Program Research Project

KLEPSUDRA: HOW THE RIO GRANDE TREATY INCREASED INSTABILITY IN MEXICO

BY

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ABSTRACT

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KLEPSUDRA: HOW THE RIO GRANDE TREATY INCREASED INSTABILITY IN MEXICO

Touch water [in the West] and you touch everything.

−John Gunther

The “Great American Desert” was a prominent feature on elementary school maps at the turn of the last century. This desert was an expanse of arid grassland and treeless landscape stretching west from central Texas to the central valley of California and southward from the Dakotas into Mexico. Receiving less than 20” of rain each year, this land was largely untouched for most of the 19th century. In his 1878 report to Congress, John Wesley Powell described how irrigation might be used to make the land productive. The timing of his report was fortuitous as Congress was interested in harnessing natural resources, populating the center of the country, and solidifying control over the lands in order to build the nations’ power.[1] Congress thereafter authorized a comprehensive irrigation survey and set the stage for the most expansive water management scheme on earth. During the next 100-years the United States built 75,000 dams, over 80,000 miles of waterways, drains, and various flood control channels and diversions.[2] By the middle of the 20th century, the Great American Desert faded from maps as the area became one of the most productive agricultural areas in the world.

American efforts to harness nature had more to do with national security and international power than creating farmland. Water was a source of national power as the United States was facing emerging competition and threats from across the oceans.[3]

Key to American interests was mitigating Mexican rights to watersheds that might be claimed under historical rights of first use. This was accomplished, in part, by the 1944 Rio Grande Treaty between the United States and Mexico.[4] The Rio Grande created more than a convenient natural border as its use under the treaty provided the United States with a unique opportunity to leverage security and growth. Today, Mexico's internal stability is stressed by a combination of social, economic, and environmental conditions which, when combined with water scarcity, increases the risk of creating conditions counter to American national interests. For Mexico this treaty became the "klepsudra", or water thief, of the 20th century. This paper shows how the United States used the treaty to protect domestic growth while hindering sustainable development on the Mexican side of the border. It will also show, while advantageous to the United States, that this action is now counter-productive to United States-Mexico relations and regional security. This paper addresses the consequences of our adherence to the treaty, potential impacts from climate change, population growth, the North American Free Trade Agreement (NAFTA), and implications for future policy considerations related to internal stability for Mexico.

Why water matters

Mexico is the most water stressed country in North America and one of the most stressed countries in the Western Hemisphere.[5] Part of this stress can be traced to the 1944-treaty, while other parts rise from a combination of geography, poor infrastructure investments in Mexico, rapid population growth, and by-products of trade liberalization through the North American Free Trade Act. Regardless of the cause, Mexico's lack of

water is contributing to its economic, social and political instability; conditions which are contrary to those desired in the United States National Security Strategy.[6]

While Mexico has approximately 150 rivers, the distribution of surface water is uneven across the country. The five major rivers, contributing 52% of the annual volume of surface water, are in the south and southeast (areas with high rainfall averages).[7] The northern, central and western areas of Mexico, home to 80% of the population and 85% of the Gross Domestic Product (GDP), receive only 32% of the annual surface water. This trick of geography defaults key parts of Mexico into a state of water scarcity.[8] Climate change will potentially place further stress on Mexico with temperature variations and rainfall patterns which include increased likelihood of drought.[9] Northern Mexico and the Rio Grande basin, already susceptible to drought cycles (Figure 1), and home to some of Mexico's most productive farmlands, will be particularly hard hit due to underground water-tables that have been significantly over-extracted.[10]

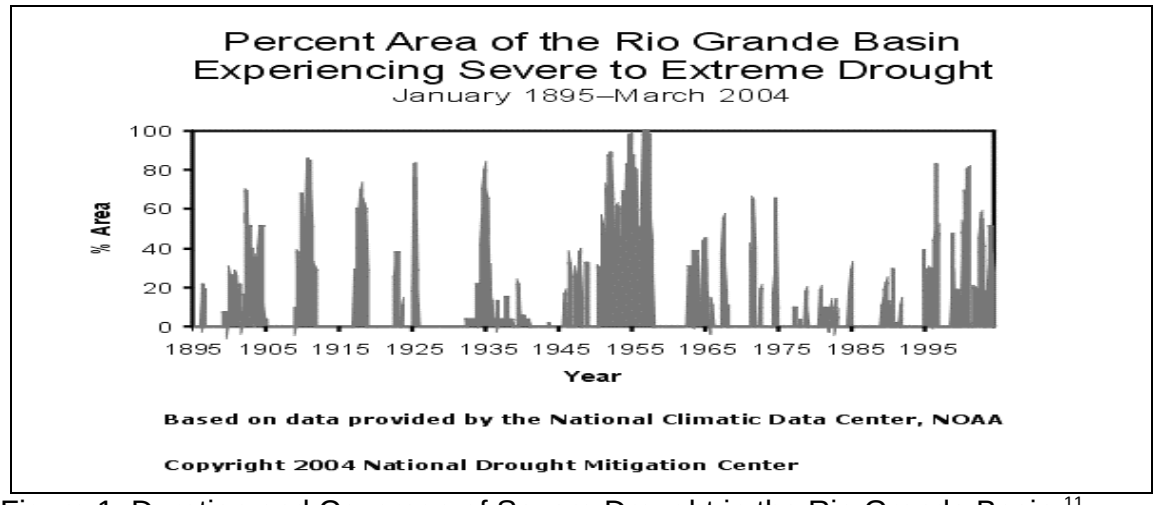

Figure 1. Duration and Coverage of Severe Drought in the Rio Grande Basin.[11]

Water scarcity in Mexico is exacerbated by declining expenditures on civil infrastructure and large increases in population. Over the last twenty years Mexico's investment on civil infrastructure has declined from 7% to 3% of GDP.[12] This accelerated the deterioration of already outdated and inefficient water storage and transfer facilities. The failure to invest in new infrastructure and techniques left Mexico's agricultural sector reliant on irrigation methods which waste 62% of the water used.[13]

While infrastructure in Mexico deteriorates, rapid population growth catapulted Mexico to the 11th most populous country in the world with forecasts predicting the population to double by 2029.[14] Projections for the border region show significant increases in population despite the arid conditions (Figure 2). This rapidly growing population generates an increased per capita demand against available water supplies.

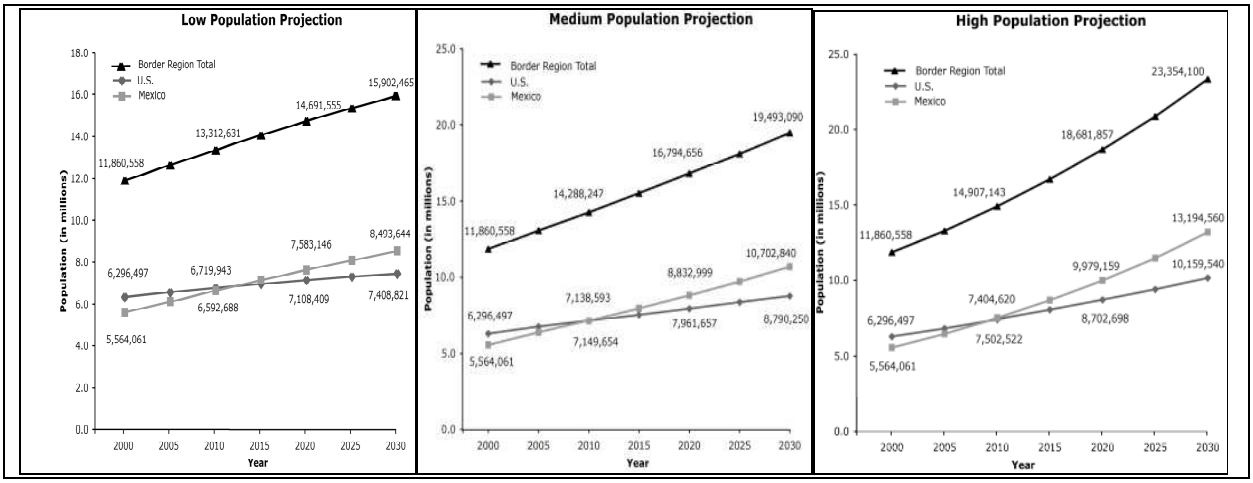

Figure 2. Low, Medium and High projections for population growth along the United States-Mexico border region through 2030.[15]

