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Water scarcity poses a significant security concern in China. Issues with availability and pollution compound the problem, especially in regards to industry and agriculture. While the Chinese government has tried several initiatives to correct the water scarcity issue, such as the Three Gorges Dam, the South-North Water Transfer Project, and the Chinese Water Laws, the lack of agreements with neighboring nations regarding water use has the potential to cause interstate conflict, especially with India and Pakistan.

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TITLE:

LIQUID SECURITY:
SECURITY IMPLICATIONS OF WATER SCARCITY IN CHINA

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Executive Summary

Title: Liquid Security: Security Implications of Water Scarcity in China

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Thesis: Water scarcity and its impacts on interstate security have the potential to be a significant source of tension and possibly conflict in China and its neighboring countries in the next 50 years if this issue is not taken seriously.

Discussion: Water scarcity poses a significant security concern in China. Issues with availability and pollution compound the problem, especially in regards to industry and agriculture. While the Chinese government has tried several initiatives to correct the water scarcity issue, such as the Three Gorges Dam, the South-North Water Transfer Project, and the Chinese Water Laws, the lack of agreements with neighboring nations regarding water use has the potential to cause interstate conflict, especially with India and Pakistan.

Conclusion: Political pressures keep adequate conservation efforts from taking hold and the demand for water throughout China continues to rise. The economic and political issues that surround the water scarcity issue have significant impacts on security within China and across the globe. If the Chinese government continues to fail in their handling of the water scarcity issue, the effects could, at their worst, lead to national collapse and destabilization for neighboring countries. Ignoring the water crisis in China can be catastrophic.

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Introduction

Security is a topic in the 21st century that crosses all international boundaries. Media focus much of their attention, with regard to security, on dealing with terrorism and insurgencies. However, there are many other security threats that should garner an equivalent amount of attention from the international community. One of these topics is the depletion of water across the world. Water scarcity and its impacts on interstate security have the potential to be a significant source of tension and possibly conflict in the next 50 years if countries do not take this issue seriously. Teamwork and regulations within the international community are necessary in order to minimize and potentially eliminate this threat.

Water is the foundation for life. Whether used for personal consumption, agriculture, industry or energy production, water is a necessary resource for all human beings. Water scarcity is a global concern and has far reaching consequences that range from inferior individual way of life to national and international security problems. China has long struggled with water scarcity due to its large population and difficulties with climate change and pollution. Water scarcity continues to be China's most pressing challenge of the 21st century. China

has made attempts to remedy the crisis. However, they must not only examine creative initiatives to mitigate the ramifications of water security in their dealings with neighboring nations, but should also utilize their government to make lasting changes that will assist in the conservation of the water resources they still possess.

The causes of the current water situation in China are relatively easy to track. From increased consumption to pollution, identifying the issue is not the problem. Just by looking at statistics about the amount of water that China possesses, it would be easy to assume that water scarcity is not even an issue within this country. China is ranked sixth in the world for total water resources, with 76 percent of the water supply being surface water and 24 percent being ground water.[1]

Background

The issue when it comes to water supply in China is not total supply. Rather, the issue is availability for the population. Due to the large population, water availability per capita in China averages 86 liters per day per person. By contrast, the United States averages approximately 575 liters per day per person.[2] This scarcity is more pronounced in the northern, rural areas of China. Agriculture is the predominant occupation of rural China.

While the population is more dispersed in the rural areas, water use greatly exceeds sustainable quantities and the demands just continue to grow.[3]

Compounding this problem of water scarcity is the fact that as many as 90% of Chinese cities are currently dealing with water pollution.[4] Chinese national standards estimate that 53% of major waterways, half of all lakes, and more than one-third of all ground water is unfit for human consumption.[5] Water quality has significantly decreased since the 1960s due to discharge of polluted water through seepage, predominantly as a result of agricultural practices.[6]

The economic impacts of water scarcity in China affect more than just China, but they are difficult to estimate. By the numbers, the World Bank determined that the water crisis in China, in 2007, cost China approximately 2.3 percent of its GDP, or approximately $62 billion dollars. The split of this percentage was 1.3 percent dealing with water scarcity and 1 percent dealing with the ramifications of water pollution.[7] In comparison, China spent 2.1 percent of its GDP on military expenditures in 2010.[8] China sees the significance in the water crisis since it is spending more on the water crisis than it is spending on national defense.

