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# THESIS

**CENTRAL ASIA'S RAGING WATERS: THE PROSPECTS OF WATER CONFLICT IN CENTRAL ASIA**

by

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This thesis examines the prospects of conflict caused by water scarcity in Central Asia. The thesis analyzes the three most recent political eras of Central Asia of Tsarist Russia, the Soviet Union and the independent states of Central Asia utilizing indicators of water tensions including: Water quality, water quantity, the management of water for multiple uses, the political divisions and geopolitical setting, state institutions and national water ethos. Although water is not likely to be the sole cause of a major regional conflict, the resource may be one catalyst of conflict or instability in the already weak region. Almost every indicator studied in this thesis worsened during the Soviet era and has not improved with independence. The current water situation in Central Asia leaves the region insecure.

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# CENTRAL ASIA'S RAGING WATERS: THE PROSPECTS OF WATER CONFLICT IN CENTRAL ASIA

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Submitted in partial fulfillment of the
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# ABSTRACT

This thesis examines the prospects of conflict caused by water scarcity in Central Asia. The thesis analyzes the three most recent political eras of Central Asia, Tsarist Russia, the Soviet Union and independence, utilizing indicators of water tensions including: water quality, water quantity, the management of water for multiple uses, the political divisions and geopolitical setting, state institutions and national water ethos. Although water is not likely to be the sole cause of a major regional conflict, the resource may be a catalyst of conflict or instability in an already weak region. Almost every indicator studied in this thesis worsened during the Soviet era and has not improved with independence resulting in an insecure Central Asian water situation.

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# ACKNOWLEDGMENTS

Success flourishes only in perseverance — ceaseless, restless perseverance.

- *Baron Manfred von Richthofen*

Without my wife, my perseverance may have been restless, but never ceaseless. Thank you, Kristi, for putting up with my procrastination. My thanks to Bowen for reminding me about the important things in life…cookies and trucks. The support I received from my family and the Zugays has been unequaled.

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# I. INTRODUCTION

## A. PURPOSE

This thesis examines cooperation and conflict among Central Asian states concerning natural resources, particularly water, and the impact of resource scarcity on regional security. The thesis explicitly studies Russian Tsarist policies, Soviet policies and the current policies of the independent states of Central Asia. The main goal of the thesis is to examine the relationship of contentious water issues and conflict in Central Asia.

## B. SIGNIFICANCE

President Bush proclaimed in the 2006 National Security Strategy that America has chosen "leadership over isolation" and chosen to "deal with challenges now rather than leaving them for future generations."[1] Additionally, Bush outlined two pillars of the current strategy; first, to further "freedom, justice and human dignity" and secondly, to create a "community of democracies."[2] These pillars represent the founding principles around which to aid failing states; states which potentially harbor terrorists or extremists bent on furthering their own power and influence. Central Asia consists of five ailing states which have grappled with issues of freedom, justice, human dignity and democracy since independence in the early 1990s. Central Asia presents a challenge to the goals of the United States' National Security Strategy.

While the Central Asian states have not witnessed widespread interstate conflict since their independence, these states have faced significant disagreements over the importance of civil liberty, the role of Islam in the state and community, and natural resources. The former commander in chief of U.S. Central Command General Anthony Zinni, speaking at an intelligence conference in 2000 noted "water, not energy, probably

[1] White House Press Office, *National Security Strategy of the United States, 2006*, (March 2006), Introduction by President George W. Bush, http://www.whitehouse.gov/nsc/nss/2006/intro.html, accessed 15 September 2006.

[2] Ibid.

will be the cause of conflict in the region in the next five years."[3] While, there has never been an interstate conflict explicitly over water rights, the scarcity of water, the environmental degradation of water resources through Soviet mismanagement, and the contentious national policies towards water resources all have the potential to foster instability in Central Asia. Despite the lack of a single conflict over water in the region, the resource remains a source of instability. Nevertheless, resource cooperation and sustainability is an often overlooked factor in Central Asian security studies. Instead, most scholarly attention is focused on the roles of Russia, the U.S. and China in Central Asia, or on the burgeoning Islamist movements in Central Asia. However, transboundary water issues, water sustainability and regional energy production have the potential to create regional disagreements leading to border incursions and regional violence, all of which would create regional instability. Analysis of the policies, attitudes and trends leading to current non-sustainability of water resources and regional disagreements will help policy makers gain understanding and enhanced appreciation for the role that resource scarcity may play in regional security.

## C. OVERVIEW OF THESIS LAYOUT

In order to systematically examine the impact of water resources and its potential distribution of conflict to the Central Asian peoples and states, this thesis employs a comparative case study methodology. The last 150 years of Central Asian history can be clearly categorized into three periods: Tsarist Russia's invasion and occupation of Central Asia, Soviet annexation of the region, and eventual independence for the former Soviet Central Asian republics. Each of these periods will serve as a case for this thesis' comparative methodology. The thesis examines each case relative to four potential conflict indicators introduced in Section C of Chapter II. Chapter III examines the Tsarist policies toward water distribution and use according to the four indicators. The thesis analyzes the potential for conflict in the Soviet era in Chapter IV and finally the independent Central Asian state policies according to the conflict indicators in Chapter V. Lastly, Chapters VI and VII will compare all three periods and offer recommendations

[3] National Intelligence Council, "Keynote Address: Central Asia and the South Caucasus: Reorientations, Internal Transitions, and Strategic Dynamics," Conference Report October 2000, http://www.dni.gov/nic/confreports_asiacaucasus.html, accessed 15 September 2006.

and conclusions. Such a research strategy allows for the examination of each indicator's prominence relative to a particular period or case and also allows for a comparative assessment across periods or cases. Hence, the thesis provides analysis of the potential for overt conflict in Central Asia over water sustainability and resource sharing. Policy makers will be able to use the comparative case study to understand the evolution of regional disagreements leading to possible violence and instability.

## D. CONCLUSION

Central Asia plays a key role in Eurasian geopolitics. Because the region is between East and West, Islam and Christianity, any small conflict in the region has the potential to spread into more widespread conflict. Resource distribution and allocation exists as a potential catalyst to a conflict; one that could explode into much larger war. The United States policy to prevent regional conflict and state failure applies directly to this situation; however, the possibility of conflict surrounding access to water has not received the attention it deserves. By detailing the Tsarist water policies followed by Soviet and now independent Central Asian policies, this paper explores the trends over time surrounding a water conflict in Central Asia. It outlines the relationship between contentious water issues and possible conflict in the region. The current literature on security in Central Asia does not cover the trends of an environmentally stimulated conflict in Central Asia.

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# II. LITERATURE REVIEW

## A. INTRODUCTION

Water and resource shortages have primarily been an ancillary topic in recent scholarship examining security threats in Central Asia and are seldom considered as potential catalysts of conflict. The subject's primary literature can be divided into three classifications: non-traditional security theory, environmental security theory, and finally, geographical and Soviet induced resource shortages. The literature does not address in detail the cooperation among states, the style and stability of governments in Central Asia or indicators of growing tension in the region in relation to water. Below, I will briefly discuss the major themes of these three classifications.

## B. NON-TRADITIONAL SECURITY THEORY

The bipolar power struggle between the U.S. and the Soviet Union in the Cold War has been the primary focus of security theory. Most of this theory has reflected notions of a realpolitik world order. However, with the ending of the Cold War and demise of the Soviet Union, new forces in international relations gained prominence with international relations theorists. A particular focus of much of this new theory has dealt with non-traditional sources of conflicts between states. Indeed, it seems the definition of security has had a paradigmatic shift since the end of the Cold War. As Peter Katzenstein suggests, "the domain of national security issues [has become variable]."[4] Traditional definitions of security narrow the concept and often focus it on material capabilities and the use of military force. Narrower definitions of security do not allow for the interaction of non-traditional aspects of security that have become so prominent over the last few decades. Yet, other definitions of security are so broad and include so many variables that they become useless for policy analysis. These broader definitions of

[4] Peter J. Katzenstein, *The Culture of National Security: Norms and Identity in World Politics*, (New York: Columbia University Press, 1996), 10.

security may include too many non-traditional aspects. For example, Richard Ullman claims that anything degrading the quality of life of a nation or limiting a nation's policy option is a threat to security.[5]

States are threatened by a variety of forces, not just an opponent's military force or violent overthrow. Non-traditional security seeks to identify the non-military challenges to the functioning of the modern state.[6] Factors such as poverty, political upheaval and human rights abuses affect the stability of states and as such can lead to armed conflict.

Drawing from these more non-conventional theories, this thesis utilizes Marc Levy's definition of security which is "a threat to national security is a situation in which some of the nation's most important values are drastically degraded by external action."[7] Interstate water cooperation and conflict clearly fit Levy's definition. The people of Central Asia rely heavily on water resources to fuel their agrarian needs and power their infrastructure. State policy makers might view interstate cooperation as limiting state sovereignty and therefore try to avoid cooperation especially over riparian rights.

## C. ENVIRONMENTAL SECURITY THEORY

The works discussing environmental security cover a wide range of viewpoints. As a relatively new subfield of international relations theory, the precise relationships between environmental issues and security domains remain uncertain. Some academics such as Arthur Westing propose that all wars basically start over environmental issues including territorial gains, minerals and products of the land. Others claim that the environment has no impact on conflict and contend that environmentalists use environmental security as a vehicle to gain funding and more research for environmental issues. The environmental security literature attempts to answer what constitutes an environmental security threat and how policy makers should integrate the environment

[5] Richard Ullman, "Redefining Security" in *International Security*, Vol. 8 No. 1, (Summer 1983), 133.

[6] Robert E. Bodeski, "Integration of Non-Traditional Security Issues: A Preliminary Application to South Korea," in *Environment and Security: Discourses and Practices*, ed. Miriam R. Lowi and Brian R. Shaw, (New York: St Martin's Press, 2000), 104.

[7] Marc A. Levy, "Is the Environment a National Security Issue" in *International Security*, Vol. 20, No. 2, (Autumn 1995), 35-62.

into national security thinking. As with other aspects of international relations theory and literature, the definition of environment ranges from broad concepts to narrow descriptions.

Scholars have attempted to narrow the definition of environmental conflict and security in order to produce a meaningful study of the implications of environmental degradation. Stephan Libiszewski argues against Arthur Westing's claims that all wars have been caused by environmental scarcity. Libiszewski claims that conflicts caused by geopolitical or socioeconomic scarcity are not environmental; rather they are resource distribution conflicts. He defines environmental conflict as:

> a conflict caused by the environmental scarcity of a resource, that means: caused by a human-made disturbance of its normal regeneration rate. Environmental scarcity can result from the overuse of a renewable resource or from the overstrain of the ecosystem's sink capacity, that is pollution. Both can reach the stage of a destruction of the space of living.[8]

Most scholars argue that environmental degradation and scarcity are not direct causes of conflict. Aaron Wolf and Jesse Hammer argue that water scarcity does not lead to direct conflict but it has tremendous impacts on regional security. They go so far as to say "war over water is neither strategically rational, hydrographically effective, nor economically viable."[9] Levy argues that the academic community has a lot of work to do in this field not because the environment plays a big role in security, nor because we do not understand the environment but because we still do not know what causes war.[10] He argues that environmental degradation does not pose a direct threat to U.S. security. In line with the National Security Strategy of the United States, a prime U.S. policy goal is to prevent war by creating the conditions for peace. Thwarting environmental degradation can in turn help thwart potential regional conflict and instability. The assessment of water related tensions can help scholars and policy makers alike to recognize more precisely the relationship between water and conflict issues.

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[8] Stephan Libiszewki, "What is an Environmental Conflict?" Occasional Paper No. 1, Environment and Conflicts Project (Bern: Swiss Peace Foundation, 1992), 6.

[9] Aaron T. Wolf and Jesse H. Hammer, "Trends in Transboundary Water Disputes and Dispute Resolution," in *Environment and Security: Discourses and Practices*, ed. Miriam R. Lowi and Brian R. Shaw, (New York: St Martin's Press, 2000), 147.

[10] Levy, 35-62.

Wolf and Hammer provide nine possible indicators of future tensions over water allocation: Water quantity issues, water quality issues, management for multiple use, political divisions, geopolitical setting, level of national development, the hydropolitical issue at stake, institutional control of water resources and national water ethos."[11] This thesis, utilizing a case study method focusing on Tsarist Russian Turkistan, Soviet Central Asia and the newly independent Central Asian states examines four of Wolf's and Hammer's suggested indicators of conflict over water: water quantity and quality, management for multiple use (irrigation vs. power source), political divisions and geopolitical setting, and institutions and national water ethos. Each of these will be examined relative to their potential inducement of conflict or cooperation.

## D. GEOGRAPHICALLY AND SOVIET INDUCED RESOURCE SHORTAGES

The final body of literature that this thesis will utilize specifically concerns Central Asian resource scarcity. Nearly all literature related to Central Asian security addresses rising interstate tension related to water and energy sharing issues. A particularly important focus has been the degradation of the Aral Sea basin in Central Asia. A prominent theme of this literature is that the disappearance of the Aral Sea and the unequal distribution of water was a direct result of Soviet agricultural policies during its occupation of Central Asia.

The collapse of the Soviet Union thrust the Central Asian states into independence which led to independent resource policies and to the unequal spread of resources. Boris Rumer claims that as these states drift apart, political tensions between the states have risen. Border disputes and conflicts concerning water and energy resource sharing have grown as each nation tries to flex its sovereignty and ensure its survival.[12] Gregory Gleason asserts that the water crisis in Central Asia is not a shortage crisis but a crisis of distribution.[13] Noted Central Asian scholar Martha Olcott concurs with these opinions.