Water availability and population growth have an inverse relationship in that the amount of available water decreases as populations increase. In the 45-years between 1950 and 1995, Mexico incurred a 70% decrease in per capita water availability due to

population growth (Figure 3). As the population continues to grow, water availability is projected to decline by another 10% by 2025.[16]

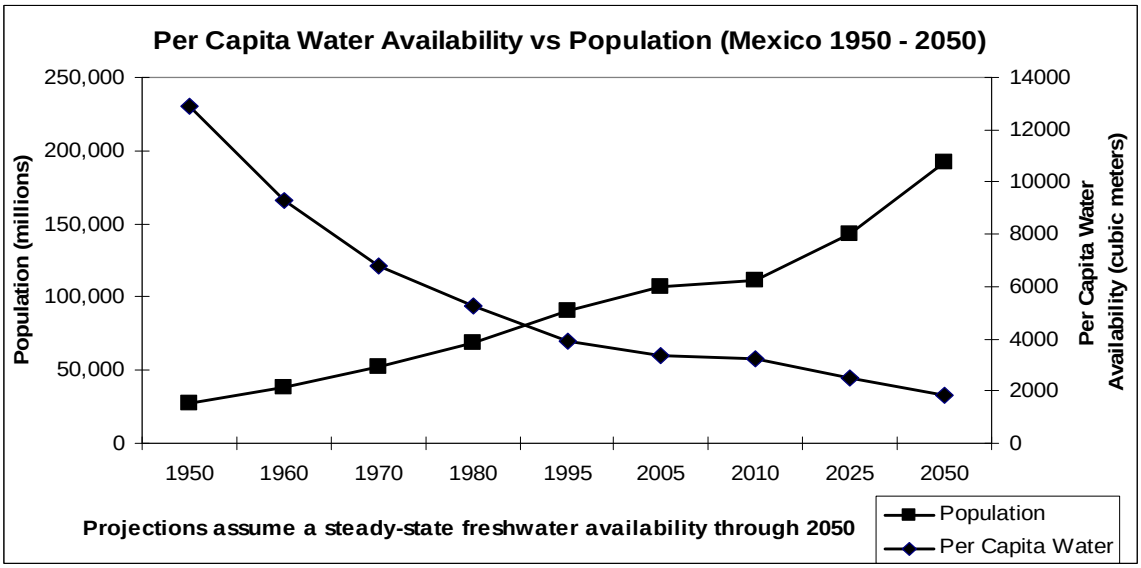

Figure 3. Mexico per capita water availability decreases 85% over 100-years.[17]

Water availability is much worse in Northern Mexico due to trade liberalization. Foreign owned manufacturing plants, introduced under the Maquiladora program, increased population and industrialization along the border areas in Mexico.[18] People were attracted north for better paying jobs in the Maquiladoras at the same time that NAFTA was fueling growth in several sectors of the Mexican economy. Water availability, however, decreased in conjunction with this growth.[19] Mexico's irrigated crop-production increased 236% in the State of Chihuahua between 1980 and 2000 while cultivated land (which increased by 44%) shifted towards water intensive crops to accommodate market demands in the United States, Canada and shifts in consumer preferences in Mexico.[20] NAFTA triggered explosive growth in fruit and produce exports to the United States and represents a sizeable "virtual" water transfer.[21] NAFTA also

produced a vibrant Mexican economy which translated into a larger middle-class, more consumer affluence and shifting consumer preferences. Ironically the new found affluence exacerbated per capita water demand by moving Mexican diets towards more water intensive staples such as meat and dairy products.[22]

Mexico recognizes it is on a path of unsustainable growth where water is now a critical issue both domestically and with the United States.[23] Water is now on par with illegal immigration and drug-trafficking as a key relationship issue between Mexico and the United Sates.[24] Climate change potentially produces additional risk of political instability and violence in Mexico.[25] Mexico's water scarcity and potential climate change impacts, particularly in the heavily populated north, could produce economic weakness, food insecurity, and more migration toward the United States.[26] Water plays a vital role in supporting key American interests with Mexico, Central America and the Western hemisphere. Almost every issue related to Mexico and water scarcity can be linked to American interests espoused by the Commission on American National Interests (Figure 4) and largely mirrored in the 2006 National Security Strategy.[27]

Figure 4. American interests which can be linked to water scarcity issues in Mexico.[28]

Contemporary thinking in the joint operational environment and the 2005 Senator Paul Simon "Water for the Poor Act," both recognize water as a key factor in producing regional stability.[29] In particular, Senator Simon's act links American foreign assistance programs to the development of clean water and sanitation around the world.[30]

Water Policies and Treaties of the United States and Mexico

The United States has historically used the rights of "prior appropriation" for determining water rights. Sometimes referred to as the "Harmon Doctrine", this approach favors the first settlers that started using the waters from a river. This first appropriation of the waters granted full rights to the waters.[31] In practice it means that downstream states are at the mercy of the upstream states controlling the headwaters. This is indeed the case between the United States and Mexico. Historically the United States has exercised unilateral control over the trans-boundary waters. Americans made decisions and acted unilaterally, simply, because we could.[32] Mexico had little say in defending its rights to any of the water and for more than 100-years lived under a series of agreements that provided the upper hand to the United States. Sometimes these agreements were brokered and handed to Mexico as a "fait accompli." This was perhaps best echoed in 1922 by Arizona Senator Carl Hayden, who said "…I shall oppose any kind of Mexican right in the Colorado River until it is definitively and fully determined there is a surplus of water in that stream for which there is no use in the United States."[33]

The key to the water relationship between the United States and Mexico is a 1944 treaty often referred to as the Rio Grande Treaty. This treaty evolved over approximately 100-years of border and water issues between the two countries and

established all of Mexico's water rights to the Rio Grande and Colorado River while solidifying the United States position of strength in terms of water.[34] This treaty required the United States to provide Mexico with specific water allocations from the southward flowing Rio Grande and Colorado River. Mexico, in turn, agreed to provide water from the northward flowing Rio Conchos and other Mexican rivers/tributaries as they flow into the Rio Grande.

The treaty appeared equitable in 1944, but as the years passed and water scarcity became more pronounced, four distinct frailties of the treaty have become apparent.[35] First, the treaty specified surface waters and ignored any mention of underground aquifers which flow, in some cases, southward under the border and into Mexico. Over the last sixty years Mexico has become dependent on these underground waters for municipal and agricultural needs in the border areas. Rights to these waters have become a key point of contention with Mexico. Recent American efforts to reduce leaks from the All American Canal along the Arizona-California border with Mexico would largely diminish underground waters flowing into Mexico. Mexican farmers in Mexicali Valley have loudly protested the project.[36] Second, the treaty makes provisions to handle emergency water allocations in the event of an "extraordinary" drought; however it fails to provide any definition, measure, or duration for conditions constituting such a drought. Within the last fifteen years this has created significant tensions between Mexico and the United States.[37] Third, water accounting within the treaty is done on five-year cycles. Water allocations granted for emergencies are to be paid back no later than the next accounting cycle. The border region has experienced almost cyclical droughts that make water debts difficult to pay off within any five-year period.

This is precisely what happened to Mexico during the most recent drought where the emergency water allocations were not repaid for over ten years.[38] Finally, the treaty provides no considerations for future changes in water needs or priority of use. By tacitly ignoring future changes in population, agriculture and industrial growth, the 1944 framers of the treaty allowed the United States a long-term ability to maintain the status quo in the water relationship with Mexico.[39]

Water as an American Instrument of Power

During the period prior to World War II, the United States recognized that water would be a key ingredient to the sustained growth of the nation and its economy. Fortunately the previous fifty years had produced significant water infrastructures and a treaty that secured full rights to the substantial Rocky Mountains' watershed that flowed into both the Colorado River and Rio Grande. The combination of infrastructure, treaties, and natural rainfall placed the United States at a distinct advantage over Mexico in four key areas.[40]

First, the United States capitalized on this wealth of infrastructure and natural resources to establish a strong multi-faceted economy. Access to plentiful water allowed for the development and maintenance of a strong agriculture base.[41] This was a key consideration as power tends to reside in those states which can create a food surplus.[42] Mexico has not been as successful and today has 24% of its population living in a state of food poverty.[43] Beyond agriculture and food, water as an industry in itself became a surprisingly large part of the American economy with 2003 revenues at $100B and projections for future growth ranging upwards of 10%.[44] In the last fifty years NAFTA fueled economic growth allowing the United States to further leverage the water

imbalance with Mexico. While NAFTA benefits have accrued to each partner, the United States has reaped benefits through market conditions that resulted in exporting low water-intensive crops to Mexico in return for relatively high water imports from Mexico.[45]

Second, American-controlled water flows into the Colorado River and Rio Grande artificially limit sustainable growth on the Mexican side of the border. Water scarcity on the Mexican side of the border created conditions wherein municipalities could not accommodate additional population and industrial growth. Some towns require trucked-in water from other areas and the capacity of the municipal sanitation infrastructure is overwhelmed.[46] Other areas are nearly totally dependent upon ground-water for agricultural and domestic uses. Key aquifers in these areas continue to be rapidly drained and cannot sustain the current rates of over-extraction.[47] Despite these difficulties, NAFTA-related growth and foreign direct investment in Northern Mexico inspired local governmental bodies and businesses to pursue further growth.[48] Working to the United States' advantage, this growth mostly supports the American marketplace, yet is fully funded from the Mexican water supply.

