indus Treaty: A Different View. *Economic and Political Week, Vol. 40, No. 29,* pp. 3140-3144.

Jawed, Tufail (1996). The World Bank and the Indus Basin Dispute: Indus Waters Treaty—III. *Pakistan Horizon, Vo. 19, No. 2,* pp. 133-142.

Johnson, L. S. (2007). Moving from Piecemeal to Systemic Approaches to Peace Education in Divided Societies: Comparative Efforts in Northern Ireland and Cyprus. In *Addressing Ethnic Conflict Through Peace Education: International Perspectives*. Paglrave Macmillan.

Kahneman, Daniel & Renshon, Jonathan. (2009). Hawkish biases. In A. Trevor Thrall & Jane K. Cramer (Eds.), *American Foreign Policy and the Politics of Fear: Threat inflation since 9/11.* 79-93. Routledge.

Kashmir: Conflict Profile. *Insight on Conflict*. Retrieved from http://www.insightonconflict.org/conflicts/kashmir/conflict-profile/.

Khawaja, Idrees. (2012). Development, Disparity, and Colonial Shocks: Do Endowments Matter?. UCLA: The Institute for Research on Labor and Employment.

Mandhana, Niharika. "Water Wars: Why India and Pakistan Are Squaring Off Over Their Rivers." *Time*, Accessed April 16, 2012. Retrieved from http://content.time.com/time/world/article/0,8599,2111601,00.html.

Mary Miner , Gauri Patankar , Shama Gamkhar & David J. Eaton (2009) Water sharing between India and Pakistan: a critical evaluation of the Indus Water Treaty. *Water International, Vol. 34, No. 2*, pp. 204-216.

McCaffrey, Stephen (2003) The need for flexibility in freshwater treaty regimes. *Natural Resources Forum 27(2):* 156–162.

Muhammad, Atta (Nov. 2011). Mastery over Geography and the Rise of Social Development: A Case Study of the Canal Irrigation System of the West Punjab During Colonial India. *Academic Research International, Vol. 1, No. 3,* pp. 65-72.

Pakistan's Indus Water Commission Visited India (2013). Retrieved from http://currentaffairs.gktoday.in/pakistans-indus-water-commission-visited-india-1020139067.html

Pearce, Fred. (May 2002). "Water War: India Could Suck Pakistan Dry. (This Week)." *New Scientist* 174, No. 2343:18.

Qureshi, Asad Sarwar. (2011). Water Management in the Indus Basin in Pakistan: Challenges and Opportunites. *Mountain Research and Development, 31(3).*

Rajbhandari, R., Shrestha, A. B., Kulkarni, A., Patwardhan, S. K., & Bajracharya, S. R. (2014). Projected changes in climate over the Indus river basin using a high resolution regional climate model (PRECIS). *Climate Dynamics*, *44*(1-2), 339–357.

Rossi, Giuseppe; Nilgun Harmancioğlu & Vujica Yevjevich. (1994). Coping with Floods. Dordrecht: Kluwer Academic.

Sarfraz, Hamid. (2013). Revisiting the 1960 Indus Waters Treaty. *Water International*, *38(2).* pp. 204-216.

Siddiqui, Maleeha Hamid. (March 2015). "The Indus Commission Hasn't Played an Effective Role." Retrieved from http://www.dawn.com/news/1170910

South Asia Water Initiative Indus Focus Area Strategy: 2013-2017. (n.d.). Retrieved May 19, 2016, from https://www.southasiawaterinitiative.org/indus

Spangler, Brad. "Facilitation." *Beyond Intractability*. Eds. Guy Burgess and Heidi Burgess. Conflict Information Consortium, University of Colorado, Boulder. Posted: July 2003 <http://www.beyondintractability.org/essay/facilitation>.

Sprout H, Sprout M. 1957. Environmental factors in the study of international politics. *J. Conflict. Resolution.* 1:309–28

Thar Desert (n.d.). In Encyclopædia Britannica online. Retrieved from http://www.britannica.com/EBchecked/topic/590028/Thar-Desert

The Threat of Climate Change to the Indus. (n.d.), Retrieved from http://wwf.panda.org/about_our_earth/about_freshwater/freshwater_problems/river_decline/10_rivers_risk/indus/indus_threats/

United Nations Environment Programme. (2015). From Conflict to Peacebuilding: The Role of Natural Resources and the Environment. In K. Conca and G. Dabelko (Eds.), *Green Planet Blues: Critical Perspectives and Global Environmental Politics Fifth Edition.* 258-272. Westview Press.

Warikoo, K. (Sept. 2005). Indus Waters Treaty: View from Kashmir. *Himalayan and Central Asian Studies, Vol. 9, No. 3,* pp. 1-26.

Wescoat, J. L. (1991). Managing the Indus River basin in light of climate change: Four conceptual approaches. *Global Environmental Change*, *1*(5), 381-395.

Wheeler, William. (2011, Oct. 13). India and Pakistan at Odds Over Shrinking Indus River. Retrieved from http://news.nationalgeographic.com/news/2011/10/111012-india-pakistan-indus-river-water/

Wolf, Aaron (July 2007). Shared Waters: Conflict and Cooperation. *Annual Review of Environment and Resources. 32:3.1-3.29.*

Wolf, Aaron & Hamner, Jesse (2000) Trends in trans- boundary water disputes and dispute resolution. In: Green Cross International (ed.) Water for Peace in the Middle East and Southern Africa. Geneva: Green Cross International, pp. 55–66.

Wolf, Aaron & Newton, Joshua (n.d.) Case Study of Transboundary Dispute Resolution: the Indus Waters Treaty. Department of Geosciences. Oregon State University.

Wouters, P. (2013). International law–facilitating transboundary water cooperation. *Published by the Global Water Partnership, TEC Background Papers*, (17).

WWF [World Wide Fund for Nature]–Pakistan. 2007. Pakistan's Waters at Risk: Water and Health Related Issues in Pakistan and Key Recommendations. Lahore, Pakistan: WWF Pakistan.

Yang, Yi-Chen E., Casey Brown, Winston Yu, James Wescoat, and Claudia Ringler. "Water Governance and Adaptation to Climate Change in the Indus River Basin." *Journal of Hydrology* 519 (2014): 2527–37.

Yu, W., Yang, Y. C., Savitsky, A., Alford, D., Brown, C., Wescoat, J., & Debowicz, D. (2013). *The Indus basin of Pakistan: The impacts of climate risks on water and agriculture*. World Bank Publications.