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[11] Wolf and Hammer, 144-146.

[12] Boris Rumer, "The Search for Stability in Central Asia," in *Central Asia: A Gathering Storm?* Ed. Boris Rumer, (New York: ME Sharpe, 2002), 4.

[13] Gregory Gleason, *The Central Asian States: Discovering Independence*, (Boulder: Westview Press, 1997), 161.

She points out the competition of water resources goes back thousands of years between the farmers and the nomads in Central Asia. The age old problem took on new found significance in the aftermath of independence.[14]

The majority of the existing Central Asian security literature recognizes the distribution problem and roots this problem with the Soviet mismanagement and inefficient control of water resources. Gleason claims it is the result of an excessive agrarian policy in a semiarid environment. The Soviets attempted to yield too much out of the region to keep up with American agricultural wealth.[15] Rumer writes "the severity of the water question is intensified by the highly complicated water management system that the Soviet regime constructed in Central Asia."[16] Olcott combines the problem of Soviet rule and newfound independence when she claims that the privatization of land will lead to conflict over who owns the access to the water.[17] Resource allocation and sharing in Central Asia has historically deep roots that have been uncovered in the first decade of independence.

## E. CONCLUSION

Contemporary Central Asian security studies leave a void around non-traditional security theory. Current works tend to look at the region in more traditional ways, often analyzing competition in the region between the world's major powers. These works often mention the poor water distribution and environmental degradation as a secondary impact on regional security. Current works that do examine a water shortage impact on security do not relate the issue to current geopolitical indicators specific to Central Asia. This thesis adds to the contemporary literature by elucidating the implications of current indicators of a potential water conflict.

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[14] Martha Brill Olcott, *Central Asia's Second Chance*, (Washington, DC: Carnegie Endowment for International Peace, 2005), 26-27.

[15] Gleason, 156.

[16] Rumer and Zhukov, 131.

[17] Olcott, 120.

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# III. TSARIST RUSSIAN COLONIZATION CASE STUDY

Central Asia once existed at the crossroads of intercontinental trade and culture. The region grew wealthy and became home to powerful political and religious figures. As a northern neighbor, Russia maintained continual yet intermittent trade-related contact with the Central Asians; however, the 19th Century brought the Russians in force into the region. The Russians began colonizing the region in an attempt to counter the British settlement in the Indian Subcontinent. This competition spurred the so called "Great Game" in which Russia and Great Britain vied for influence in Central Asia.[18] Russia held the advantage in Central Asia, as its proximity and historical relations with the region helped guarantee its influence. During the 19th Century, Russia colonized and usurped the fruits of the region for itself and altered water distribution and use forever.

## A. WATER QUANTITY AND QUALITY

The physical geography of Central Asia dictates its water quantity. Central Asia is a landlocked region containing a range of elevations and climatic zones. The overall topography of Central Asia resembles a bowl consisting of elevated grasslands surrounded by high mountain ranges that act as climatic barriers which help to create an arid climate. In the north, modern day Kazakhstan gives way to Siberia, Turkmenistan in the Southwest gives way to the deserts of Persia, while Kyrgyzstan and Tajikistan bound the mountains of China and Afghanistan to the East and South. The Pamir Mountains in the Southeast are some of the highest and most formidable mountains in the world. Limited precipitation in the plains, combined with high temperatures and low humidity create a "high degree of evapotranspiration" which draws away most of the rain that falls in the plains.[19] The mountainous areas receive around 600-800 mm (23-31 inches) of precipitation annually while the desert areas average around 80-150 mm (3-6 inches).[20]

[18] Peter Hopkirk, *The Great Game: Struggle for Empire in Central Asia*, (New York: Kondansha International, 1994).

[19] Peter Sinnott, "The Physical Geography of Soviet Central Asia and the Aral Sea Problem," in *Geographic Perspectives on Soviet Central Asia*, Ed. Robert A. Lewis, (London and New York: Routledge, 1992), 82-83.

[20] Interstate Commission for Water Coordination in Central Asia, "Challenges and Actions for Integrated Approaches," December 2005, http://www.gwpcacena.org/en/pdf/ca_position_paper_eng.pdf, accessed 30 November 2006.

Because the bulk of the precipitation occurs in the mountains, the main water source for the entire region is runoff from melting snow and glaciers in the mountains. This runoff contributes to the two major rivers which traverse the region, the Amu Darya and the Syr Darya; both of which empty into the Aral Sea.

The Amu Darya is the longer of the two main rivers. Today, it is over 1,500 miles long, and takes in four tributaries. The river encompasses a catchment area of almost 120,000 square miles. Because melting snow provides most of its flow, the heaviest runs occur in the summer. The river's rapid descent from the heights of the Hindu Kush produces a quick flow rate which causes erosion, delivering loads of fertile sediment all along its path. These deposited silt beds support fruitful fields along the Amu Darya's banks which invigorate farming and irrigation.[21] The Syr Darya, although not much smaller than the Amu Darya, catches much less water. Just over 1,400 miles long, the Syr Darya's catchment area includes 57,950 square miles; less than half of the catchment of the Amu Darya.[22] As with the Amu Darya, the Syr Darya originates in the mountains and flows to the plains and eventually into the Aral Sea. Data for the water volume of the two river basins does not exist for the Imperial Russian era.

The arid climate of Central Asia creates a need for networks of irrigation canals to allow population growth in the region. Central Asia once contained vast networks of canals, some dating back to before the Christian era.[23] Most of these canals became military targets during times of war and fell into disrepair. The Russian arrival actually generated a period of peace and allowed the repair and construction of new irrigation canals. The majority of Central Asians lived near parcels of land that had adequate irrigation when the Russians arrived in mass.[24] Soon, however, the Russians began to

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[21] Ian Murray Matley, "The Population and the Land," in *Central Asia: 120 Years of Russian Rule*, Ed. Edward Allworth, (Durham and London: Duke University Press, 1989), 116.

[22] Interstate Commission for Water Coordination in Central Asia, "Challenges and Actions for Integrated Approaches," December 2005, "Syrdarya River Basin Morphology," http://www.cawater-info.net/syrdarya/geo_e.htm, accessed 11 December 2006.

[23] Richard A. Pierce, *Russian Central Asia 1867-1917: A Study in Colonial Rule*, (Berkeley and Los Angeles: University of California Press, 1960), 175.

[24] Ian Murray Matley, "Agricultural Development," in *Central Asia: 120 Years of Russian Rule*, Ed. Edward Allworth, (Durham and London: Duke University Press, 1989), 266-267.

extend the usefulness of flowing water by constructing canals, channeling water from the rivers and pushing settlers away from the banks of rivers.

Increased Russian settling of the region spurred demand for water. The 1911 census of the Turkistan oblasts lists a total population of 6,492,692 including 406,607 Russian nationals.[25] Assuming that these Russians, making up nearly seven percent of the population, only recently moved into the area to work as farmers or with livestock, a dramatic increase in the use of water would have occurred. Even with this influx of people and increased water use, the region probably did not face a water shortage at the time, even though it is an arid region. Scholars label a region as water scarce when two-thousand people share one million cubic meters of water. [26] As will be shown in Chapter V, current population and water quantity measures do not indicate the region as a whole has a water scarcity problem today; Central Asia under Imperial Russia's control did not have a problem either.

As with water quantity, no significant data exists about water quality in Imperial Russia's Central Asia. Chemicals and chemical based fertilizers were not used readily in this era; however, salinization from evapotranspiration has been a problem throughout the history of the region. Due to the region's arid climate, open water sources evaporate in the dry air leaving behind silt and sand which decreases water quality for domestic use. As the water evaporates, salt is left behind close to the surface of the ground. Without adequate precipitation to wash away the salt, the concentration becomes toxic to many plants.

Daily life for the Central Asians revolved around keeping the canals clear of silt and debris. The canals supported the especially dense populations in the oases but also were constructed in some upland valleys. "Along the large rivers there were intricate networks of canals which had to be kept free from silting and regulated" in order to

[25] Pierce, 308.

[26] Kai Wegerich, "Water: The difficult path to a sustainable future for Central Asia," in *Central Asia: Aspects of Transition*, Ed. Tom Everett-Heath, (London and New York: RoutledgeCurzon, 2003), 256.

insure a constant flow to the fields.[27] The fast flowing mountain rivers provided valuable silt for the fields, but also deposited this silt in the irrigation and drinking water canals.

Central Asians also worked hard to eliminate animal waste from stored water containers. "Brick lined cisterns" of water derived from wells and rainfall along the routes provided water for traders and caravans. To prevent evaporation, they were often covered with masonry domes. The water lasted long in these reservoirs, but often fell victim to dirt and animal waste "washed in by the rain."[28]

Where canals did not suffice, Central Asians often flooded the pastures creating a problem of too much water rather than a problem of water scarcity. Indeed in areas close to rivers rather than using the canals, the Central Asians simply flooded the fields. The silt-laden water provided decent fertilizer, but left salt as a byproduct when it evaporated. The Russians simply followed centuries of Central Asian tradition and continued to flood the fields close to rivers rather than build canals. In the late Nineteenth Century, a Russian General actually flooded over 80,000 acres of land where a canal did not accomplish proper irrigation.[29] Flooding proved very inefficient and left behind silt and sand when the water evaporated. Furthermore, flooding created marshlands which fostered malaria infested mosquitoes. Despite the aridity of the region and the silt-laden waters, water quality and quantity in Tsarist Russia's Central Asia do not seem to have been catalysts of regional conflict.

## B. MANAGEMENT FOR MULTIPLE USE

Water, a valuable resource, can be managed for different uses. When the water uses diverge, the potential for conflict and disputes rise. Water use during the Imperial Russian colonization of Central Asia revolved around crop irrigation and domestic use. Most of the domestic users of fresh water during this time period understood the

[27] Elizabeth E. Bacon, *Central Asians Under Russian Rule: A Study in Culture Change*, (Ithaca and London: Cornell University Press, 1980), 57.

[28] Ian Murray Matley, "Industrialization," in *Central Asia: 120 Years of Russian Rule*, Ed. Edward Allworth, (Durham and London: Duke University Press, 1989), 321.

[29] Pierce, 176.

importance of irrigation; it existed as the center of the Central Asian lifestyle. The interests of different groups and users may have varied, but typically did not diverge so much as to incite elevated conflict.

The Russians increased the amount of land irrigated and enlarged the canal system dramatically which helped create a farming culture reliant on transported water. They transported the water away from the rivers creating tillable fields and communities in previously deserted regions. Statistics vary concerning the amount of land that Tsarist Russia irrigated before 1917. Some Soviet sources report an increase of 815,000 acres of irrigated land in Central Asia between 1870 and 1915; another source claims an increase of 7.4 million acres by 1914.[30] Table One represents several districts in Southern Central Asia and shows that irrigated lands in Southern Central Asia nearly doubled between 1903 and 1914.

| | **1903** | **1913** | **1913-1914** |
|---|---|---|---|
| **Guberniia of Turkistan** | 5,899,500 | 7,581,600 | 8,159,400 |
| **Emirate of Bukhara** | 1,080,000 | 4,320,000 | 4,860,000 |
| **Khanate of Khiva** | 540,000 | 945,000 | 810,000 |
| **Total** | 7,519,500 | 12,846,600 | 13,829,400 |

Table 1. Irrigated Areas of Southern Central Asia (Acres)[31]

The Russians dramatically altered the Transcapia oblast by reclaiming the desert land to produce crops. In ancient times, this region had been famous for its fertile soil; however, a gradual climate change turned it into a dry region of disappearing small streams. In 1887, Emperor Alexander III approved construction of a new dam along the Murgab River. Several dams were built and several burst before the Russians built a successful dam using European construction models. The irrigated land exploded to over 67 thousand square acres. Unfortunately, planners had counted on irrigating hundreds of

[30] Matley, "Agricultural Development," 272.

[31] Ibid.

thousands of acres. Additionally, the poor design of the dams and canals created poor irrigation practices. Over irrigation created marsh lands leading to malaria, and an alkaline soil. The location of the dams allowed much silt into the reservoirs which limited their total water capacity. [32]

## C. POLITICAL DIVISIONS AND GEOPOLITICAL SETTING

The period of Russian colonization occurred at a time of European imperialism. While the rest of the "modern" world reaped the benefits of colonization, Imperial Russia had only begun to spread its fingers across the Eurasion continental land mass. Where there existed political voids and opportunities to subsidize its own agricultural intakes, Russia spread its citizens. Central Asia offered attractive land for the Russians; it provided a buffer against northward British expansion, and supplemented its grain and cotton consumption.

During the Nineteenth Century, Russia imported most of its cotton; Central Asia provided a means to produce its own cotton and balance its cotton trade. The American Civil War drove up the price of American cotton, which much of the world depended on. Russia needed to find another source to clothe its growing population. In 1870, Russia produced less than 200,000 pud of cotton and imported more than 2.5 million pud.[33] By the time of the Bolshevik Revolution, Turkistan alone produced 24 million pud of cotton.[34] The Russians had introduced a new breed of American cotton to Central Asia in 1884 and by 1913 increased the amount of lands cultivated for cotton in Central Asia by nearly nine hundred times! Cotton fields accounted for one-fifth of the irrigated land in the region and provided nearly half of Russia's cotton needs. [35]

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[32] Pierce, 178.