Third, the mandatory Mexican water allocation from their Rio Conchos into the Rio Grande supports the life-blood of the Southern Texas farming industry. These waters, which represent 56% of the flow into the Rio Grande south of El Paso, are essential for ensuring the survival of the +$100B Texas farm economy and the livelihood of those living in a border area with the most challenging demographics in the United States.[49]

Finally, unquestioned water rights to the upper Rio Grande and Colorado River basins provide the United States with a tremendous advantage in managing agricultural,

urban and industrial growth while weathering droughts predicted under various climate change models.[50] This massive river basin and its connected economy only use about 50% of the available annual water flow.[51] From an economic perspective, this gives the United States more flexibility versus Northern Mexico where a relatively high proportion of the economy is tied to NAFTA-related farming. This Mexican agricultural base becomes more important as Mexico's oil reserves shrink and become a smaller portion of the national economy.[52] Water is without question a key ingredient, and perhaps a tipping point, for the economy in Northern Mexico.

Water as a Regional Security Issue

Mexico is currently laboring under a variety of issues which are eroding domestic stability. The Rio Grande Treaty increases stability risks in five areas of Mexico which, simultaneously, introduce additional stressors on regional security.

Political instability. Mexico is listed as a country likely to be subject to violent conflict over water rights.[53] It is also ranked the 32nd country most at risk for political instability due to climate change.[54] In addition to political instability, climate change can introduce economic weakness, food insecurity, and migration.[55] Empirical evidence substantiates that both water quantity and quality are destabilizing issues detrimental to economic and social stability.[56] Water and politics (stable governance) are intimately linked. The concept of hydro-political instability is tied, in part, to the rate of change in a given area. The growing population and economy in the Rio Grande basin, combined with the existing over-extraction of groundwater and the potential impact of climate change, will increase changes faster than the various government institutions can

manage. Exceeding the institutional capability to cope with change is another factor that creates increased tensions and instability.[57]

It is highly unlikely that there will be a violent conflict between Mexico and the United States over water. The control regimes are strong enough that they provide all the mechanisms needed to prevent violence at state or national levels.[58] A substantial body of research indicates, however, that the likelihood of violence is significantly higher at local (lowest) levels of water management and use.[59]

Economic Instability. The Mexican labor market has already felt the impact from NAFTA. Millions of Mexican farm-workers left failing farms and searched for better paying jobs in the northern states and the United States.[60] American farm subsidies are still bolstering American competition that continues to threaten Mexican farms[61]. Despite record high oil prices, the Mexican petroleum industry is also at risk. At current production rates, Mexico has less than ten years of proven reserves remaining. Dwindling oil reserves create additional economic risk for Mexico and elevate agriculture [again] as a key employer and source of income.[62]

Competition from China is hurting the Maquiladores and siphoning away critical investment dollars.[63] Mexico's ability to export is strong in the same areas as China and China's entry into the World Trade Organization weakened Mexico's ability to compete. Throughout this decade Mexico would have enjoyed better exports, and less labor emigration, if China had not become a direct competitor for low cost manufacturing.[64] Recent reports indicate that investor confidence in Mexico has been declining. Mexico has dropped from #5 in global foreign direct investment preference to #19 in the last few years.[65] Public and private financing for Mexican agriculture has also dropped.[66]

Ultimately this means the Mexican labor market in the north will be impacted by both water scarcity and external competition. Historically this has translated into higher unemployment, more pressure to migrate north for jobs in the United States, and increased calls for "populist" measures to fix the ailing economy.[67]

*Immigration***.** Migration is one of the oldest ways that people have coped with water scarcity.[68] Decreases in irrigation water quantity or quality have the proven potential to trigger large movements of people from impacted agricultural areas towards urban areas and regions with better opportunities for employment and survival.[69] Usually the movement is from the farms to the city, or in the case of Mexico, to the United States. As seen in other parts of the world, and certainly the United States, this eventually increases tensions and regional instability.[70] The United States experienced this phenomenon as a result of the first wave of change brought by NAFTA.[71]

Crime. There is an interesting relationship between tensions attributable to water scarcity and crime. Water scarcity has the ability to contribute to socio-economic collapse which strengthens the criminal element; yet, at the same time, the existence of criminal elements is a contributing factor which increases water-related tensions.[72] Crime is a wide-ranging topic when looking at recent conditions in Mexico and is a key focus for American policy in Mexico and Central America. Drug-trafficking, in particular, is a very real threat to Mexico's national security and has been costing the United States up to $1B per month for counter-narcotics programs.[73] Water scarcity has the potential to make the situation worse. As the economy falters, the power of the drug cartels could be strengthened. This was recognized recently by both the 109th and 110th Congress where criminal activity and human smuggling from Northern Mexico were the

focus of new legislation.[74] Additional instability in the north could allow the drug cartels to step-in and take over more than they already have.[75] There is ample evidence that Mexico's state sovereignty is eroded in the northern states with some areas largely controlled by criminal cartels/gangs. Evidence of cartel influence recently appeared as large public advertisements (banners) soliciting police, federal agents and members of the Mexican armed forces to apply for jobs with the drug cartels.[76] The situation is already delicate and further weakening of the Mexican economy could precipitate further collapse of the fragile sovereignty situation.[77]

Public Health. Deteriorating water conditions in Mexico create problems related to healthcare. There is already evidence of water/sanitation related disease in Northern Mexico and the United States border areas.[78] Water scarcity is the single largest factor behind sanitation-related diseases.[79] The Mexican government, already suffering with an inability to provide adequate public service in the northern states, could be unable to deal with this increasing challenge. A states' inability to provide basic public services can break the social contract between citizens and state, leading to conflict.[80] Mexico's inability to adequately provide healthcare produces new opportunities for drug cartels or non-state entities to step-in and establish strong shadow governments by providing public services (much like Hezbollah has done in Lebanon).[81]

Policy Recommendations

The United States demonstrated over the last 100-years that it can and will act in a unilateral manner on water issues with Mexico. A position of power is not in question; but changing conditions suggest that it is now time to balance American state power against the potential risks to Mexico. A failure to weigh the risks versus benefits and

make adjustments to American policies could have significant consequences on the already fragile political and social stability of Mexico. The following five recommendations provide avenues through which to build better internal controls over water, reduce water related tensions, develop better cooperation with Mexico, and shape conditions in Mexico which influence both stability and security.

From a domestic stand-point, the United States should establish a unified national water management body in order to integrate both the policies as well as the various agencies that touch water into a single synchronized federal entity. Currently there is no single unified strategy for water in the United States. A national agency has been suggested in the past and is viewed as an important step given the current challenges in managing our various water issues.[82] It provides several advantages, not the least of which is having an agency that can operate on the peer level with Mexico's national water agency (Comisión Nacional del Agua). It could also act as the integrator for strategic plans. Currently there are few, if any, strategic plans regarding water in the various cabinet level departments in the United States.[83] Finally, a national water agency, with the ability to synchronize federal policies and resources, could provide better leverage to our ability to resolve domestic and trans-boundary water disputes.

The United States must address the issue of groundwater and extraordinary drought. Both issues have generated substantial tension over the last fifteen years and the potential remains for additional conflicts to arise. Defining the parameters for extraordinary drought appears simple, yet it must be considered within the context of climate change predictions. Groundwater, on the other hand, presents a discontinuity in that it not only crosses an international border, but Mexican law treats all waters as

federal property while the United States water laws do not. This could result in American property owners, local governments, water districts, and states contending directly against the Mexican government over rights to underground water.[84] Some legal, diplomatic and informational prowess will need to be demonstrated by both countries in order to overcome the differences and reach an agreement. Addressing both issues will go a long way towards mending noticeable defects in the treaty.

Both countries need to retool the water credit/debit cycles as the current five-year cycle has produced significant tensions between multiple levels of stakeholders in the two countries.[85] With the implications of climate change and severe drought, these accounting cycles become unworkable. Evidence of this is clear from a recent drought, starting in the early 1990's, where Mexico did not achieve full payment of the water debt until more than a decade later.[86] Redefining these cycles could provide more realistic means for achieving water balances and more accurate availability projections while precluding the possibility of rising tensions over prolonged periods.

A national set of priorities for water could help the states and regions balance future water demands against available supply. Unlike Mexico, the United States does not have a standardized set of water priorities and current conflicts between states have reached exceptional heights.[87] A uniform priority list could help water planners make "best use" trades with available water supplies. Extending these priorities across the border region, either inside or outside the context of the Rio Grande Treaty, could help better synchronize water solutions against projected needs in the border region.

Finally, the United States should champion greater support for improvements to infrastructure and irrigation practices in Northern Mexico.[88] There is substantial evidence

to show that water demand management, through better irrigation techniques, combined with more effective storage and transport facilities, can provide significant savings.[89] Large increases in aid to supplement Mexico's infrastructure improvement program are needed to produce these results. Mexico receives a relatively small amount of foreign aid which can be applied to this infrastructure program and current funding is at the lowest level in over four decades.[90] In addition to infrastructure, practice has shown that the daily management of water issues is most successful when it takes place at the lowest levels of government.[91] Improvements to infrastructure and irrigation techniques in Mexico, therefore, should be managed at the local versus federal levels. This presents the single largest challenge to these five recommendations and links water to the other security issues facing Mexico. Support from the United States must be contingent upon Mexico's ability to regain positive political, social and economic control of its northern states and local government bodies. Many of these states are essentially owned by the drug cartels that have created a modern-day Hobbesian environment of violence and terror.[92] The infrastructure aid that goes to these states could be at risk of diversion by this wide-spread crime and corruption. This risk must be mitigated before investor confidence can be restored to the point that large public or private investments can be possible. This is clearly a domestic issue for Mexico, but one in which the American water leverage over perhaps 10 million Mexican citizens in the border region might encourage a serious response from the Government of Mexico.

These recommendations are not intended to set the stage for renegotiating the Rio Grande Treaty and granting larger water allocations to Mexico. To do so would weaken the United States position over this scarce resource and endanger future

American interests. The United States should also resist efforts to expand the border region beyond the current 100 kilometer limits. Some suggestions have been made that a range of 300 kilometers might provide better water management and planning.[93] This is counter-productive towards safeguarding American interests in that expanding the range would open up a significantly larger portion of American river basin and aquifers to contention with Mexico. We should also resist suggestions to take a more holistic view of the Rio Grande and consider the entire river as a single river basin to be managed jointly with Mexico. As with extending the range of the border region, this proposal produces significant risk as it would potentially extend Mexican interests all the way into the Rocky Mountains and expose several river basins that commingle in that area.[94]

The proposed recommendations, to the contrary, provide a means by which to avoid future conflicts while shaping conditions in Mexico to better suit American national security interests. All of these are in keeping with our stated national security objectives to strengthen relations with Mexico, expand economic opportunities, fight corruption and crime, strengthen democracy, promote prosperity, invest in people, reduce illegal immigration, and reduce infectious diseases.[95]

Conclusion

Water played a significant role in the development of the arid west. It now plays an equally critical role as an element of regional security in North America. This paper showed that the United States achieved and maintained a position of power over Mexico by leveraging our considerable infrastructure with a 64-year-old water treaty as an instrument of power. It also points out several risks to Mexico's stability associated

with the current status quo. Projected changes in trade patterns, population growth, consumer preferences and climate change will require a reassessment of American policies towards water as an element of regional security along our southern border.

Enactment of the 2005 Water for the Poor Act clearly demonstrated that the United States recognized water as a key contributor towards regional security. It also demonstrated that Americans are willing to align various elements of national power behind a strategy whereby water is eliminated as a factor in regional conflicts. Recognizing that water is a national security issue, on par with oil, is a key step towards moving water beyond a humanitarian consideration and placing it onto the global stage as a vital element of security and prosperity. Our challenge is to turn that attention to our southern neighbor and use water as a lever against much needed changes in other aspects of Mexican society. Mexico must to regain positive control over its northern areas and push the criminal elements back down to a law enforcement issue versus a national security and sovereignty issue. Only then can the additional benefits of American assistance pay true dividends to the people of Mexico and the United States.

In 1964, Dr. Hans Morgenthau observed two challenges with regard to state power. He said, essentially, that we must be careful about setting objectives which fall short of our means to accomplish them, or setting objectives which overreach our means.[96] It is clear that this statement is as relevant today as it was then. Our contemporary objectives with regards to Mexico are, in part, buried in our policies regarding water. It is time to assess these policies and rebalance our objectives with the means we have available to achieve them.

Endnotes

[1] Donald Worster, Rivers of Empire (London: Oxford University Press, 1985):130 -131, 265. Our need for water to sustain the interior was extremely strong in the late 19th century. Population was sometimes used as a gauge for progress. The census of 1890 showed the center of the country was populated, yet by the next census, after a severe drought throughout the central United States, the populations dropped significantly. Perhaps a more important consideration beyond population was establishing the American power base through harnessing the natural resources. Congress looked upon world power and domination being linked to the harnessing of water in the western states. Without the various reclamation projects, Congress feared that America might not be able to stand up to the emerging overseas competition and a communist Soviet threat across the Pacific.

[2] Daniel McCool, "Evolving Political Institutions: A New Water Policy and its Impact on the Border Region," in The U.S.-Mexican border environment: Bi-national Water Management Planning, ed. Suzanne Michel. (San Diego: Southwest Consortium for Environmental Research and Policy, 2002), available from http://scerp.org/pubs/ mono8.htm Internet; accessed 3 April 2007. 366.

Congress authorized what became known as the "Irrigation Survey" in October 1888. Information on Powell's work and the history of the water management scheme is available from http://pubs.usgs.gov/circ/c1050/first.htm; Internet, accessed 1 April 2008.

[3] Worster, 265.

[4] The 1944 treaty was follow-on to a May, 1906 treaty with Mexico. That earlier treaty stipulated water allocations between the United States and Mexico for waters in the Rio Grande between El Paso and Fort Quitman. The Rio Grande is called "Rio Bravo" in Spanish. The International Boundary and Water Commission maintain copies of all treaties and meeting minutes related to the rivers. Available from www.ibwc.state.gov/ Treaties_Minutes/treaties.html; Internet; accessed 27 July 2007.

[5] Scott Vaughan, "How Green is NAFTA? Measuring the Impacts of Agricultural Trade," Environment, (March 2004), available from http://findarticles.com/p/articles/ mi_m1076/is_2_46/ai_n6126285; Internet; accessed 03 April 2007.

[6] The 2006 National Security Strategy for the United States provides several focused desires for the Western Hemisphere. In summary they are: strengthen relations with Mexico; reduce illegal immigration; expand economic opportunities; bolster security; strengthen democracy; promote prosperity; and invest in people. Of particular relevance to this paper is a clear statement of need with regards to our southern neighbor: "If America's nearest neighbors are not secure and stable, then America will be less secure." Bush, George W. "The National Security Strategy of the United States of America," (Washington, DC: The White House, March 2006). 37.

[7] "Country Studies: Mexico," available from http://www.countrystudies.com/ mexico/ topography-and-drainage.html Internet; accessed 30 August 2007

[8] Ibid. Note that Mexico has some extreme ranges regarding per capita water availability. The rain-rich southeast portion of the country has more than 13,500 cubic meters (annually) per

person, while the State of Mexico, for example, has less than 200 cubic meters per person. Therefore the "average" per capita water availability figures sometimes used to categorize stress versus scarcity in a particular country are too general to be of value. Water stress occurs with <1,000 cubic meters of water per person (renewable supply), while water scarcity is 1,000 to 1,700 cubic meters per person. See Malin Falkenmark, "The Massive Water Scarcity Now Threatening Africa–Why Isn't It Being Addressed?" Ambio 18, no. 2 (1989): 114-115.

[9] R. Schubert, et al., Climate Change as a Security Risk, German Advisory Council on Global Change. (Berlin, 2007), 59-61. Available from: http://www.wbgu.de/ wbgu_jg2007_engl.html; Internet; accessed 22 January 2008. Also see a detailed prediction on the increasingly arid landscape in the southwestern United States and Northern Mexico in Richard Seager, et al, "Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America," Science, (May 2007): Vol. 316. no. 5828, pp. 1181-1184.