[33] One pud equals 16.380 kg, see Gerard O'Neill, "Land and Water 'Reform' in the 1920s", in *Central Asia: Aspects of Transition*, ed. Tom Everett-Heath, (London and New York: Routledge Curzon, 2003), 66.

[34] Ibid.

[35] Gerard O'Neill, "Land and Water 'Reform' in the 1920s", in *Central Asia: Aspects of Transition*, ed. Tom Everett-Heath, (London and New York: Routledge Curzon, 2003), 67.

The Russians never governed Central Asia as a single discrete territorial unit.[36] The Tsarist government divided Central Asia into three governor-generalships which included Orenburg, West Siberia and Turkistan. The governor-general in charge of each region reported directly to the Tsar. An enormous bureaucracy assisted the governor-general in all aspects of colonial rule. The Tsar further divided each region into "provinces, known as gubernias in the older, longer-settled parts of the empire, and as oblasts in the newer regions" which included Central Asia.[37] The oblasts mirrored the governor-generalships in structure. The whole system resembled a military chain of command structure, rather than a civilian system of government.

This seemingly simple governor-generalship system became dysfunctional due to the rampant corruption, scandal and confusion related to the exact chain of command. Local chiefs did not know whether to adhere to orders given by military commanders in the oblasts or from the civilian administrators. The size of the bureaucracy created a weakness as well. As the size of the administration expanded, less dependable administrators and military leaders became infused into the ranks. The Russian army in Turkistan became "a refuge for the scum of the military society" as most of the "good" officers would rather be stationed in European Russia.[38] Several attempts at governmental reformation were attempted right up until the Bolshevik Revolution; however, most proved to be inadequate. The style of government and provincial divisions did not help create unified institutions in Central Asia.

## D. INSTITUTIONS AND NATIONAL WATER ETHOS

State institutions that settle disputes fairly and provide a strong framework of governing can help quell tensions concerning water resources. A state with weak institutions or with no authority or control of water resources may be inclined to have more conflict. Additionally, the national ethos, the feeling of the country, towards water can elevate minor disputes into large conflicts or help deescalate the same disputes. How

[36] Martha Brill Olcott, "Central Asia: Common Legacies and Conflicts," in *Central Asian Security: The New International Context*, ed. Lena Jonson and Roy Allison, (Washington, D.C.: Brookings Institution Press, 2001), 29.

[37] Pierce, 65.

[38] Ibid., 68.

much does a nation value water? Similar to nationalism, the feeling of a nation, while hard to gauge, can be a useful tool to analyze the potential of a regional conflict over water.

People living in arid climates in limited contact with frequent running water tend to devote much attention to water procurement and protection. The Central Asians are no different; water rights and use are ingrained in their customs and religious laws. Before and during the Imperial Russian conquest of Central Asia, the people of the region valued water and took great care to its maintenance and upkeep. In fact, the people often valued water rights more than land rights.[39]

Ancient Central Asian customs helped alleviate water distribution disputes and provided a high authority to oversee the water system. Each village elected an official, usually an elder, to preside over the distribution of water and care of the canal. Any family that used the water from a particular canal was expected to "contribute labor in keeping the canal clear."[40] The elected official, known as the *mirob*, was often considered the most important member of a local government. The mirob ensured all people along a river or canal received equal and adequate amounts of water, whether for crops, livestock or domestic use. In some cities, water gauges detected water flow in several sections of urban canals. Mirobs in these urban areas received hourly reports on water flow from a large network of employees. The mirob passed out instructions via messengers to each section of the city concerning how to alter the flow of water.[41] As in most aspects of Central Asian life, corruption became embedded in the distribution. Mirobs often delivered more water to those in the community that had the ability to pay for it.[42]

Islamic law guided land and water ownership rights in Pre-Soviet Central Asia. The ownership of water rights made owning land valuable; without water, the land sat

[39] Bacon, 73

[40] Ibid.

[41] Sarah L. O'Hara and Tim Hannan, "Irrigation and Water Management in Turkmenistan: Past Systems, Present Problems and Future Scenarios," in *Europe-Asia Studies*, Vol. 51, No. 1, (January 1999) 24.

[42] Bacon, 74.

parched and useless. Sharia "connected the right to water with the right to land."[43] Land that was not irrigated and was not cultivated belonged to the government whereas improved land, according to Sharia, belonged to the person who made the improvements. This landowner had a right to an "equitable share of the water" not rights to the water source itself. While water rights derived from Islamic law, the "sale of water, cleaning of ditches and other servitudes" followed regional custom.[44]

## E. CONCLUSION

Although Central Asia had an arid climate during Imperial Russia's rule, water quantity does not seem to have been a problem for the colony. The population of the region, although dense in areas of oases, did not exceed the supply of water. Glacier runoff and annual precipitation provided sufficient water for the region. Additionally, distribution of the water to outlying areas came under repair during the Tsar's rule. Water quality began to decline during the Tsar's rule, but did not endanger the population. Rather, the water quality only hindered the successful operation of the canals. Heavy silt from the rivers and salinization from evapotranspiration limited the effectiveness of the irrigation techniques the Russians used in Central Asia.

The multiple uses of water during the Tsar's rule over Central Asia did not create tensions in the region. The Russians only improved irrigation and created more available farmland which would have benefited the Central Asians. Although ethnic Russian settlers helped colonize the area and took water resources from established native farmers, there was enough water for both groups. Central Asians still maintained some authority in local villages and communities to impart their own wishes on the use of water.

The geopolitical setting and institutional practices during this era did not help reduce tensions concerning water. The governing system that the Russians established in Central Asia, while relatively simple, actually created tension. Natives did not understand whether the military or the civilian leadership ruled over them. The

[43] Pierce, 144.

[44] Pierce, 144.

conversion of farmland from cereals and grains to cotton decreased the food supply in Central Asia. Central Asia's different regions and oblasts did not unify under Russian control, creating the potential for tension. Additionally, rampant corruption decreased justice while increasing lawlessness, both of which led to weak institutions cultivating in a higher potential for the outbreak of violence. These institutional weaknesses and the overall geopolitical setting created higher regional tension in Central Asia.

The Central Asians value water and efficient use of it. The region bloomed from several oases in a vast, arid, landlocked landmass. Their customs and religion dictated the governance and use of the valuable resource. Their custom dictated that anyone who used canals was to aid in maintenance and construction of the waterways. This shared responsibility led to greater cooperation and decreased potential for violence. Additionally, the appointment of a town elder to govern the water rights and distribution aided in village confidence in the water distribution. Although these mirobs were often corrupted, overall, they were a valuable institution and public official. The high level of respect for the water resource has the potential to create feelings of ownership and envy of those with greater quantities which could escalate violence. However, the strong role of custom and religion in the region counteracted any feelings of mal-intent between the "haves" and the "have-nots." The region's strong value of water contributed to peaceful water sharing.

The Tsarist reign over Central Asia set into motion the customs and laws that the Soviets would eventually encounter and expand upon. The Imperial occupation would forever change the practices of sustainable development in both agriculture and water in Central Asia; however, the indicators of a potential water conflict do not show an escalation towards a water crisis during this era. Unfortunately, the seventy years following the Bolshevik Revolution changed the nature of the water situation in Central Asia forever; more so even than the Tsarist policies.

# IV. SOVIET UNION CASE STUDY

The Imperial era came to a close in a dramatic fashion in Central Asia. The native Central Asians had for years expressed discontent with the Tsar's policies and government. The corruption and confusion of the governor-generalship combined with the Imperialist usurpation of the fruits of Central Asia fueled resentment that first showed itself in the Andijon uprising of 1898. The turmoil of World War I, the Tsar's display of weakness and his eventual resignation provided a catalyst for the Central Asians to stand up to the Bolsheviks. The Basmachis, or bandits, attempted to disrupt Russian control over the region in numerous ways, including disrupting irrigation systems, and destroying crops. During the Russian Civil War, crop production decreased dramatically.[45] The Basmachi Rebellion lasted for at least ten years before the Red Army squashed the native insurgency. Meanwhile, Russian nationals living in the region, including workers, soldiers and peasants, simultaneously began to form Soviets (councils) and fill the power vacuum left by the abdication of the Tsar. Stated simply, the new Soviets voted the old regime out and seven decades of social and political experimentation ensued. The water situation in Central Asia did not escape the Soviet experiment.

## A. WATER QUANTITY AND QUALITY

The years of the Russian Civil War nearly collapsed the tender agrarian economies of Central Asia. The disruption of the Basmachis combined with a horrific drought led to a famine causing the deaths of well over a million people between 1919 and 1923.[46] As soon as the Soviets quelled the Rebellion and took power, they earnestly began to fix the dilapidated water management system. The policies and programs that the Soviets instituted in Central Asia strongly affect its current situation.

> When the Soviets seized power in Central Asia, existing trends were halted abruptly. The administrative and economic forms of the previous

[45] Matley, "Agricultural Development," 285.

[46] Ibid., 286.

> regime were scrapped and replaced by a more highly centralized and inflexible system, able to mobilize labor and capital as never before.[47]

The water distribution and irrigation system did not escape this new "centralized and inflexible system."

The average annual precipitation over time remained steady throughout the Soviet era. A study published in 1962 showed an average of 21.9 inches of precipitation in the mountains (556 mm), of which sixty-five percent is lost through evapotranspiration.[48] Permanent snow fields provide the majority of the water to the rivers. This melt-off has kept the volume of the rivers relatively constant over the years. "In the thirty years preceding 1944, annual deviations from the mean were considerably less than five percent despite the increase in irrigation."[49] Because of this consistency, the numbers in Tables Two and Three located in Chapter V serve as good estimates for river flow in the Soviet era as well.

Most of the water needs during the Soviet era were originally met by smaller tributaries to the Amu and Syr Darya, rather than from the large rivers themselves. The smaller rivers usually originated from permanent snow fields and provided a constant and steady source of useful water. In contrast, the Amu and Syr Darya both flowed very fast, carrying large amounts of sediment. Canals only used 15-17 percent of the water from the Amu Darya and even less from the Syr Darya before 1962.[50] Ground water also provided means for irrigation; however, at least until 1956, groundwater only contributed about 5.5 percent of the irrigation water for Uzbekistan, 3.4 percent in Kirgiziya, 6 percent in Tadzhikistan and 8.3 percent in Turkmeniya. One source estimates that the total usable amount of groundwater existed at 12.8 million acre-feet per year compared with the 105 million acre-feet (130 $km^3$) available from the rivers. [51]

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[47] Pierce, 304.

[48] Robert A. Lewis, "The Irrigation Potential of Soviet Central Asia," in *Annals of the Association of American Geographers*, Vol. 52, No. 1, (March 1962), 102.

[49] Ibid., 103.

[50] Ibid.

[51] Ibid., 113.

The Soviets steadily increased the amount of irrigated cropland until the mid 1960s when they finally began to use more water than the river basins produced. The estimated irrigation requirements for 1960 using 1956 data show a planned increase of more than 2.3 million acres. Even with this increase, the water requirements were estimated to be just over 70 million feet acre-feet (86 $km^3$). Given the average water flow of 105 million acre-feet, the planned irrigation increase in 1960 would have been tangible with the yearly water flow. Unfortunately, the Soviets continued to increase the amount of irrigated land in Central Asia until the rivers could no longer sustain the increase. By 1988, seven million hectares were under irrigation, an increase of more than one-third.[52] In the same time period, water use more than doubled; this "disproportionate increase in water use resulted mainly from the development of new irrigation on marginal land."[53]

| Area | Planned Increase of Irrigated Land (acres) | Water Requirements for Planned Acreage (acre-feet) | Average Efficiency | Irrigation Diversion Requirements for Planned Acreage (acre-feet) | Irrigation Diversion Requirements in 1955 (acre-feet) | Potential Irrigation Diversion Requirements in 1960 (acre-feet) |
|---|---|---|---|---|---|---|
| Uzbek SSR | 803,000 | 1,921,400 | 32.7 | 5,876,000 | | |
| Kirgiz SSR | 284,200 | 570,700 | 32.5 | 1,756,000 | | |
| Turkmen SSR | 506,600 | 1,324,600 | 40.5 | 3,271,000 | | |
| Tadzhik SSR | 219,900 | 526,000 | 35.7 | 1,473,000 | | |
| Kazahk SSR | 528,800 | 1,109,600 | 36.7 | 3,023,000 | | |
| Total | 2,342,500 | 5,452,300 | | 15,399,000 | 54,606,000 | 70,005,000 |

Table 2. Estimated Irrigation Diversion Requirements (for the 1960 irrigation season)[54]

[52] Sinnott, 84.

[53] Stefan Klotzli, "The Water and Soil Crisis in Central Asia- A Source for Future Conflicts?" ENCOP Occasional Paper No. 11, Center for Security Policy and Conflict Research/Swiss Peace Foundation, Zurich/Berne, May 1994, http://cms.isn.ch/public/docs/doc_246_290_en.pdf, accessed 14 February 2007.

[54] Lewis, 111.