[10] Underground water contributes 80% of the total water needs in Mexico state/city and ground in some places is subsiding at 40cm per year due to groundwater extraction which is taking place at rates of up to 850% of recharge rate. Note that land subsidence like this is destroying underground pipes and contributing to the overall inefficiency of the civil infrastructure in Mexico. See United Nations Educational, Scientific and Cultural Organization, "Water: A shared Responsibility: The United Nations World Water Development Report," (New York: Berghahn, 2006) available from http://www.unesco.org/water/wwap/wwdr/wwdr2/pdf/ wwdr2_ch_14.pdf; Internet; accessed 20 January 2008. 492-494.

Mexico City has sunk approximately thirty feet in the last 100 years. Jo Tuckman, "Mexico Shows World Water Forum What Not to Do," Guardian, 15 March 2006, available from http://www.guardian.co.uk/environment/2006/mar/15/ water.internationalnews; Internet; accessed 01 May 2008.

On the United States border, extensive withdrawals from the El Paso area aquifer will cause the City of Juarez to exhaust their underground water supplies by 2020. Juarez officials plan to cross-drill into the aquifer under El Paso to solve the problem. William A. Nitze "Meeting the Needs of the Border: A Growing Challenge for the United States and Mexico" in The U.S.-Mexican border environment: Bi-national Water Management Planning. ed. Suzanne Michel. (San Diego: Southwest Consortium for Environmental Research and Policy, 2002), available from http://scerp.org/pubs/mono8.htm; Internet; accessed 3 April 2007.148.

[11] Figure 1 procured from the National Drought Mitigation Center. A substantial amount of information on historical droughts and contemporary drought mitigation techniques are available through the National Drought Mitigation Center. See the National Drought Mitigation Center, available from http://www.drought.unl.edu/ whatis/palmer/ riverbasin.htm; Internet; accessed 15 February 2008.

[12] Arian Orta and Patrick Hess, Mexico: Mexico's National Infrastructure program 2007-2012, (Washington D. C.: United States Department of Commerce, August 2007), available from http://commercecan.ic.gc.ca/scdt/bizmap/interface2.nsf/vDownload/ IMI_8530/$file/X_360288.PDF; Internet; accessed 20 January 2008. Note that the lack of modernization of infrastructure also decreases that infrastructure's ability to withstand the impact of natural disasters which can, like the severe damage caused in Honduras with Hurricane Mitch in 1998, knock-out water supplies for months or even years. Under some

climate change models, rising water temperatures in the Gulf of Mexico are projected to increase the intensity and frequency of tropical storms that regularly batter Mexico. Schubert, 3,113. Also see a detailed discussion on this topic in "Global Water Supply & Sanitation Assessment 2000 Report," (Geneva, World Health Organization, 2000), 57.

[13] Stan Bernstein, Freshwater and Human Population: A Global Perspective, available from http://www.google.com/search?hl=en&q=freshwater+and+human+population

Internet; accessed 16 January 2008.

[14] Mexico's population is expected to double by 2029. Kent Hughes Butts, "The Strategic Importance of Water," Parameters, (Spring 1997): 65-83; Population data is a key consideration for planning public health programs. Pan-American Health Organization, "Health in Mexico," available from http://www.paho.org/hia/ archivosvol2/paisesing/Mexico%20English.pdf; Internet; accessed 28 March 2008.

[15] James Peach and James Williams, "Population Dynamics of the U.S.-Mexican Border Region." Unpublished Monograph for the Southwest Consortium for Environmental Research and Policy. (San Diego: SCERP/SDSU Press, 2003). Available from http://scerp.org/population.htm; Internet; accessed 3 November 2007.

[16] The drop in available water is a reflection on both population increases and declines in available freshwater. Mexico's decrease in per capita water availability is outpacing the world average due to higher population growth in Mexico versus the global average. During the same period, world population grew from roughly 2.5B to 6.0B and water availability dropped by 58%. Sandra L. Postel and Aaron T. Wolf, "Dehydrating Conflict," Foreign Policy, September 18, 2001.

[17] Figure 3 constructed by the author from historical census records and projections on population growth in Mexico. Water availability and population projections assume a finite water resource of 357.4 cubic kilometers per year in Mexico. Some population projections and water availability figures are found in Peter H. Gleick, et al., The Worlds Water 2006-2007: The Biennial Report on Freshwater Resources, (London, Island Press, May 2006), 244.

[18] Nitze,154 -156. Mexico created industrial "free trade" zones in order to attract manufacturing and foreign investment to the northern states. This program has often been referred to as the "Maquiladora Program".

[19] NAFTA brought more growth into the Mexican northern states and the area experienced growth rates 10 times faster than other states in Mexico. Robert A. Pastor, "North America's Second Decade," Foreign Affairs, Vol. 83, (Jan/Feb 2004). 1.

[20] Susan Combs, "The Mexico Water Debt," Texas Bar Journal, (March 2004). Available from http://www.texasbar.com/ Template.cfm?Section=texas_bar_journal1&Template= /ContentManagement/ContentDisplay.cfm&ContentID=6519; Internet; accessed 16 November 2007. Also note that Mexico has the highest rates of deforestization in the hemisphere (averaging 631,000 hectares annually) with poverty the number one culprit as farmers increase crop size to off-set price declines brought by NAFTA. Vaughan.

[21] Vaughan. NAFTA sparked explosive growth in vegetable exports (up 80%) and fruit (up 90%). A fresh (raw) tomato is roughly 93% water. Considering the tons of Mexican tomatoes exported to the United States each year, the water content of those tomatoes has been averaging 162,000,000 gallons of water per year since the beginning of NAFTA (roughly 2.2 billion gallons in the last 14 years). This is essentially a virtual water transfer from a water-scarce country to a water-rich country.

[22] Bernstein. 151. Sufficient research exists to support the conclusion that as consumer income increases consumers will shift towards higher meat content diets. This is precisely what is occurring in Mexico. Mexico's import of United States beef is up 200%, poultry imports have tripled, and pork imports quintupled with NAFTA. See Emad McKay, "World Bank Lauds North American Deal's Impact on Mexico," 17 December 2003; available from http://ipsnews.net/ interna.asp?idnews=21623; Internet; accessed 02 April 2007.

All of the changes related to consumer preference in Mexico place extra stress on the Mexican water supply. Beef imports from the United States have increased, but so has domestic production in Mexico. It takes 15,000 liters of water to make one kilogram of beef. Center for Strategic and International Studies with Sandia National Laboratories, "Global Water Futures," (Washington DC: Center for Strategic and International Studies, 30 September 2005), available from http://www.csis.org/ index.php?option=com_csis_pubs&task=view&id=3491; Internet; accessed 11 December 2007, 41.

Milk production in Mexico has jumped from 5B liters in 1989 to 10B liters in 2003. Dairy production is another high water content industry requiring more than 700 gallons per day per cow. Dairy cows also drive additional Alfalfa production in Mexico for feed. Alfalfa uses 85% more water than previous crops like sorghum. See "Agricultural Production Trends & The Future of the Trans-boundary Rio Grande/Rio Bravo Basin", Conference Proceedings, September 2004, Woodrow Wilson International Center for Scholars, Mexico Institute, available from http://www.wilsoncenter.org/topics/pubs/ final%20ag%20conference%20proceedings.pdf; Internet; accessed 3 May 2007. 4.

[23] Stephen P. Mumme and Ismael Aguilar Barajas "Managing Border Water to the year 2020: The Challenge of Sustainable Development," in The U.S.-Mexican border environment: Bi-national Water Management Planning. ed. Suzanne Michel. (San Diego: Southwest Consortium for Environmental Research and Policy, 2002), available from http://scerp.org/pubs/mono8.htm; Internet; accessed 3 April 2007. 63.

[24] Mumme, 63-67. And D. Rick van Schoik "Opportunities, Costs, Benefits, and Unintended Consequences: Secure and Sustainable Water by 2020". In The U.S.-Mexican border environment: Bi-national Water Management Planning, ed. Suzanne Michel, available from http://scerp.org/pubs/mono8.htm; Internet; accessed 03 April 2007. 1.

[25] Dan Smith and Janani Vivekananda, "A Climate of Conflict: The links between climate change, peace and war," International Alert, November 2007, available from http:// www.international-alert.org/publications/322.php; Internet; accessed 3 April 2007. 17.

[26] Ibid.13, 17, 21-22.

[27] Bush, 37. Robert Ellsworth, Goodpaster Andrew and Rita Hauser, "America's National Interests: A Report from the Commission on America's National Interests, July 2000." (Cambridge: Belfer Center for Science and International Affairs, July 2000). 1-21.

[28] Ellsworth, 7-8.

[29] Aaron T. Wolfe, "Long term View of Water & Security," (Berlin: German Advisory Council on Global Change, 2006). Available from http://www.wbgu.de/ wbgu_jg2007_ex08.pdf; Internet; accessed 27 January 2008; "The Joint Operational Environment: The World through 2030 and Beyond," U.S. Joint Forces Command. (Washington DC: Department of Defense, September 2006), 15, 17, 24-26, 30;

Also see the 2007 report to Congress under the Senator Paul Simon "Water for the Poor Act 2005" where this point is reinforced. Department of State, "Senator Paul Simon Water for the Poor Act 2005: Report to Congress 2007," (Washington DC: Department of State, June 2007), available from http://www.state.gov/g/oes/water/; Internet; accessed 03 April 2007. 10-15.

[30] Ibid. The United States objectives under the act are: improve water security and cooperation on shared waters; improve water management and productivity; and increase access to safe water and sanitation in order to improve public health. All of these objectives tie closely with the water issues currently facing Mexico.

[31] Butts, 65-83. Prior to the treaty, Mexico might argue a right of first use to the Rio Grande based upon early 17th century use of those waters. See Donald C. Jackson, "Water Policy in the American West," available from http://encarta.msn.com/ encyclopedia_761589807/ water_policy_in_the_american_west.html; Internet; accessed 08 December 2007.

The "Harmon Doctrine" was named after Judson Harmon, who served as United States Attorney General from 1895 to 1897. Harmon espoused a strict interpretation over water rights within international rivers. His territorial sovereignty argument concluded that the United States had no obligations to Canada or Mexico. Available from http://legal-dictionary.thefreedictionary.com/Judson+Harmon; Internet; accessed 17 April 2008.

[32] This unilateral action and the American ability to do things simply "because we could" is perhaps best explained by Fernando Medina Robles in his detailed history of water in the American Southwest. Fernando A. Medina Robles, "The Colorado River and the All American Canal: The Historical and Cultural Perspective of Water in the U. S. Southwest," published in The U.S.-Mexican border environment: Bi-national Water Management Planning. ed. Suzanne Michel. (San Diego: Southwest Consortium for Environmental Research and Policy, 2002), available from http://scerp.org/pubs/ mono8.htm; internet; accessed 03 April 2007.108.

Notice should be taken that the first treaty with Mexico, in 1906, took place only after the United States had approved the National Reclamation Act of 1902. The act authorized extensive irrigation projects throughout the western states. In particular, the authorization of the Rio Grande project, and the approval to construct the Elephant Butt Dam (completed in 1916) probably convinced Mexico to pursue treaty negotiations before the projects were completed. Historical information can be found on the Bureau of Reclamation website available from http://www.usbr.gov/history/; Internet; accessed on 28 April 2008.

[33] Robles. Mexico had little voice in establishing the parameters of the 1944 treaty. A significant amount of internal American collaboration had taken place which, for all intents and purposes, excluded and ignored any claim that Mexico might have had to Colorado or Rio Grande waters under America's recognized "prior appropriation" laws.

[34] The proper name for the treaty is "Utilization of Waters of the Colorado and Tijuana River and of the Rio Grande." The treaty specifies waters to be granted to the United States from the northward flowing Rio Conchos and related tributaries from Mexico. The treaty provided specific water quantities, locations and measurement standards. The International Boundary & Water Commission; available from http://www.ibwc.state.gov/ Treaties_Minutes/treaties.html; Internet; accessed 3 October 2007

[35] A fourth consideration might be the issue of water quality for the water flowing south into Mexico and making up the United States contributions to the treaty. However, water quality was added to the treaty when salinity started to become a problem in the Colorado River. It took eleven years and Mexican threats of going to the International Court of Justice before the United States agreed to adjust the treaty. Julie Ferguson, "Colorado River Dispute." Available from http://www.american.edu/TED/colorado.html; Internet; accessed 19 October 2007.

[36] Barnard R. Thompson, "Mexico claims right to California's water," MEXIDATA.INFO, 11 July 2005, available from http://mexidata.info/index.html; Internet; accessed 13 September 2007.

[37] Tensions rose between the United States and Mexico as a drought that began in the early 1990's and caused Mexico to fall behind in contributing treaty waters into the Rio Grande. By 2004, the water debt reached more than 1.3M acre feet. Texas farmers wanted to sue Mexico under provisions in NAFTA to force the repayment of the water. "Report Delves into Details of US Mexico Water Treaty," U.S. Water News Online, March 2005, available from http://www.uswaternews.com/archives/arcglobal/ 4repodelv11.html; Internet; accessed 22 December 2007.

A similar situation was brewing on the Mexican side of the border. A group of Mexican farmers sought legal action to stop Mexico from repaying the water debt. Travis Philips, "Mexico's Water Debt: Behind the U.S.-Mexico Water Treaty Dispute," Texas House of Representatives (Austin: House Research Organization), available from http://www.hro.house.state.tx.us/interim/int77-7.pdf; Internet; accessed 02 December 2007.

[38] "Mexico- U.S. reach agreement on water debt," U.S. Water News Online, March 2005, available from http://www.uswaternews.com/archives/arcglobal/ 5mexiu.s.3.html; Internet; accessed 28 September 2007.

[39] Mexico has been complaining about water issues, under one treaty or another, for over 100 years. Charles D. Turner, "Water Issues Along the Rio Grande Elephant Butt Reservoir: A Water Quality and Quantity Assessment," In The U.S.-Mexican Border Environment: Water Issues Along the U.S.-Mexican Border, ed. Paul Westerhoff (San Diego: Southwest Consortium for Environmental Research and Policy, 2003), 1. Available from http://scerp.org/pubs/m2c2.pdf; Internet; accessed 13 September 2007.

[40] It is worth noting that the United States also flexes its water muscles with Canada. As recently as 2004, the State of Montana complained that Canada had been taking more than their allowed share of water allocated under a 1921 treaty. See "Canada Takes Too Much Water," April, 2004, U.S. Water News Online, available from http://www.uswaternews.com/ archives/arcglobal/4studcana4.html; Internet; accessed 31 October 2007.

[41] Butts, 65-83. State power is enhanced and maintained when there is an economic advantage over other states. History of American agricultural strength is available from http://usinfo.state.gov/products/pubs/oecon/chap8.htm; Internet; accessed 01 March 2008.

[42] Ibid. Water provides the means to accumulate a food surplus. This translates into both political and economic power. According to Leif Roderick Ronsenberger, food and our ability to produce it has "…become legitimate strategic considerations." Leif Roderick Ronsenberger, "The Strategic Importance of the World Food Supply," Parameters, (Spring 1997), 84-105.

[43] Approximately 24% of the Mexican population lives with food poverty. Pan-American Health Organization, "Health in Mexico." Available from http://www.paho.org/ hia/ archivosvol2/paisesing/Mexico%20English.pdf; Internet; accessed 28 March 2008. 467.

[44] Gleick, 158-159, 277, 304. The world-wide estimate is that water as a business sector is a $400B per year industry. This figure includes several billion dollars in bottled water sales where, ironically, Mexico is the second largest consumer of bottled water in the world behind the United States.

[45] Over the last 30 years, Mexico has become a significant export market for American agricultural products. Mexico imports large amounts of American soybeans, corn and wheat. See Carol Whitten, "Processed Agricultural Exports Led Gains in U.S. Agricultural Exports between 1976 and 2002," Outlook, (Washington D.C.: United States Department of Agriculture, February 2004), 9-12. Mexican exports to the United States include three water intense crops that are increasing in the Mexican Rio Grande area along with increases in the dairy industry. Wilson, 21. In general water intensive crops exported from Mexico are negatively impacting the overall water availability within Mexico. Water availability is further reduced since Mexican irrigation uses twice the water as would be allotted in other areas (for example, Texas). Philips.

[46] "Water Drives the US-Mexico border Economy," U.S. Water News On-line, January 2001. Available from http://www.uswaternews.com/archives/arcsupply/ 1watdri1.html; Internet; accessed 03 January 2008.

[47] Nitze, 148.

[48] Note that NAFTA increased Foreign Direct Investment (FDI) confidence in Mexico's northern manufacturing plants and moved Mexico up the investment ladder to fourth place in the world. See the 2005 FDI Confidence Report published by consulting firm A.T. Kearney, Inc. for details. A.T. Kearney, FDI Confidence Index; Global Business Policy Council 2005, (Alexandria, A.T. Kearney),16.