Gradually, the Soviets diverted more water from both the Amu and Syr Darya for irrigation. Diversion increased from 71.5 percent in 1970 to 88.4 percent just two years later in 1973. As stated before, the overall average flow of the rivers remained fairly constant over the years; however, the amount of water reaching the endpoint of the rivers at the Aral Sea, continually decreased during the Soviet era to the detriment of the Aral Sea. The downstream countries therefore saw their shares of the rivers dwindle as the water came to a trickle closer to the mouth.

| Year | Combined Flow |
|---|---|
| 1960-1971 | 42.9 |
| 1971-1980 | 16.1 |
| 1981-1984 | 4.2 |

Table 3. Combined Flow of Amu Darya and Syr Darya into Aral Sea($km^3$)[55]

The demand for water increased in the Soviet era, not only due to increased irrigation, but also as a result of the Soviet settlement of the area. Russians technocrats, intelligentsia and peasants moved to the region. Between 1951 and 1989, Central Asia's population more than tripled partially due to a growth rate more than double that of the entire USSR.[56] Most of the population lived along riverbanks and irrigation canals and in some valleys exceeded two hundred people per square kilometer.[57] This more than three-fold increase in regional population began the strain on the area's water reservoirs.

Central Asian water quality also declined dramatically during the Soviet era. To increase production, the Soviet system relied upon chemicals pesticides and fertilizers as a means of creating more hardy crops. As a result, Central Asia "boasted the highest

[55] Sinnott, 86.

[56] Richard H. Rowland, "Demographic Trends in Soviet Central Asia and Southern Kazakhstan," in *Geographic Perspectives on Soviet Central Asia*, Ed. Robert A. Lewis, (London and New York: Routledge, 1992), 223.

[57] Ibid., 228.

level of pollution in the Soviet Union."[58] The Soviet used the fields of cotton as a tool of employment. By creating vast, productive fields with the aid of fertilizers and herbicides, the Soviets were able to employ large amounts of unskilled Central Asians. They aimed to help the region develop as quickly as possible with little thought to the environmental consequences. As a result, to this day much of the industry in the region is still not fitted with pollution-limiting devices.[59] The pollution affected the rural populations the most, as they derive their domestic water from the irrigation canals. "High morbidity rates for typhoid, hepatitis, and gastrointestinal illness, along with high infant mortality" resulted from the pollution before Central Asia's independence.[60] Infant mortality rose 43 percent from 1980 to 1986 in the Tashauz Oblast because of polluted water.[61] Just before independence, some areas of Central Asia used quantities of poisonous chemicals per hectare that exceeded the Soviet average by more than fifty times.[62] The Soviet emphasis on production directly hindered the quality of water in Central Asia.

The enormous increase in irrigated land during the Soviet era led to even greater salinization of the water. The new fields that the Soviets chose to push into production often were not the best qualified fields and were typically very heavily salt-laden. These fields had to be "washed" of the salt with water that was re-circulated into the canal and reservoir system. The high salt content requires higher than normal use of irrigation water to keep the salts flushed out of the soil.[63] Additionally, low-efficiency canals that were uncovered allowed evapotranspiration to add even more salt to the water. Soviet Turkmenistan had "moderate to severe salinization on 37 percent of the irrigated lands in 1980."[64] The declining Aral Sea exemplifies the salt problem the region faces from evaporating water. "Much of the 28,000 $km^2$ of bottom exposed between 1960 and 1989

[58] Igor Lipovsky "The Deterioration of the Ecological Situation in Central Asia: Causes and Consequences," in *Europe-Asia Studies*, Vol. 47, No.7. (November 1995), 1119.

[59] Ibid., 1120.

[60] Peter R. Craumer, "Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia," in *Geographic Perspectives on Soviet Central Asia*, Ed. Robert A. Lewis, (London and New York: Routledge, 1992), 141.

[61] Ibid.

[62] Alex Stringer, "Soviet Development in Central Asia," in *Central Asia: Aspects of Transition*, Ed. Tom Everett-Heath, (London and New York: RoutledgeCurzon, 2003), 150-151.

[63] Craumer, 139.

[64] Ibid.

is salt covered."[65] This concentration of toxic salts inhibits any new vegetation from growing, creating vast wasteland and clouds of blowing salt and dust often deposited as far as 400 km away.[66]

The last years of the Soviet Union finally brought the pollution of Central Asia into the limelight. Gorbachev's perestroika and glasnost allowed outsiders to view the region for the first time and discover the ecological disaster in the making. Unfortunately, the ecological disaster that Soviet planning and action created will not blow away as quickly as the salt that blows off of the desiccated Aral Sea.

## B. MANAGEMENT FOR MULTIPLE USE

Soviet planning attempted to maximize resources and squeeze as much out of the people and land as possible. The rise of technology, industry and power generation around the world coincided with the rise of the Soviet Union. The backward state mined the raw materials of Central Asia to feed and power its infrastructure. Central Asia's unique position as an arid region with fast flowing mountain rivers made water a valuable resource in more ways than one. During the Soviet era, water developed another use; it provided hydroelectric power. With the advent of this use, a rift automatically occurred between the Republics that used water for hydroelectric power versus those who traditionally used the water for irrigation.

The Soviets began developing Central Asian hydroelectricity during World War II but engineered the largest increase during the 1960s to feed the growing industrial sector. Kazakhstan's total electrical production doubled during the war to support mines and mineral processing plants and continued to grow during the 1960s.[67] Total electrical production in the "four southern republics rose from 679 [thousand] kilowatt-hours in 1940 to 12.45 million in 1963."[68] The Sixth Five-Year Plan called for an increase in electricity production of 88 percent with an emphasis on hydroelectric power which was

[65] Philip P. Micklin, "The Water Management Crisis in Soviet Central Asia," in *The Carl Beck Papers in Russian and East European Studies,* No. 905, August 1991, 48.

[66] Ibid.

[67] Matley, "Industrialization," 342.

[68] Ibid., 335

in turn supposed to increase by 2.7 times.[69] By the end of the 1980s, Central Asia derived about 35 percent of its electricity from hydroelectric stations.[70]

The Soviets constructed many of the hydroelectric power stations to feed industrial manufacturing, which in turn served the farming and irrigation needs of the region. Construction began on the Nurek power station in 1961; although it did not become fully operational until 1981. Located on one of the world's highest dams, most of its power fueled operations at a nearby aluminum mine.[71] As the Soviets increased the number of hydroelectric power plants, water users downstream began to feel the loss of dependable water for irrigation. As shown in Section A., the amount of irrigation also increased dramatically at this time, creating a tug-of-war between water users.

The Soviets favored the downstream agricultural needs of the water users. The upstream republics had less farmland and more hydroelectric plants. Irrigation for farmland usually received the most water. In 1987, the Soviets allocated 87 percent of water available in the Aral Sea Basin for rural areas, only 10 percent for industrial uses and a meager 3 percent for municipal uses.[72] The Soviets demanded that Kyrgyzstan and Tajikistan, the republics with the most water, supply large amounts of downstream to the cotton fields during the growing season in the spring and summer. In the fall and winter, when cold temperatures increase energy use in the mountains, Turkmenistan and Uzbekistan were supposed to help supply energy to the up streamers with their rich supplies of oil and gas.[73] The Soviets settled any disputes concerning the energy for water trades.

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[69] Aloys A. Michel and Stephen A. Klain, "Current Problems of the Soviet Electric Power Industry," in *Economic Geography*, Vol. 40, No. 3 (July 1964), 207.

[70] Klotzli, http://cms.isn.ch/public/docs/doc_246_290_en.pdf, accessed 14 February 2007.

[71] Matley, "Industrialization," 335

[72] Gleason, 161.

[73] Valery Votrin, "Transboundary Water Disputes in Central Asia: Using Indicators of Water Conflict in Identifying Water Conflict Potential," Vrije Universiteit Brussel, Master's Thesis 2003, http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html, accessed 18 February 2007.

## C. POLITICAL DIVISIONS AND GEOPOLITICAL SETTING

The socialist experiment that formed the Soviet Union created states in Central Asia where states had never existed before. The Party quelled regional differences concerning ethnicity, language and religion in Central Asia by creating new republics where political lines crossed ethnic lines. Central Asia, a mosaic of ethnic tribes and blended cultures, did not have unified nations or defined states until the Soviets laid claim to the region. Instead, the region consisted of clans and familial groups using Islamic ideals as governance. The Soviets desired to modernize Central Asia and make them contributors to the Soviet state. Rather than helping to foster a Central Asian sense of nationalism, they wanted to create Soviet citizens and a Soviet nationalism. Lenin declared that he wanted to turn the people into a group of Soviet nations.[74] However, some of the Soviet policies actually fostered clan networks, rather than creating Soviet citizens. Collectivization forced the nomads into a more sedentary lifestyle, but allowed the clans to interact and gather more often.

The mosaic-like ethnic makeup of Central Asia produced a quagmire for the Soviets when it came time to construct borders. Some scholars contend that the Soviets actually drew borders across ethnic lines in order to divide and conquer.[75] Others argue that the Soviets really attempted to draw political lines along demographic borders.[76] In either case, the Soviet fashioned states did not coincide with the ethnic majorities which hindered any nationalistic feelings in Soviet Central Asia. In fact, in none of the states does the titular nationality constitute an overwhelming majority.[77] This Central Asian lack of nationalism toward their newly formed republics created nations loyal to the Soviet Union. Although each republic has a certain degree of autonomy, the Central Asian leadership filtered all policy and governance problems through Moscow. Moscow

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[74] Kathleen Collins, "Clans, Pacts and Politics in Central Asia," in *Journal of Democracy*, Vol. 13, No. 3 (July 2002), 143.

[75] Olivier Roy, *The New Central Asia: The Creation of Nations*, (New York: New York University Press, 2000), viii-ix.

[76] Adrienne Lynn Edgar, "Review of Roy: New Central Asia; Geiss, Nationenwerdung in Mittelasien," in *Kritika: Explorations in Russian and Eurasian History* Vol. 3, No. .1 (2002) 187.

[77] Anna Matveeva, "Democratization, Legitimacy and Political Change in Central Asia," in *International Affairs*, Vol. 75, No. 1 (January 1999), 25.

became an arbiter of regional differences and strife. In fact, "water and irrigation systems were managed by a central agency, the Ministry of Land Reclamation and Water Resources, in Moscow.[78]

During the Soviet era, Central Asia disappeared from the world political stage. The region did not resurface until the 1980s after the Soviets invaded Afghanistan and Gorbachev opened up the Union to outsiders with his policies of perestroika and glasnost. During this time, the water situation in Central Asia descended into a catastrophic situation. With no help from the outside, the Central Asians floundered with the backwards Soviet administration. The central control of Moscow on the region may be the only aspect of the Soviet administration that halted the eruption of a conflict caused by water availability.

## D. INSTITUTIONS AND NATIONAL WATER ETHOS

The Soviet system changed the traditional conscience of the Central Asians concerning water use. The Soviets instituted planned economies and declared that all resources belonged to the state. Individuals lost ownership of land and water rights. The Soviets strengthened the water governing institutions, but weakened the Central Asians value of water.

The Soviets claimed ownership of the water rights and provided them free to the public. The costs of maintenance and construction were the only fees associated with water use. The Soviets bound the water laws strictly to the land laws because water use was not possible without utilization of the land. Additionally, regulation of water fell under Soviet Fundamentals of Water Legislation of the USSR and the Union Republics.[79] Furthermore, they divided water utilization and regulation between three departments including state administrations, special state administrations concerned with water conservation and "Federal" agencies charged with developing sectors of the national

[78] Stuart Horsman, "Water in Central Asia: Regional Cooperation or Conflict?" in *Central Asian Security: The New International Context*, Ed. Roy Allison and Lena Johnson, (Washington, D.C.: Brookings Institute, 2001), 72.

[79] Klotzli, http://cms.isn.ch/public/docs/doc_246_290_en.pdf, accessed 14 February 2007.

economy.[80] The Soviets took the Central Asian customs out of water management and created a conglomeration of bureaucracies that interrupted once-traditional modes of water distribution. Because Moscow acted as the end-all coordinator of disputes, the system operated with few large disagreements.

The Soviets further complicated water distribution when they removed local officials and ancient customs from the process. They linked irrigation canals through different drainage basins and connected upstream and downstream users through drainage collectors and canals. Water allocation became much more complex on a supra-regional level than it was before in traditional administration.[81] Once again, the total control of the Soviet Administration in Moscow eliminated disagreements.

The influence of Islamic law and traditions during the Soviet era decreased, leading to less cultural attention to water management. Muslims in the new Soviet regime found themselves practicing Islam underground during the Soviet era. Soviet and Marxist scholars thought of Islam as an anachronism whose superstition inhibited the evolution into a completely socialist society. Politicians claimed that Islam provided a basis for subversive activity and claimed that Soviet Central Asia would be the first region to revolt against the Soviet Union.[82] Stalin punished and purged Muslims and most other religious types who practiced openly.

The Central Asians' treatment of water seemed to change during this period. Water became free and therefore the cost of wasting it decreased. Additionally, the Soviet planned economy demanded output of industrial and agricultural goods regardless of cost. With water flowing generously, the Central Asians' and Soviets' water use efficiency decreased. The Soviets changed the Central Asian view of water use, but maintained the peace with a strong, central authority.

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[80] Klotzli, http://cms.isn.ch/public/docs/doc_246_290_en.pdf, accessed 14 February 2007.

[81] Klotzli, http://cms.isn.ch/public/docs/doc_246_290_en.pdf, accessed 14 February 2007.

[82] Petra Steinberger, "Fundamentalism in Central Asia," in *Central Asia, Aspects of Transition*, ed. Tom Everett-Heath, (New York: Routledge-Curzon, 2003), 220.