[49] Combs. The Texas border region, which includes 41 counties, is highly dependent on agricultural employment. This area has the highest poverty rate in the United States (27%), the highest unemployment rate (7.5%), one of the areas with the lowest number of high school

graduates (62.7%) and college graduates (10.3%). The Texas agricultural economy is second only to California. See Blair Fannin, "Economic impact of Texas agriculture hits record $100 billion in 2007," 17 January 2008, available from http://southwestfarmpress.com/mag/ farming_economic_impact_texas/; Internet; accessed 03 April 2008.

[50] Schubert, 3,113.

[51] McCool. 383.

[52] Mark P. Sullivan, ed. Latin America and the Caribbean: Issues for the 110th Congress, (Washington, DC: Congressional Research Service, June 2007). 3.

[53] Smith,13.

[54] Ibid,17. Also see Max G. Manwaring's follow-on work to his 2005 writings on criminal gangs as a threat to sovereignty. Max G. Manwaring, "A Contemporary Challenge to State Sovereignty: Gangs and Other Illicit Transnational Criminal Organizations (TCOs) in Central America, El Salvador, Mexico, Jamaica, and Brazil," Available from http://www.strategicstudiesinstitute.army.mil/pubs/ display.cfm?pubID=837; Internet; accessed 02 February 2008.

[55] Ibid. 21-22. There is little evidence to indicate that Mexico is taking adequate steps to deal with the possible impacts of climate change. Fernando Gonzalez and Victor Magana, "Working Together to Respond to Climate Change," available from http://www.oecd.org/document/54/0,3343,en_2649_34361_36279350_1_1_1_1,00.html Internet; accessed 02 May 2008, 4-5.

[56] Center for Strategic and International Studies with Sandia National Laboratories, "Global Water Futures," (Washington D. C.: Center for Strategic and International Studies, 30 September 2005), available from http://www.csis.org/ index.php?option=com_csis_pubs& task=view&id=3491; Internet; accessed 11 December 2007, 103.

[57] Wolfe, 4-6.

[58] Schubert, 84. Also see Organization for Economic Development and Co-operation, "Water & Violent Conflict," available from http://www.oecd.org/dataoecd/ 26/5/35785565.pdf; internet; accessed 25 October 2007. 6.

[59] Wolfe, 13. Water conflicts between the states are not new. In 1934 the State of Arizona commissioned a Navy, consisting of one ferry boat, and its state militia to run upstream and stop a diversion on the Colorado River. Water, as a source of conflict, is still present in the United States seventy-four years later. Tensions are on the rise in the drought stricken southeast where, at the beginning of the year, approximately 74% of a six-state area was in "exceptional drought". Among the six states affected, Florida, Georgia and Alabama have been at war for years over access to water sources. Larry Copeland, "Drought Eases; Water Wars Persist," USA Today, 18 March 2008, sec A, p. 3.

Also note that Mexican citizens have predicted that there will be conflict over water rights in their own country. See that prediction in "What the World Should Know about Mexico's Future

Issues and Mexican Experts Views on the 15 Global Challenges," available from http://www.acunu.org/millennium/mppc-0705/Mexico_0705.pdf Internet; accessed 31 March 2007.

[60] This initial impact from NAFTA was a particularly devastating in that Mexico had more than 25% of its workforce engaged in labor intensive agricultural production at the time NAFTA was signed. A large percentage of that workforce was engaged in growing Maize, one of the staple food crops in Mexico. With prices depressed by 70%, approximately 1.5M Mexican farmers left their fields. Research begun shortly after NAFTA was enacted, indicated that 2.8M workers from Mexico entered the United States between 1986 and 1995. It is unclear how many more have joined that first wave. James R. Markuson and Stephen Zahniser, "Liberalizations and Incentives for Labor Migration Theory with Applications to NAFTA." National Bureau of Economic Research, (October, 1997). 2. Also see Daniel P. Erikson, "Central America's Free Trade Gamble," World Policy Journal, Vol. 21 (Winter 2004/2005).

[61] CBS News, "Senate OK's $286 Billion Farm Bill," Washington D. C.: 15 October 2007, available from http://www.cbsnews.com/stories/2007/12/14/national/main3619817.shtml?source=RSSattr=Business_3619817; Internet, accessed 22 January 2008.

[62] At current extraction rates, Mexico has less than 10 years of proven oil reserves remaining. Available from http://www.eia.doe.gov/emeu/cabs/Mexico/Oil.html; Internet; accessed 18 April 2008. Approximately 70% of Mexico's revenue comes from the petroleum industry. Available from http://www.mexiconline.com/mexico-summary.htm; Internet; accessed 18 February 2008.

[63] FDI flows into Mexico increased rapidly after NAFTA. Between 1993 and 2001, FDI increased more than 600%. During the same period FDI to China only increased by 161%. In the next four years Mexico's FDI dropped off sharply while China's increased by almost 300%. Organization for Economic Co-Operation and Development, "Trends and Recent Developments in Foreign Direct Investment: 2007," available from www.oecd.org/dataoecd/62/43/38818788.pdf; Internet; accessed 18 February 2008. 44. Of significant importance is the FDI related to Research & Development (R&D) investments in Mexico as this denotes future growth potential. Note that China received $15.6B in R&D investment from 1996-2002 while Mexico only received $2.7B. For detailed description of FDI flow to both Mexico and China see consulting firm A.T. Kearney's annual FDI reports. Kearney,16.

[64] Gordon H. Hanson and Raymond Robertson, "China & the Recent Evolution of Mexico Manufacturing Exports," June 2006. Available from http://irpshome.ucsd.edu/faculty/gohanson/IDBChinaMexico.PDF; Internet; accessed 12 March 2008. 20.

[65] A.T. Kearney, FDI Confidence Index; Global Business Policy Council 2001 (Alexandria: A.T. Kearney), 2. As compared to earlier information provided in A.T. Kearney, FDI Confidence Index; Global Business Policy Council 2007, (Alexandria: A.T. Kearney), 2.

[66] Woodrow Wilson International Center for Scholars, "Agricultural Production Trends & The Future of the Trans-boundary Rio Grande/Rio Bravo Basin," Conference Proceedings, September 2004, Woodrow Wilson International Center for Scholars, Mexico Institute. Available from http://www.wilsoncenter.org/topics/pubs/ final%20ag%20conference%20proceedings.pdf Internet; accessed 3 April 2007.

[67] Matthew R. Cleary, "Explaining the Left's Resurgence," Journal of Democracy. Vol. 17, (October 2006). 35-49.

[68] Schubert, 86, 116. Migration is the oldest form of people coping with climate change and water scarcity. We could see this [again] in Mexico if more farms collapse.

[69] Wolfe, 14.

[70] Ibid. Some of the northward migration might have been mitigated had FDI been more successful in developing the southern portion of Mexico where water is less of an issue. Gordon H. Hanson, "What Has Happened to Wages in Mexico Since NAFTA? Implications for Hemispheric Free Trade," National Bureau of Economic Research, (March 2003). 28.

[71] McCool, 383. Markuson, 2. Erikson.

[72] Outside impacts that influence water tensions include trans-national crime, immigration, and drugs. Leif Ohlsson, "Livelihood Conflicts: Linking poverty and environment as causes of conflict," available from http://www.staff.ncl.ac.uk/ david.harvey/AEF806/ OhlssonLivelihoods.pdf; Internet; accessed 18 April 2008.

[73] Sullivan (2007), 310. Sam Logan "Organized Crime, Mexico's Top Threat." 26 April 2006. Available from http://www.isn.ethz.ch/news/sw/details.cfm?id=15630; Internet; accessed 3 April 2007. Also note that Max G. Manwaring has detailed how the spread of organized crime, to include street gangs, is capable of putting a country into a downward spiral of social, political, and economic collapse. Max G. Manwaring, "Street Gangs: The New Urban Insurgency," (Carlisle Barracks: U.S. Army War College, March 2005), 20.

Mexico is using the military to fight the drug cartels and deployed 24,000 soldiers towards the effort. "Mexico Cracks Down on Tijuana drug Crime," Available from http://www.dpna.org/drugarticles/01_tiajuana_drug_crime.htm; Internet; accessed 17 April 2007.