## E. CONCLUSION

The experiments and policies implemented during the Soviet Union's control over Central Asia will shadow the region for a long time to come. The emphasis on production at all costs created a region dependent on the cotton monoculture and unfamiliar with world politics. As shown, many of the indicators of increased tension over water during the Soviet era worsened; however, the strong central control stamped out any potential regional conflicts.

While water quantity remained fairly constant in the seventy years of Soviet rule, water efficiency and quality became worse. Regional water quantity remained at levels comparable to Tsarist Russia, however, the Soviets diverted more water further away from the main rivers. Additionally, they began to irrigate fields increasingly less suitable for crops, creating inefficient water use. This inefficiency also led to the use of more chemicals and greater salt content in the fields and water supply. The farmers required more chemical fertilizers and herbicides to render the unsuitable fields tillable. Salt levels increased due to higher levels of evapotranspiration as water was moved further away from its source and farmers "washed" the new fields of salt. Had it not been for the strong central control of the Soviets, the region easily could have evolved into conflict due to the degradation of water quantity and quality.

The Soviet introduction of hydroelectricity into the region created a dichotomy in water use. The hydroelectric power primarily fed the industrial needs which in turn fed the agricultural needs of the region. Irrigation and agriculture remained the key industry and were allocated the most water. However, the upstream states depended on the water for their energy needs and relied less on water for agricultural needs. This created a division of opinion on the use of the fast flowing water. In a perfect society, the two users might complement each other: delivering water to the crops in the growing season and utilizing the water for energy in the cold months. Although not a perfect government by any means, the Soviet government distributed fuel to the upstream republics from the downstream republics during the months of limited hydroelectric production while constantly supplying the downstream agricultural users with irrigation water practically year-round. Once again, if not for the absolute power of the Soviet system, the region may have escalated into a water-induced conflict during this time.

The political divisions and geopolitical setting-though convoluted and tense worldwide-helped keep Central Asia stable. The Soviets created states where none had existed before and established a group of nations that lacked nationalism with borders drawn across ethnic lines. Geopolitically, Central Asia became isolated. Without world-wide attention, it drifted into environmental chaos but relative political stability. All decisions and disagreements filtered through Moscow where the Party leadership kept its thumb on events in the region. By blurring the ethnic lines the region may have crept into instability, but the power of the Soviet government kept the region peaceful.

Soviet Central Asia's national ethos towards water lost strength while the institutions gained it. The Communist ideal of state-owned resources created a national mindset of waste towards water. Free water could be used inefficiently without fear of future consequences. Furthermore, the emphasis on production spurred users to till unusable fields and flood fields with water to create more ideal soil conditions. No longer did customs and religion govern water use; rather a confused state bureaucracy from Moscow mandated who received what water and what it was used for. This legacy of water use lasted well after the eventual collapse of the befuddled Soviet empire.

# V. INDEPENDENT STATES POLICIES

The Soviet Union's collapse immediately created five new nations in Central Asia. Suddenly, these independent nations had to learn how to act on the international stage and how to gain identity. Along with other Soviet legacies, the states had to deal with the past environmental degradation and now, transboundary water issues. What were once Soviet controlled water management institutions became international, contentious issues. These issues challenge the region's peace and stability.

## A. WATER QUANTITY AND QUALITY

The current water problem in Central Asia does not necessarily revolve around scarcity, rather it concerns distribution problems. Uzbekistan only creates nine percent of the discharge of both the Amu and Syr Darya in country. Meanwhile, it has the largest amount of irrigated agriculture in the world.[83] Further north, Kazakhstan relies on fifty percent of its water from transboundary sources, and receives different amounts every year.[84] This regional distribution inequality has potential to create conflict.

The Amu Darya contains the largest watershed of the region; however, after flowing through four independent states, it slows to a trickle at its mouth. Its most recent annual flow, averaged over several years, was calculated at 74.22 $km^3$ but can average from 55-100 $km^3$ depending on climatic conditions (dry versus wet years).[85] Because the majority of the water in the Amu Darya originates in mountainous areas, the amount of water that each country generates is not equal. Kyrgyzstan generates just over 1.6 $km^3$, Tajikistan over 54 $km^3$, Uzbekistan contributes 6.2 $km^3$, and Turkmenistan provides 1.4 $km^3$ while Iran and Afghanistan actually contribute the rest. The Amu Darya river basin also contains significant amounts of groundwater. The estimated amount of groundwater

[83] CARNet, "Environmental and Sustainable Development in Central Asia: Water Resources in Uzbekistan," http://www.caresd.net/site.html?en=1&id=301, accessed 29 January 2007.

[84] Ibid.

[85] CAWaterInfo, "Amudarya River Basin Morphology," http://www.cawater-info.net/amudarya/geo_e.htm, accessed 11 December 2006.

is 14.7 km$^3$ of which only 7.1 km$^3$ is actually obtainable. [86] Table Four summarizes this data, including water discharge contributed by the minor tributaries of the Amy Darya.

| River basin | River flow generated within the countries | | | | | Total Amudarya Basin |
|---|---|---|---|---|---|---|
| | Kyrgyzstan | Tajikistan | Uzbekistan | Turkmenistan | Afghanistan and Iran | |
| Pyandj | — | 30.081 | — | — | 3.300 | 33.381 |
| Vakhsh | 1.654 | 18.400 | — | — | — | 20.054 |
| Kafirnigan | — | 5.575 | — | — | — | 5.535 |
| Surkhandarya | — | — | 4.841 | — | — | 4.841 |
| Sherabad | — | — | 0.228 | — | — | 0.228 |
| Kashkadarya | — | — | 1.222 | — | — | 1.222 |
| Murgab | — | — | — | 0.771 | 0.771 | 1.542 |
| Tedjen | — | — | — | 0.488 | 0.489 | 0.977 |
| Atrek | — | — | — | 0.136 | 0.137 | 0.273 |
| Rivers of Afghanistan | — | — | — | — | 6.167 | 6.167 |
| Total (km$^3$) | 1.654 | 54.056 | 6.291 | 1.405 | 10.814 | 74.22 |
| Amudarya Basin (%) | 2.2 | 72.8 | 8.5 | 1.9 | 14.6 | 100 |

Table 4. Natural surface flow in the Amu Darya River basin (mean annual runoff, km$^3$/year)[87]

The Syr Darya also begins in the mountains, and depending on its ultimate flow, empties into the Aral Sea. The most recent flow rate averaged over several years for the river shows a rate of 37.2 km$^3$. Because of its small catchment area, the river does not see as much flow as the Amu Darya.[88] Breaking up the water production by state shows

[86] CAWaterInfo, "Water Resources of the Amudarya Water Basin," http://www.cawater-info.net/amudarya/water_e.htm, accessed 11 December 2006.

[87] Ibid.

[88] See Chapter III, Section A.

the inequality of water production. Kyrgyzstan produces the majority of the water at 27.6 $m^3$. Kazakhstan produces 2.4 $km^3$, Tajikistan just over 1 $km^3$ and Uzbekistan produces just over 6 $km^3$.[89]

| Source, river basin | The state, where it is formed | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Kyrgyzstan | | Kazakhstan | | Tajikistan | | Uzbekistan | | the Syrdarya basin | |
| | Total | Transb. | Total | Transb. | Total | Transb. | Total | Transb. | Total | Transb. |
| Naryn | 14.544 | 12.831 | — | — | — | — | — | — | 14.544 | 12.831 |
| Karadarya | 3.921 | 2.060 | — | — | — | — | — | — | 3.921 | 2.060 |
| Rivers of Fergana valley | 6.040 | 5.400 | — | — | 0.855 | 0.700 | 0.910 | 0.800 | 7.805 | 6.900 |
| Rivers of midstream | — | — | — | — | 0.150 | — | 0.145 | — | 0.295 | — |
| Chirchik | 3.100 | 3.100 | 0.749 | 0.749 | — | — | 4.100 | 2.000 | 7.949 | 5.849 |
| Akhangaran | — | — | — | — | — | — | 0.659 | — | 0.659 | — |
| Keles | — | — | 0.247 | — | — | — | — | — | 0.247 | — |
| Arys | — | — | 1.183 | — | — | — | — | — | 1.183 | — |
| Rivers of downstream | — | — | 0.600 | — | — | — | — | — | 0.600 | — |
| Total, $km^3$, the Syrdarya river basin (%) | 27.605 (100) | 23.391 (84,7) | 2.426 (100) | 0.749 (30,9) | 1.005 (100) | 0.700 (69,7) | 6.167 (100) | 2.800 (45,4) | 37.203 (100) | 27.640 (74,3) |
| Share of states, % | 74.2 | 84.6 | 6.5 | 2.7 | 2.7 | 2.6 | 16.6 | 10.1 | 100 | 100 |

Table 5. Natural surface flow in the Syr Darya River basin (mean annual runoff, $km^3$/year)[90]

Although the average flow of the two rivers remains at relatively normal levels, the level of inflow of water into the Aral Sea has actually decreased during the last fifteen years. From 1990-1994, the minimum and maximum flow rates are listed as 11.41 $km^3$

[89] CAWaterInfo, "Syrdarya Water Basin Morphology," http://www.cawater-info.net/syrdarya/water_e.htm, accessed 11 December 2006.

[90] CAWaterInfo, "Syrdarya Water Basin Morphology," http://www.cawater-info.net/syrdarya/water_e.htm, accessed 11 December 2006.

and 32.24 $km^3$ for the Amu Darya and Syr Darya respectively. Unfortunately, those numbers decreased to 5.17 $km^3$ and 28 .13 $km^3$ respectively over the next five years from 1995-2000. Some argue that these reports are very optimistic and that a combined flow 23 $km^3$ would sustain the Aral Sea at its current level.[91]

The Central Asian rivers originate high in the mountains where snow and glacial runoff contribute significantly to the total discharge. Unfortunately, recent data indicates that the glaciers are melting and receding very rapidly in the region. From 1955-2000, the glaciers have been losing about one percent of their water each year and their surface area has decreased from 70,000 to 45,000 square kilometers over the same period.[92] This global phenomenon has very real effects on the every day life of the Central Asians, and may only worsen in the future.

Regional water scarcity is not currently a problem; however scarcity is a concern at the national level. According to a report from the International Water Management Institute, by 2025 almost two billion people around the world will live in regions affected by water scarcity; Central Asia is not one of these regions. The report says that many of the countries not affected by water scarcity will have to improve their water use and efficiency by twenty-five percent or more in order to escape scarce conditions.[93] Scholars label a region as water scarce when two-thousand people share one million cubic meters of water. Central Asia ranges from 52 people per every one million cubic meters in Turkmenistan, to 192 people per every one million in Uzbekistan.[94] Unfortunately, these numbers are based on water availability for the entire region; Uzbekistan relies primarily on water that originates in other countries. As shown in Tables Four and Five, Uzbekistan only contributes 6.2 and 6.1 cubic kilometers to the Amu and Syr Darya Rivers respectively. Using the 2004 Uzbekistan population of 26,410,000 and their total water contribution to the Aral Sea Basin of 12.458 million

[91] Wegerich, 253.

[92] UNESCO, "Regional Workshop on Snow Glacier and Water Resources in Asia," Almaty, Kazakhstan, 28-30 November 2006, http://www.unesco.kz/science/2006/snow_glac_ws_en.pdf, accessed 13 December 2006.

[93] International Water Management Institute, "Projected Water Scarcity in 2025," http://www.iwmi.cgiar.org/home/wsmap.htm#A1, accessed 12 December 2006.

[94] Wegerich, 256.

cubic kilometers, the number becomes over 2,100 people per one million cubic meters of water.[95] When dividing the population by these lower numbers, water scarcity in the individual states suddenly becomes an issue. *Regional* water scarcity is not an issue, however, regional distribution and *national* water scarcity is a very real issue.

While the water quantity seems adequate for the region, the amount of water that is actually useful may be a catalyst of conflict. Decades of pesticide and fertilizer use, and high rates of evapotranspiration from the many Soviet era canals have damaged the quality of the water. Although there may be plenty of the resource for the inhabitants of the region to share, the poor quality of the water may incite trouble.

Water quality downstream in Uzbekistan, Turkmenistan and Kazakhstan is worse than the quality upstream. In general "the greater the water use upstream, the lower the water quality downstream."[96] As water evaporates or is used in irrigation, sediments including salt remain in the leftover water thus increasing the sediment density. When farmers add this dirty water to crops the water percolates to the groundwater and the sediments help raise the water table which can actually deprive crops of oxygen. Additionally, as the water level decreases downstream, the diluted level of pollutants increase. The amount of chemicals and salt increase while the water level decrease, leading to greater particles per unit of water.

Central Asians often recycle drainage water for use in irrigation. The idea sounds reasonable and even environmentally responsible at first thought. However, often the drainage water originates from areas where farmers have tried to cleanse a parcel of land of its salt content. "Newly irrigated soils often require high volumes of water to flush out accumulated salts;" this process can take many years. When farmers recycle the drainage water, they are actually just adding water with a high salt content to the fields they only recently flushed.[97]

Stagnant reservoirs of unusable, mineralized water exist all over Central Asia. The reservoirs are the result of run-off water from irrigated crops. Fortunately, in this

[95] "IDB Summary Demographic Data for Uzbekistan," US Census Bureau, http://www.census.gov/cgi-bin/ipc/idbsum.pl?cty=UZ, accessed 12 February 2007.

[96] Gleason, 161.

[97] Craumer, 139.

case, the water is not being re-introduced to the river system; rather it is fed into reservoirs that serve no useful purpose to the independent states. The reservoirs cannot be used for fishing because no animal or plant life can survive in the salt and mineral laden waters.[98]

The primary crop of Central Asia, cotton, requires more pesticide and fertilizer than most other crops. Unfortunately, cotton only absorbs fifteen to forty percent of the chemicals while the rest of the pollutants flow into the water supply. There is a progressive increase in the amount of chemicals found in the water supply as you move downstream. DDT and nitrates are found in water sources in every region of Central Asia at unacceptable levels. Central Asian farmers, uneducated about the dangers of DDT, have been spotted mixing "it with water and [rubbing] the white paste on their faces to keep away the mosquitoes."[99] Farmers often pump large amounts of chemicals into their crops intended for public sale and put much smaller doses in the crops intended for private use. The newspaper *Pravda* privately conducted a report that showed that twelve percent of all food in Kazakhstan and nearly 19 percent in Tajikistan contain toxic chemicals.[100]

The water quality in Central Asia has stabilized since the dissolution of the Soviet Union. The opening of borders and entrance of the newly independent states into the world arena also opened up the environment to interest groups and world organizations. This newfound attention helped the region stabilize the environmental degradation.[101] However, the effects of decades of pollution will take a toll on the water supply for many years to come. Central Asia has an adequate supply of water; however, the quality of the resource may create dangerous conditions.

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[98] United Nations: Environment and Sustainable Development Division, "Diagnostic Report of Water Resources in Central Asia," in *Strengthening Cooperation for Rational and Efficient Use of Water and Energy Resources in Central Asia*, Working Group on Energy and Water Resources, (April 2005), 2.4.

[99] Ze'ef Wolfson, *The Geography of Survival: Ecology in the Post-Soviet Era,* (New York: M.E. Sharpe, 1994), 48.

[100] Ibid., 49.

[101] CAWaterInfo, "Water Resources of the Aral Basin," http://www.cawater-info.net/aral/water_e.htm, accessed 13 December 2006.

## B. MANAGEMENT FOR MULTIPLE USE

Upon the Soviet Union's collapse, the Central Asian states found themselves in disagreement over water utilization with no governing authority to settle disputes. The region mainly uses water for crop irrigation and hydroelectric power. Carrying on from Soviet production plans, the independent states still rely heavily on irrigation for their crops and rushing water for their electricity. Upstream countries use the fast-flowing, freely available water for hydroelectric power while the downstream countries, where the water flows less rapidly, primarily use the resource for irrigation. Often these two uses conflict when the upstream countries regulate the flow between a trickle and a rush to meet their needs.

Not only is the water in Central Asia unequally distributed, but it is also unequally used. "The countries that contribute most to the shared rivers utilize the least amount."[102] In 1996, Kazakhstan used 33.67 $km^3$ of water flow from the Aral Sea Basin for agriculture and industry while contributing on average less than 3 $km^3$ to the Syr Darya watershed. Meanwhile, Tajikistan contributed slightly over 55 $km^3$ to both the Amu and Syr Darya while using just under 12 $km^3$ of water.[103] If and when Tajikistan begins to use more water for any type of program, Kazakhstan will suddenly find itself scrambling to maintain their current agricultural and industrial output. A disturbance upstream will disturb the equilibrium of the whole system.

Kyrgyzstan and Tajikistan rely on their water supply to produce hydroelectric power. The two countries obtain over fifty percent of their electricity from hydroelectric sources.[104] This percentage could actually be larger if it were not for the downstream nations' need for agricultural water. "Irrigated land produces 90 percent of the region's crops…employs 44 percent of Turkmenistan's work-force and is responsible for 76

[102] Wegerich, 255.

[103] Ibid.

[104] Stuart Horsman, "Water in Central Asia: Regional Cooperation or Conflict?" in *Central Asian Security: The New International Context*, Ed. Roy Allison and Lena Johnson, (Washington, D.C.: Brookings Institute, 2001), 71.

percent of Uzbekistan's hard currency revenue."[105] Turkmenistan relies on external water sources to maintain its already weak economy. Any lapse in water supply will lead to social strife and regional instability.

The allocation of water to different agencies has not changed dramatically since Soviet times. Central Asia uses the majority of its water in support and irrigation of rural areas. About eighty-seven percent goes to rural areas, ten percent to industrial needs and only about three percent goes to municipal uses.[106] Since the majority of the water is used in rural areas for crop production, the states have competing interests. "Uncoordinated and conflicting development strategies can lead competing states into overt conflict."[107] However, hydroelectric uses and irrigation uses can be complementary, if cooperation and shared state strategy making takes place.

## C. POLITICAL DIVISIONS AND GEOPOLITICAL SETTING

The breakup of the Soviet Union immediately thrust the five Central Asian states into independence and newfound sovereignty. Suddenly, water management in the region became a much more political process dictated by individual state interest and strategic planning. The job of water manager suddenly separated into five separate jobs. The two major rivers, the Amu Darya and the Syr Darya abruptly became transboundary waters. A simple project on any of the waterways becomes more complex because it involves international consent. This geopolitical setting can incite conflict. Poor relations between neighbors or the fear of lost sovereignty may dictate how a nation resolves water use disputes. As such, the political divisions and geopolitical setting in Central Asia lend the region towards a water conflict.

The independent nations immediately placed an emphasis on interstate water agreements, showcasing the importance of access to water in the region. The Almaty Agreement in 1992 sought unification and coordination of water management to avoid

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[105] Stuart Horsman, "Water in Central Asia: Regional Cooperation or Conflict?" in *Central Asian Security: The New International Context*, Ed. Roy Allison and Lena Johnson, (Washington, D.C.: Brookings Institute, 2001), 71.

[106] Gleason, 161.

[107] Ibid., 156.

any water crises and maintained the Soviet era water allocations.[108] Soon thereafter, the states established several institutions to monitor water cooperation in the region: the Interstate Coordinating Water Commission (ICWC), the Amu Darya and Syr Darya Basin Management Authorities, the Interstate Council on Problems of the Aral Sea Basin and the International Fund for the Aral Sea (IFAS). Additionally, to place even more emphasis on the problem, over 300 agreements concerning the problem of the Aral Sea had already been signed by 1994.[109] The states chartered these groups to decide water allocations, regulate the use and protection of waterways and most importantly, to study the avoidance of "disputes before they arise."[110]

Despite the quick coordination of policies and establishing of institutions, the sovereign states of Central Asia show weak commitment to water cooperation. The agreements have not been given status in international law and are often not recognized by national legislatures. Additionally, the organizations, institutions and treaties do not receive enough funding to operate properly. A 1998 report listing state contributions to IFAS shows that Kyrgyzstan and Tajikistan contribute only 0.1 percent of GNP while the other three countries of Kazakhstan, Turkmenistan and Uzbekistan contribute 0.3 percent to the Fund.[111]

State regimes have favored their sovereignty over multi-lateral agreements. Karimov and Niyazov, the respective presidents of Uzbekistan and Turkmenistan often do not even provide a national presence at negotiations. These two nations have the most to lose from revised agreements, as they currently receive a majority of the water from the basin. Meanwhile, the upstream countries welcome any new chance to gain more allocated water.[112]

Current disputes arise because the independent nations have difficulty adhering to agreements. The allocation of water, being unequal, causes the most tension. During cotton season, the upstream countries release most of the water from their reservoirs,

[108] Horsman, 72.

[109] Horsman, 73.

[110] Ibid.

[111] Ibid.

[112] Ibid., 74.

trying to act in accordance with the treaties. Unfortunately, this negatively affects their power production. During Soviet times, the Kazahk and the Uzbek SSRs supplemented power to the upstream countries in times of need.

Tensions over water have often erupted into disputes. Since its independence, Kyrgyzstan has cut off water flow to Kazakhstan several times as has Tajikistan to Uzbekistan. Reciprocally, Uzbekistan has often cut off gas and power supplies to Kyrgyzstan because of outstanding debts only to have Kyrgyzstan threaten to start charging Uzbekistan for their water. In a 1997 incident, Kazakhstan and Uzbekistan almost erupted into an ethnic war over water. Uzbekistan reduced flow of the Druzhba Canal by seventy percent, inciting Kazakh riots against Uzbek border guards. Luckily, Uzbekistan reopened the flow to deescalate the situation.[113] Uzbekistan actually threatened to capture the Toktogul dam in Kyrgyzstan in an attempt to gain more water allocation. Strong rhetoric among all of the leaders of the region often shows the lack of desire to cooperate, give up political power or lose sovereignty.

Turkmenistan's declaration of permanent neutrality and the eccentric nature of the former regime creates a potential for conflict. The isolationist policy of the country, in which no multilateral organization "shall infringe upon [Turkmenistan's] sovereignty" creates problems when it comes to water policy and cooperation.[114] The state has increased land under irrigation and extended canals. Additionally, former President Niyazov and his neighbor in Uzbekistan, President Karimov, have a tense relationship because of their strong rivalry. With new leadership at the helm in Turkmenistan, it will be interesting to see what direction state policy takes on water distribution and relations with its neighbors.

## D. INSTITUTIONS AND NATIONAL WATER ETHOS

The efforts and attitude each individual country makes in Central Asia can either impede or encourage disputes in the region. Since 1991, state support to Irrigation, Drainage and Maintenance institutions has declined. According to the World Bank

[113] Horsman 75.

[114] Ibid.

Kazakhstan's funding for Organization and Maintenance (O & M) has decreased by a factor of twenty-one and only 31% of the required maintenance in Kyrgyzstan actually receives funding.[115] Uzbekistan seems to have the best irrigation maintenance funding, providing 50% of what is actually needed. Furthermore, the salaries of water management and maintenance personnel have continually decreased over the last decade and a half causing qualified staff to leave the industry in droves.[116] Some farmers have organized themselves into unions, in an attempt to help each other with irrigation and maintenance; however, these institutions have shown to be little help and are still in their infancy.

Weak institutions have given way to a rise in water stealing, especially in the upstream states. Water efficiency has declined because the states cannot ensure adequate and equitable delivery of water to local farmers; they have begun to take it for themselves, often drilling holes in existing canals and pipes to divert the water to their crops. Kyrgyzstan has shifted to using "an old earthen canal with a low flow capacity" to divert water downstream resulting in a loss of 70% from upstream to downstream.[117] The water thieves tend to be well-connected, wealthy landowners with friends in the institutions who make certain the thievery goes unnoticed.

Inertia from decades of irrigated crops continues to impede national water efficiency. Uzbekistan, farmers have historically "withdrawn 14,000 $m^3$ per hectare while Pakistan, a country not known for its efficient water use, only averages 9-10,000 $m^3$ per hectare.[118] Since independence, irrigation channels and mechanisms have begun to decay from lack of money to provide proper maintenance. The government placed responsibility for canal and irrigation maintenance into the hands of the farmers who have been hampered by decreasing profits since independence. While some farmers have attempted to change their crops to drought resistant types, the governments actually

[115] The World Bank, "Irrigation in Central Asia: Social, Economic and Environmental Concerns," February 2003, http://www.cawaterinfo.net/library/eng/reports/irrigation_in_central_asia.pdf, accessed 15 December 2006, 4.

[116] The World Bank, "Irrigation in Central Asia: Social, Economic and Environmental Concerns," February 2003, http://www.cawaterinfo.net/library/eng/reports/irrigation_in_central_asia.pdf, accessed 15 December 2006, 4.

[117] Ibid., 6.

[118] Ibid., 3.

impede their switch. The corrupt governments of Central Asia limit the voice of the common farmer, making it difficult for them to express the need for change. Additionally, many farmers only understand how to grow one or two crops; education does not exist to change this fact.[119]

Poverty and unemployment have created a migration trend towards more urban areas which can not keep up with the demand for fresh water. The urban areas of the Ferghana Valley contain high population densities. The Uzbek portion of the Valley has the highest density varying between two and five hundred people per square kilometer.[120] As the rural areas gain density, the demand for water in these highly populated areas out grows the construction and repair of existing water delivery sources.

The institutions and ethos of the region indicate strong tensions and heightened prospects of a water induced conflict. The independent states seem to be drifting away from each other politically and unsupportive of water management institutions. Water remains one of the most important aspects of the economy of Central Asia, accounting for a majority of the GDP. As the states continue to compete for economic power in the region, water will become even more of a catalyst in state rivalry. The weak state institutions have created an ethos wherein regional "bosses" can dictate how much water local farmers receive, and the rich are capitalizing. Because of this, the chances for regional intrastate conflict increase, and these battles may spill across borders as the mosaic of ethnicities join in the conflict.

## E. CONCLUSION

Water quantity does not seem to be a factor that might induce regional instability or conflict. The mountains of Kyrgyzstan and Tajikistan produce plenty of water for the entire region. The flow per capita water supply does not indicate a shortage according to World Bank standards. However, the quality of the water that does flow deserves attention. Years of industrial pollution, fertilizer and pesticide use and salinization due to

[119] The World Bank, "Irrigation in Central Asia: Social, Economic and Environmental Concerns," February 2003, http://www.cawaterinfo.net/library/eng/reports/irrigation_in_central_asia.pdf, accessed 15 December 2006, ii.

[120] United Nations Development Program. ""Environment and Security: Transforming Risks into Cooperation, Ferghana Valley, 2005," 16.

evapotranspiration have deteriorated the water quality producing poor crops and health hazards. The situation seems to have stabilized, but it may be too late. Health problems and crop quality will be affected for years, both of which may lead to social discontent and economic depressions. The poor water quality since independence indicates greater probability for instability in Central Asia.