The War on Drugs has not received as much notice as the War on Terror in recent years, but this campaign is still ongoing and costing the American taxpayers dearly. William M. LeoGrande, "From the Red Menace to Radical Populism: U.S. Insecurity in Latin America," World Policy Journal, Vol. 22, (Winter 2005/2006): 28; Up to the minute estimates on the cost of the War on Drugs can be found on the "Drug War Clock." Available from http://www.drugsense.org/wodclock.htm; Internet; accessed 11 April 2007.

[74] Sullivan.19-21. Also Mark P. Sullivan, ed. "Latin America and the Caribbean: Issues for the 109th Congress," (Washington, DC: Congressional Research Service, 26 May 2005). 30.

[75] Some sources estimate that the organized crime rings can exercise control over as much as 40% of Mexico. Sergio Aguayo Quezada. "Mexico: Living with Drugs and Organized Crime," 19 March 2007. Available from http://www.mexidata.info/ id1300.html; Internet; accessed 07 April 2007; It is also noteworthy that the drug cartels have helped spread the use of drugs throughout Mexico, adding further social instability to an already fragile country. Sam Logan and Kate Kairies "U.S. Drug Habit Migrates to Mexico," 02 March 2007. Available from http://www.worldpress.org/Americas/2699.cfm; Internet; accessed 07 April 2007.

[76] Large banners from highway overpasses and handbills affixed to telephone poles offered housing, cars, family healthcare and a good salary. Chris Hawley, "Drug Cartels in Mexico put up 'Help Wanted' ads," USA Today, 25 April 08, sec. A, p. 8.

[77] Manwaring (2007), 9-11, 24-25, 34-35.

[78] Contamination levels along the border areas and in the Rio Grande River after NAFTA has been extensively researched and documented. Recent testing indicates extreme fecal contamination is exposing border residents to higher risks of Hepatitis A. The Texas Department of Health reports that since NAFTA went into effect, Hepatitis A rates for Cameron County increased 400%, Maverick County rates increased by 122% while Webb County increased by 78%. "NAFTA at 5." Global Trade Watch, available from http://www.corpwatch.org/article.php?id=1528; Internet; accessed 28 March 2008.

Mexican sanitation and sewage treatment infrastructure has been overwhelmed by current demand. As reported in an interview with Mayor Gustavo Elizondo, Ciudad Juarez, Chihuahua, Mexico. Roger Bybee and Carolyn Winter, "Immigration Flood Unleashed by NAFTA's Disastrous Impact on Mexican Economy," 25 April 2006, available from http://www.commondreams.org/views06/0425-30.htm; Internet; accessed 02 April 2007. It is also worth noting that reducing infectious diseases is one of the objectives listed in the 2006 National Security Strategy. Bush, 31.

[79] Wolfe, 15. United Nations Educational, Scientific and Cultural Organization. 493.

[80] Smith,15.

[81] Hezbollah is perhaps a good example of how a designated terrorist organization has worked its way into becoming a powerful shadow government in parts of Lebanon. See Daniel Byman, "Should Hezbollah Be Next?" Foreign Affairs, (November/December 2003).

[82] Erik R. Peterson, "Below the Surface: U.S. International Water Policy," 21 June 2007, (Washington D.C.), available from http://www.csis.org/component/option,com_csis_progj/task,view/id,969/; Internet; accessed 28 July 2007. Mexico has taken steps to ensure integration of priorities, plans and projects related to water and other natural resources. Sustainable development has been included in the Mexican Constitution and provides a legal driver for integrating plans from across the various government agencies. Darren Swanson, Mexico Case Study: Analysis of National Strategies for Sustainable Development, (Ottawa, June 2004), 6.

[83] Note that there is little to no mention of water in any of the strategic plans at the cabinet level. The one agency, from amongst all levels of government, that appears to have a long range plan that addresses water is the Environmental Protection Agency (EPA). Within the EPA they have established an "Office of Water" and a National Water Program. Information on the water program and progress reports can be found on the EPA website; available from www.eps.gov/water/waterplan; Internet; accessed 11 November 2007. Yet at the state level the importance of water is clearly seen in cases where strategic plans do exist. Texas, for instance, is currently operating under a strategic water plan that considers requirements out to 2060. Available from http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/2007StateWaterPlan.htm; Internet; accessed 19 December 2007.

[84] Texas farmers wanted to sue Mexico under provisions in NAFTA to force the repayment of the water. “Report Delves into Details of US Mexico Water Treaty,” U.S. Water News Online March 2005, available from http://www.uswaternews.com/archives/ arcglobal/4repodelv11.html; Internet; accessed 22 December 2007. A similar situation was brewing on the Mexican side of the border. A group of Mexican farmers sought legal action to stop Mexico from repaying the water debt to the United States. Philips.

[85] Mumme, 64. Treaty stipulates five-ear rolling water accounting cycles. This does not match the hydrologic cycle where severe drought seems to happen in 10 year cycles. It also allows for the accounting cycles. For instance, if Mexico received emergency water allocations in 1991 for an “extraordinary” drought, they would be obligated to repay the water no later than the end of the next five year period, 31 December 1999. If the drought abated in 1993, and water in Mexico returned to normal, Mexico could theoretically begin repayment immediately. However, as example of a Machiavellian calculation, where Mexican state interest/gain supersedes other considerations, Mexico can delay repayment until 1999 and thereby maximize Mexican benefit by retaining maximum water flows and storage for a longer period of time.

[86] “Behind the US-Mexico Water Treaty Dispute,” U.S. Water News Online 30 April 2002; Mexico ultimately made good on a schedule for paying the debt. “Mexico's Rio Grande Water Debt Repaid,” U.S. Water News Online October 2005. Available from http://www.uswaternews.com/archives/arcglobal/5mexiriox10.html; Internet; accessed 29 December 2007; Tensions with Texas farmers were at an all time high during this drought. It is estimated that Mexico’s failure to repay the water debt in a timely manner cost the State of Texas $5B in lost farm revenue. D.A. Wilhite and O. Vanyarkho “Drought: Pervasive Impacts of a Creeping Phenomenon,” Drought: A Global Assessment, ed. D.A. Wilhite, (London, Routledge Press, 2000), 245-55.

[87] Nitze, 146-147. Mexico has long had a set of priorities for water use with drinking water being the highest priority. Current water disputes in the United States are pitting one state against another in an ongoing battle for access to water supplies. Copeland.

[88] Over a 10-year period (1997 – 2006) Mexico received $701M in Outside Development Assistance (ODA) for water related projects. This was less than 0.20% of the total world outlay for water development. Nigeria, on the other hand, received close to 5% of the world donations. It is perhaps troubling to note that the United States is one of the smallest donors to the ODA program, that donations decreased by 18% from 2005 to 2006, and that United States ODA donations to Mexico were almost non-existent. Complete details of the ODA donations and recipient countries can be found on the Organization for Economic Development and Co-operation website. Available from http://www.oecd.org/dataoecd/50/17/5037721.htm; Internet; accessed 1 May 08

[89] Nitze. 166-168.

[90] Sullivan (2007), 6. Funding to Mexico and Central America was less than $300M in 2006 and is expected to drop by up to 14% in the 2008 budget. The United States EPA estimates that it will require more than $8B in funding to fix the border area water-sanitation issues. This and other information related to the United States-Mexico border region can be found on the EPA home page. Available from http://www.epa.gov/ owm/mab/mexican/index.htm; Internet; accessed 17 November 2007

[91] A best practice with regards to good water governance is to conduct it at the local levels. Center for Strategic and International Studies with Sandia National Laboratories, "Global Water Futures," (Washington D. C.: Center for Strategic and International Studies, 30 September 2005), 46. Available from http://www.csis.org/ index.php?option= com_csis_pubs& task=view&id=3491; Internet; accessed 11 December 2007. Also see similar references in Organization for Economic Co-Operation and Development, "Water and Violent Conflict," OECD Issues Brief, Development Assistance Committee, 2005. Available from http://www.oecd.org/ dataoecd/26/5/35785565.pdf; Internet; accessed 3 April 2007. 4-7.

[92] Quezada. Recently Mexican cartel members engaged in a platoon level battle, including automatic weapons, which left 15 gang members dead. Lizabeth Diaz, "15 Killed in Mexico drug battle near U.S.," Reuters. 26 April 2008.

[93] Nitze, 164.

[94] Mumme, 166-167. Global Water Futures, 63.

[95] Bush, 1, 7, 25-28, 31-33.

[96] Hans J. Morgenthau, "The Nature and Use of Power and Its Influence Upon State Goals and Strategies." Naval War College Review, February 1964, Vol. XVI, No. 6, 4.