Water management for multiple uses also provides conflicting implications concerning water conflict. Hydroelectricity and crop irrigation can be complementary uses. After all, water has to flow downstream in order to turn the generators and create electricity. However, the downstream users require much of their water in the spring when snow runoff has not yet begun, decreasing the amount of water the upstream countries can hold for hydroelectricity. Additionally, the upstream countries still rely on irrigation for their crops which is also important to the state economy. The potential for cooperation is high in this area, if political divisions of the region can be overcome.

The geopolitical setting and political divisions of Central Asia lend themselves toward conflict. The breakup of the Soviet Union produced five separate states, bent on displaying sovereignty and gaining economic power. As such, rivalries exist between regimes, and cooperation tends to be more bilateral than multilateral, all of which points toward higher conflict potential. Additionally, the regimes do not put a lot of support in their water institutions.

The national water ethos contributes to weak institutions in Central Asia. The corrupt regional bosses steal water and produce inefficiencies. They do not allow the local farmers a voice in the consideration of irrigation development. The region lacks education and support from their governments. These weaknesses indicate a lack of national development and improvement in water efficiency. Interstate cooperation will not improve if the state regimes do not put more effort into ensuring their success. The possibility of a water conflict in Central Asia seems to be boosted by the weak institutions and water ethos.

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# VI. COMPARATIVE ANALYSIS

This thesis examined four aspects of the impending water crisis in Central Asia in three different political eras, attempting to discover indications of regional conflict. This Chapter examines the bottom lines of each case study, comparing the indicators to ascertain whether Central Asia's current water situation may lead to conflict. With years of Soviet exploitation in combination with current policies, an atmosphere conducive to a water conflict has reached a crisis level.

## A. WATER QUANTITY AND QUALITY

Excluding seasons of drought and wet seasons, water quantity in Central Asia has remained relatively stable over the three political eras studied. Because the majority of the water flowing through the region originates from the glaciers and snow pack high in the mountains, seasonal variations do not have lasting effect on the river flow. The approximately 105 million acre-feet of water available from the rivers has predominately been the main water source for agricultural, domestic and industrial needs. Because the region is so arid, the groundwater reserves comprise a small portion of the total water available in the region.

Several items concerning water availability changed during the course of the three political eras. One item that changed drastically, for better or worse, was the amount of irrigation in Central Asia. The region has had a long history of irrigation, dating back even before the rise of Christianity. During times of war, these irrigation emplacements fell into disrepair. The relative peace of the Russian conquest and the ensuing need for growth of the Soviet Empire spurred the resurrection of irrigation in Central Asia. This rise in irrigation spread the water further away from its sources resulting in inefficiency in both transport and use. This rural consumption of water has decreased the availability of the resource to people and industry creating increased regional tension in its wake. Even while the governments have diverted more and more water to farmland, the population continually grew, increasing by three hundred percent during the Soviet era.

Although international agencies point out that by 2025 the region will not be considered to be affected by water scarcity, individual provinces in the region will be. Across each of the eras, the total population of Central Asia has never approached the water scarcity threshold of two thousand people per one million cubic meters of water. Pockets of high population densities along the oases and riverbanks, especially in the Ferghana Valley, have been dealing with water scarcity since Tsarist times. Russian settlers established their homes along the riverbanks, adding to the already high population density.

Water distribution has always been a problem in Central Asia, but has been made worse by the break-up of the Soviet system. Ancient custom and religious law guided the Central Asians during Tsarist times. While the system was sometimes unfair, it was still generally agreed upon and respected by the water users. The Soviets broke down that system, established state bureaucracies and created independent republics where borders had never previously existed. Any disagreements between the republics were settled by the heavy hand of the Party. The collapse of the Soviet Union suddenly thrust the water distribution problems from state management problems into international problems. Because most of the water is formed in the mountains, Uzbekistan, Turkmenistan and Kazakhstan rely on most of their water to flow from foreign sources.

Poor water quality and pollution limit the supply of fresh water. Arid regions battle with water salinity caused by high rates of evapotranspiration. Central Asia already had a severe problem with salinity during Russian colonial times. Salinity increased as the Russians channeled water further away from its source creating more potential for evapotranspiration. Poor techniques such as flooding fields, washing new fields and using uncovered canals increased the water salinity. Unfortunately, the downstream users see most of the increase in salinity as it increases downstream. In the modern era of independent states, the upstream users do not have incentive to limit their misuse of the water, further degrading the quality for the downstream nations.

Water quality in the Soviet era definitely worsened. The Soviet emphasis on production at all costs led to misuse and overuse of chemicals to make fields tillable and fruitful. The Soviet focus on cotton production especially hindered water quality. Cotton

requires more pesticide and fertilizer than other crops and absorbs relatively small amounts of the chemicals allowing the remnants of the growth products to drift into the water supply. The Soviets did not educate the Central Asians on the dangers of using these chemicals, leading to a society that overused the often dangerous substances and polluted the water. Infant mortality increased in the Soviet era because of this and even today, levels of toxicity in food remain at unhealthy levels.

The demise of the Soviet Union allowed Central Asia's problems to be seen by the world. Nongovernmental Organizations, scholars and the press became aware of the water problem in the region, mostly because of the drying Aral Sea. These NGO's have helped dampen the impact of the water crisis in Central Asia by educating the population and working with the independent republics to aid water cooperation and efficient use. Unfortunately, the damage done in the preceding era by Soviet policy can not be undone in a short time.

Even with the new public attention on the water issues in Central Asia, the quantity and quality of water available for use in the region has decreased. The increase of irrigation, coupled with new uses of water to produce electricity and aid industry as the population increased rapidly created a high demand on the water supply. Soviet emphasis on production destroyed water quality levels creating the current ecological disaster in Central Asia. Even with the current attention to matters of quality and quantity in Central Asia, these aspects seem to point to increased potential for conflict, tension or instability in the region.

## B. MANAGEMENT FOR MULTIPLE USE

The evolution of uses for water has evolved over the centuries and Central Asia has utilized each new innovation. Russian Tsarist times saw an increase in agricultural use as relative peace allowed the rehabilitation of the irrigation system. During this time, the region primarily used water for domestic consumption and irrigation needs. The advance of technology happened to coincide with the advance of Soviet colonization and demand for production. Technology and industrial innovation led to the need for increased power which Central Asia could readily provide using its rich natural gas and

oil reserves and its fast flowing waters. Although hydroelectric power plants competed with irrigation needs, the farming industry remained the ultimate product of both. Hydroelectric power fed industrial plants used to manufacture farming equipment. Clearly, the cotton crops still remained the region's focus and most important water user.

Once independent, the states of Central Asia immediately found competing interests. They became sovereign nations attempting to produce enough resources to become self-reliant. This spurred Tajikistan and Kyrgyzstan to begin focusing on their hydroelectric power potential and to regulate the water flow down stream more tightly. Meanwhile, the downstream users also trying to become self reliant increased their irrigation. Managing the water for different uses, while affected by the Soviet diversification, did not create tension until independence came to Central Asia. This measure of potential for conflict has increased over the studied political eras.

## C. POLITICAL DIVISIONS AND GEOPOLITICAL SETTING

The Russian conquest of Central Asia brought immediate changes to the region. The Russians and eventually the Soviets milked the fruits of Central Asia to feed their own growing economy and population. Starting with the Great Game and the American Civil War and ending with the Cold War, the global geopolitical situation pushed the Russians into conquering and developing their neighbors to the south. Their colonization of the region had a profound impact on the current water crisis.

Worldwide political situations over the past two centuries encouraged Russia to expand and find new territory to help increase economic production. The location of Central Asia at the crossroads of north and south, east and west, attracted Russia to the region as did their competition with Britain for the influence in Central and South Asia. Meanwhile, the American Civil War raised cotton prices around the world and Russia began to look for a new source of the material; Central Asia seemed ideal. The cotton monoculture expanded even more during the Soviet era as new fields were put to use and other crops were halted. Cotton farming gave unskilled workers jobs and created secondary industries. This dependency on Central Asian cotton affected the attitudes of the region towards water.

Politically, the situation in Central Asia has deteriorated towards increased tensions over the three eras. The Tsar colonized the region and created governance, but did not unify it. In fact, the system instituted by the Tsar confused the inhabitants as to who they should take direction from; both military and civil leaders claimed responsibility. Remarkably, the Soviet Union actually brought political stability to the region. Lenin's creation of the Central Asian states forever placed the region under the influence of the Soviet Union and as such, Russia. State lines drawn around and through ethnic boundaries limited nationalism and put the states under the Soviet sphere. Fortunately, this strong Soviet influence also limited ethnic strife and served as an arbiter of regional differences. Everybody recognized the power of the Party to settle disputes and its word was final. The power did not last forever and as the dissolution of the Soviet Union became inevitable, the politics of Central Asian water became cloudy.

The breakup of the Soviet Union and the emergence of the independent states of Central Asia have affected the water crisis in Central Asia the most. Clearly, the divergence of water management from one agency to five separate agencies in five separate sovereign nations has had a dramatic effect on water cooperation with states acting in their own interest to meet strategic goals. Any act of weakness shown in resource sharing or water policy potentially indicates an underlying state weakness in the view of the new states attempting to display their sovereignty. Furthermore, the collapse of the Soviet Union withdrew vast resources on which the Central Asian states depended. Funding for water improvement dropped significantly leading to a decline in irrigation, canal, drainage and domestic water technology in the past seventeen years. The current geopolitical setting and political divisions in Central Asia indicates the greatest chance of a conflict spurred by water resources.

## D. INSTITUTIONS AND NATIONAL WATER ETHOS

The water institutions and water ethos of Central Asia diverged at different points in the last three political eras; however, both currently exist in a relatively weak state compared to what they once were. The same general increase of the previous indicators pointing toward a regional water conflict also exists with these institutions and national water ethos.

The strength and ability of the water institutions increased during Soviet times but fell in strength after independence. During the days before the Tsar's forces colonized the region, the inhabitants relied on customs, tribal laws and religion as their primary institutions. One of the most important government officials, the mirob governed the distribution of water and repair of water transportation. Although mirobs were well-respected, they were still guilty at times of corruption. Additionally, each village or province often had a mirob who had to deal with neighboring mirobs, inhibiting a firm coordination of water policies. The Soviets broke down the traditional method of water management and instituted a strong bureaucracy headquartered in Moscow. Although far from the region, Moscow served as the central processor of all disputes eliminating any confusion and creating firm policies. Although this system contained corruption as well, it still remained strong and brokered deals between disputing parties. The emergence of five independent states immediately created five independent water management institutions. Although the new states attempted to quickly create treaties, these treaties often have not carried much political or international weight. Furthermore, the states have not contributed enough resources to ensure that the treaties are respected and carried out. The institutions of Central Asia have weakened and all indicate a potential for growing tension.

Similar to the institutions, the national ethos towards water have waned. Settlers of arid regions value water and take great precautions to ensure its availability. Central Asians honored their mirobs and the caretaking of irrigation during Tsarist times. The Soviet emphasis on production and their usurpation of water for the state lowered the value of water. The state provided money and equipment for the maintenance of canals and urged farmers to produce as much crop as possible. This led to inefficient water use and the addition of dangerous chemicals. Additionally, the Soviet prohibition of religion and tribal influence caused a decline in traditional water management and value. Although world pressure has been added to the region to call attention to the water situation, the national ethos towards water has not improved for the independent states as the focus on production cheapened the national value of water. Currently, most of the

rural population has greater concerns to worry about than the protection of water. Most Central Asians worry more about their next meal or paycheck rather than the quality of their water.

## E. CONCLUSION

The three case studies included in this chapter indicate a worsening of the indicators of a water crisis in Central Asia. In almost every aspect examined in this thesis, the Central Asian water crisis has been exacerbated by years of Soviet abuse and the independent policies of five nearly failing states. Table Six represents the trends in the four areas that this thesis examined over the three political eras. A positive sign indicates a healthy status that would not seem to incite conflict. A plus or minus indicates that the situation may be on the edge of increased tensions; it could go either way. A minus sign indicates that the situation has degraded towards being a catalyst of a water conflict.

| | Tsarist Central Asia | Soviet Central Asia | Independent Central Asia |
|---|---|---|---|
| Water Quantity and Quality | + | - | - |
| Management for Multiple Use | + | +/- | +/- |
| Political Divisions and Geop. Setting | - | + | - |
| Institutions and Ethos | + | +/- | - |

Table 6. Trends Towards a Water Conflict

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# VII. RECOMMENDATIONS AND CONCLUSIONS

This thesis has pointed out indicators of a regional water conflict in Central Asia. By examining water supply using water quality and quantity, water demand illustrating its different uses, the geopolitical environment and the national understanding and management of water, the thesis concludes that Central Asia's potential for hosting a water war has increased over the past three political eras. This thesis was not exhaustive and other methods could be used to indicate differing results.

Further studies should elaborate on the water institutions. Increased international attention on Central Asia especially from the OSCE and the UN to improve the water situation could strengthen the Central Asian institutions thereby helping to soften potential water conflict. A better understanding of the Soviet Fundamentals of Water Legislation of the USSR and the Union Republics might offer insight into how to organize a regional water institution. Therefore, a comparison of that institution and current institutions would illustrate the methods of controlling water distribution in Central Asia.

Besides the indicators outlined in this thesis, Wolf and Hammer provide additional indicators of water conflicts.[121] The level of national development affects the way a nation searches for alternative uses of water or increases its efficiency. Furthermore, hydropolitical issues can exacerbate water conflict. For example, Uzbekistan uses a large amount of the water in the Aral Basin while contributing a very small amount. However, Uzbekistan is the strongest state militarily in the region and wields more regional power than both Kyrgyzstan and Tajikistan. Similarly, Kazakhstan with its large oil and gas reserves, wields monetary power in the region. These two relatively powerful nations "bully" the upstream nations and take more than their share of water thereby increasing tensions.

Water will not be the primary cause of conflict in Central Asia; however, water does make the states of the region insecure. Returning to Marc Levy's definition of security, this paper has shown that the region is facing increased insecurity and tension.

[121] Wolf and Hammer, 142-146

Levy defined security as "a threat to national security is a situation in which some of the nation's most important values are drastically degraded by external action."[122] The Central Asian states exist in an arid region and depend on the availability of water. Unfortunately, three of the five states receive water from outside sources. Furthermore, two of the three states receiving water from outside sources are the most powerful politically and militarily. Uzbekistan is the world's second largest cotton exporter and relies on the crop as its main source of export earnings.[123] However, Uzbekistan only contributes 8.5 and 16.6 percent of the water to the Amu and Syr Darya river basins respectively; the rest emanates from foreign sources.[124] The nation's most important values can easily be degraded by the actions of either Kyrgyzstan or Tajikistan.

Water disputes can cause three types of conflicts as described by Thomas Homer-Dixon, all of which are possible in Central Asia. A "Simple Scarcity" conflict will erupt after a decrease in river volume (natural or human-caused), a decrease in agricultural production (due to decreased water availability), or decreased fish stocks (shrinking of Aral Sea). Population disruption caused by environmental refuges can cause a "Group-identity" conflict. Finally, a "Relative-Deprivation" conflict will erupt when water institutions fail, the economy falters, or because of mass movement of environmental refugees.[125] Because upstream states control the flow of water to the downstream states that depend on the water for their food and cotton production, each of these scenarios has a chance of happening.

A small dispute erupting over water in Central Asia has the potential to overspill into a regional conflict. Recent increases in human rights violations, drug and human trafficking, religious extremism, and the problematic role of succession of the aging Central Asian dictators create an especially volatile region. Any display of anger or aggression on the part of intra-state actors could lead to cross border conflict due to the overlapping nationalities across Central Asia.

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[122] Levy, 35-62.

[123] CIA World Factbook, "Uzbekistan: Economy," https://www.cia.gov/cia/publications/factbook/geos/uz.html#Econ, accessed 8 March 2007.

[124] See Chapter 5, Section A.

[125] Thomas F. Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict," in *International Security*, Vol. 16, No. 2 (Autumn 1991), 107.

The United States must maintain its policy of aiding weak states before these states decay into failed states. The current regimes of Central Asia do not have solid plans for secession after any possible demise which opens the door for extremist groups to take power. The political transition in Turkmenistan after Saparmurat Niyazov's death, although not democratic, occurred bloodlessly; however, the transition of the other regimes may not be as smooth considering the current state of living standards. Central Asians with limited access to fresh, clean water will be tempted to fight for their survival by any means possible, such as joining radical groups that do provide their families with welfare. These radical groups will use the public support to take power, much as the Taliban did in Afghanistan.

The United States should attempt to limit catalysts of conflict that are known; the water situation in Central Asia is a catalyst of conflict and is known. In the past, the irrigation systems of Central Asia have improved during times of peace. Although the futures of the states are not strong at the moment, they do exist in peace. The region needs to seize the opportunity to improve existing irrigation systems and the efficiency of water use.

Improved water use will benefit all nations with interests in Central Asia. The European Union recently moved into an "operational phase" of its policy towards Central Asia. They plan on injecting nearly a billion pounds and establishing more embassies in an attempt to create a special relationship with Central Asia.[126] Additionally, China has furthered its relationship with the region through the Shanghai Cooperation Organization and bilaterally with individual states. As indicated in this thesis, Russia has had a long history of influence in Central Asia. All of the countries interested in the region, whether for its energy supplies, or strategic location, stand to benefit only if the region is stable. In this new "Great Game," interested countries must pay attention to the water problem. By cooperating to strengthen the water infrastructure in Central Asia, these world powers will strengthen their own ties. Wolf and Hammer's argue that "war over water is neither strategically rational, hydrographically effective, nor economically viable."[127] The

[126] Andrew Rettman, "EU Moving Toward Operational Phase of Central Asia Policy," EUObserver.com, 27 February 2007, http://euobserver.com/24/23587, accessed 8 March 2007.

[127] Wolf and Hammer, 147.

United States should help the region understand the rationale behind this argument through education and increased funding to organizations such as USAID.

Stability in Central Asia depends on the aid of foreign powers. The leaders of the Central Asian states often look north to Russia and West to the European Union and the United States for help in stabilizing their domestic economy. With their energy reserves, mineral deposits, and strategic location, the states have the potential to remain stable; however, special attention must be paid to national living standards and especially to water use. Central Asia needs assistance in this matter. The region must return to is ancient tradition of honoring water use in the arid environment.

# LIST OF REFERENCES


Allison, Roy and Lena Jonson, ed., *Central Asian Security: The New International Context.* London: Royal Institute of International Affairs, 2001.

Alworth, Edward, ed. *Central Asia: 120 Years of Russian Rule.* Durham: Duke University Press, 1989.

Bacon, Elizabeth E. *Central Asians Under Russian Rule: A Study in Culture Change*. Ithaca and London: Cornell University Press, 1980.

CARNet. "Environment and Sustainable Development in Central Asia." http://www.caresd.net (accessed 29 January 2007).

CAWater Info. "Information Portal for Water and Environmental Issues in Central Asia." http://www.cawater-info.net/index_e.htm (accessed 11 December 2007).

CIA World Factbook. "Uzbekistan: Economy." https://www.cia.gov/cia/publications/factbook/geos/uz.html#Econ (accessed 8 March 2007).

Collins, Kathleen. "Clans, Pacts and Politics in Central Asia." *Journal of Democracy*, Vol. 13, No. 3 (July 2002): 137-152.

Edgar, Adrienne Lynn. "Review of Roy: New Central Asia; Geiss, Nationenwerdung in Mittelasien." *Kritika: Explorations in Russian and Eurasian History*, Vol. 3, No. 1 (2002): 182-190.

Everett-Heath, Tom, ed. *Central Asia: Aspects of Transition*. London and New York: RoutledgeCurzon, 2003.

Fuller, Graham E. *Central Asia: The New Geopolitics.* Santa Monica: RAND, 1992.

Gleason, Gregory. *The Central Asian States: Discovering Independence.* Boulder: Westview Press, 1997.

Gorodetsky, Gabriel, Ed., *Russia Between the East and West: Russian Foreign Policy on the Threshhold of the Twenty-First Century.* The Cummings Center Series, Oregon: Frank Cass Publishers, 2003.

Haftendorn, Helga. "The Security Puzzle: Theory-Building and Discipline-Building in International Security." *International Studies Quarterly*, Vol. 35, No. 1. (1991): 3-17.

Homer-Dixon, Thomas F. "On the Threshold: Environmental Changes as Causes of Acute Conflict." *International Security*, Vol. 16, No. 2 (Autumn 1991): 76-116.

Hopkirk, Peter. *The Great Game: Struggle for Empire in Central Asia.* New York: Kodansha America, 1992.

Hyman, Anthony. *Power and Politics in Central Asia's New Republics.* London: Research Institute for the Study of Conflict and Terrorism, 1994.

International Water Management Institute. "Projected Water Scarcity in 2025." http://www.iwmi.cgiar.org/home/wsmap.htm#A1 (accessed 12 December 2006).

Interstate Commission for Water Coordination in Central Asia. "Challenges and Actions for Integrated Approaches, December 2005." http://www.gwpcacena.org/en/pdf/ca_position_paper_eng.pdf (accessed 30 November 2006).

———. "Challenges and Actions for Integrated Approaches: Syrdarya River Basin Morphology, December 2005." http://www.cawater-info.net/syrdarya/geo_e.htm (accessed 11 December 2006).

Katzenstein, Peter J. *The Culture of National Security: Norms and Identity in World Politics*. New York: Columbia University Press, 1996.

Klotzli, Stefan. "The Water and Soil Crisis in Central Asia- A Source for Future Conflicts?" ENCOP Occasional Paper No. 11, Center for Security Policy and Conflict Research/Swiss Peace Foundation, Zurich/Berne (May 1994). http://cms.isn.ch/public/docs/doc_246_290_en.pdf (accessed 14 February 2007).

Levy, Marc A. "Is the Environment a National Security Issue?" *International Security*, Vol. 20, No. 2 (Autumn 1995):35-62.

Lewis, Robert A. *Geographic Perspectives on Soviet Central Asia.* New York: Routledge,1992.

Libiszewki, Stephan. "What is an Environmental Conflict?" in Occasional Paper No. 1, Environment and Conflicts Project. Bern: Swiss Peace Foundation, 1992.

Lowi, Miriam R. and Brian R. Shaw, ed. *Environment and Security: Discourses and Practices*. New York: St Martin's Press, Inc, 2000.

Luong, Pauline Jones. *The Transformation of Central Asia*. Ithaca: Cornell University Press, 2004.

Matveeva, Anna. "Democratization, Legitimacy and Political Change in Central Asia." *International Affairs*, Vol. 75, No. 1 (January 1999): 23-44.

Michel, Aloys A. and Stephen A. Klain. "Current Problems of the Soviet Electric Power Industry," *Economic Geography*, Vol. 40, No. 3 (July 1964): 206-220.

Micklin, Philip P. *The Water Management Crisis in Soviet Central Asia*, The Carl Beck Papers in Russian and East European Studies, No. 95. Pittsburgh: University of Pittsburgh, 1991.

National Intelligence Council. "Central Asia and the South Caucasus: Reorientations, Internal Transitions, and Strategic Dynamics." Conference Report October 2000, http://www.dni.gov/nic/confreports_asiacaucasus.html (accessed 15 September 2006).

———. *NIC Associates Report: A Long Term View of Water and* Security: International Waters, National Issues, and Regional Tensions. October 17, 2006.

Nichol, Jim. "Central Asia: Regional Developments and Implications for U.S. Interests." *Congressional Research Service*, Library of Congress. Updated August 4, 2006.

O'Hara, Sarah L. and Tim Hannan. "Irrigation and Water Management in Turkmenistan: Past Systems, Present Problems and Future Scenarios," *Europe-Asia Studies* 51:1 (January 1999): 21-41.

Olcott, Martha Brill. *Central Asia's Second Chance.* Washington, DC: Carnegie Endowment for International Peace, 2005.

Pierce, Richard A. *Russian Central Asia: 1867-1917.* Berkeley: University of California Press, 1960.

Pomfret, Richard. *The Economies of Central Asia.* Princeton: Princeton University Press, 1995.

Rashid, Ahmed. *Jihad: The Rise of Militant Islam in Central Asia.* New York: Penguin Books, 2003.

Rettman, Andrew. "EU Moving Toward Operational Phase of Central Asia Policy," EUObserver.com (27 February 2007), http://euobserver.com/24/23587 (accessed 8 March 2007).

Roy, Olivier. *The New Central Asia: The Creation of Nations.* New York: New York University Press, 2000.

Rumer, Boris, Ed. *Central Asia, A Gathering Storm?* New York: M.E. Sharp Inc., 2002.

———. *Central Asia at the End of Transition.* New York: M.E. Sharp Inc., 2004.

Rumer, Boris and Stanislav Zhukov, Ed. *Central Asia: The Challenges of Independence*. New York: ME Sharpe, 1998.

Snyder, Jed C., Ed. *After Empire: The Emerging Geopolitics of Central Asia. Washington, D.C.:* National Defense University, 1995.

Trenin, Dmitri. "Reading Russia Right," *Carnegie Endowment for Peace, Policy Brief Number 42, Special Edition*. (Oct 2005).

Ullman, Richard. "Redefining Security." *International Security*, Vol. 8 No. 1, (Summer 1983): 129-153.

United Nations. "Diagnostic Report of Water Resources in Central Asia." *Strengthening Cooperation for Rational and Efficient Use of Water and Energy Resources in Central Asia*, Working Group on Energy and Water Resources, (April 2005).

UNESCO. "Regional Workshop on Snow Glacier and Water Resources in Asia." Almaty, Kazakhstan, 28-30 November 2006, http://www.unesco.kz/science/2006/snow_glac_ws_en.pdf (accessed 13 December 2006).

U.S. Census Bureau. "IDB Summary Demographic Data for Uzbekistan," http://www.census.gov/cgi-bin/ipc/idbsum.pl?cty=UZ (12 February 2007).

Votrin,Valery. "Transboundary Water Disputes in Central Asia: Using Indicators of Water Conflict in Identifying Water Conflict Potential." Vrije Universiteit Brussel, Master's Thesis 2003," http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html (accessed 18 February 2006).

White House Press Office. *National Security Strategy of the United States, 2006*, (March 2006). www.whitehouse.gov/nsc/nss/2006/intro.html (accessed 15 September 2006).

Wolfson, Ze'ef. *The Geography of Survival: Ecology in the Post-Soviet Era.* New York: M.E. Sharpe, 1994.

The World Bank. "Irrigation in Central Asia: Social, Economic and Environmental Concerns," (February 2003). http://www.cawaterinfo.net/library/eng/reports/irrigation_in_central_asia.pdf (accessed 15 December 2006).

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