Water use within agriculture is incredibly inefficient in China and is also China's biggest consumer of water.[9] This inefficiency comes from the fact that only 45% of water intended for agriculture is used on crops. And while most developed countries recycle 75-85% of their water used in agriculture, China only recycles 40% of their agricultural water.[10] The Chinese government doesn't want incomes of those in rural areas to decrease. Therefore, the cost of water in these agricultural areas is relatively low. Since many of the country's farmers are located in the dry, arid north, irrigation is a necessary evil. As rivers continue to dry up, farmers are relying on dwindling ground water reserves to supplement their irrigation efforts.[11]

Industry does not do any better than agriculture when it comes to water. Water use in industry has increased on average 6% per year since 1990, and it is not slowing. China is looking into ways to increase its economy using renewable energy, with coal production taking priority. However, coal mining is very water intensive and takes approximately one-fifth of all water in China each year.[12] Considering the amount of water that surrounds China, desalination appears as an attractive solution to the water

scarcity problem. However, desalination takes a large amount of energy, which in turn requires water.[13]

The government of China also seems oblivious to the demand issue when it comes to water. Water in Chinese cities costs about a tenth of the price of the water in European cities. Nonetheless, there is political pressure to keep the price of water in China consistent, regardless of the fact that pricing reform would be an excellent and effective policy reform.[14] China will not increase the price. This mispricing contributes to overuse of water in agriculture and industry. The government is missing a huge opportunity to raise the cost of water for factories and farms as an overuse deterrent. Instead, the government is spending exorbitant amounts of money on other options.[15]

The political implications of not raising prices on water in China are troubling. Continued water scarcity within China has the capacity to slow economic expansion and weaken political stability. Rising medical concerns from polluted water, to include cancers, will drive up health care costs. There is also growing “internal dissent and conflict over both water allocation and water quality.”[16]

Around Bejing, the water table is dropping approximately five meters every year and wells must be

drilled to a depth of almost a half a mile before reaching the ground water supply. At this rate, groundwater in northern China, according to scientists, will be dry in 30 years with no changes in consumption and pollution rates.[17] There are approximately 200 million people who reside in the regions surrounding the Hai, Huai, and Yellow Rivers and 60 percent of the water these citizens use comes from groundwater.

China's Water Sources

The primary source of water for China is glacial and comes from the Tibetan Plateau. This area covers most of the Tibet Autonomous Region and Qinghai province in China. The Yellow and Yangtze Rivers flow from the Tibetan Plateau. The Tibetan Plateau also serves the water needs of India and Pakistan, specifically the Indus, Ganges, and Brahmaputra River systems.[18]

Since glacial sources of water are the primary source of water for China, the result is that the predominance of water used in China comes from surface sources, specifically 21 different river basins. There are nine major river basins in China: Yangtze, Yellow, Hai-Luan, Huai, Song-Liao, Pearl, Southeast, Southwest, and Northwest.[19] The river that is discussed often when looking at water scarcity and water transfer projects in China is

the Yangtze River, as it divides the humid, southern part of China with the dry, northern part of China.[20]

The Yangtze River originates at the Tibetan Plateau and is 3,900 miles long. This makes it the longest river in China.[21] It serves not only as a major transportation route in China, but also provides a tremendous source of electrical power from the Three Gorges Dam.[22]

The second longest river in China is the Yellow River and it has its own unique set of issues, such as the decreasing water flow due to an increase in water consumption by industry and agriculture.[23] While it also originates at the Tibetan Plateau, the Yellow River is a significant source of disastrous flooding in China. The pollution it has experienced as a result of industrial waste and resource mismanagement is another issue.[24] An understanding of what is taking place with the water scarcity and pollution seems to be widespread within China. However, there seem to be few actions that are taking place to remedy them.

Chinese Water Law

While the facts of the water crisis in China are readily apparent to the Chinese government, the administrative responses to the issue have so far been ineffective. Since the Ministry of Water Resources cannot

issue any binding restrictions to a provincial governor, they are, more often than not, ignored.[25]

This, however, did not stop the creation of the China Water Law in 1988. This attempt by the Chinese government to manage the water resources of the nation administratively was ultimately not successful. The 1988 law outlined the authority, functions, and powers for the Ministry of Water Resources and other entities that deal with water. What the 1988 Water Law intended to accomplish was to provide a framework in order to address conflicts and shortfalls of the current system that managed water resources in the country. It did this by enacting seven new provisions: ownership and protection of rights, creating an institutional framework, planning and implementation, water use management, water quality protection and pollution prevention, a permit system for withdrawals, and a water pricing system.[26]

China's Water Law of 1988 was updated on 29 August 2002 at the 29th Meeting of the Standing Committee of the Ninth National Peoples Congress. The 2002 China Water Law was a significant revision to the 1988 China Water Law. The updated law looks not only to address the current situation and existing problems, but also looked at how to best anticipate future water concerns. While a significant

improvement from the 1988 China Water Law, the updated 2002 version was not the effective piece of legislation China had hoped for in dealing with water issues.[27]

History of Water Scarcity

While the path China has taken to get to this point of water scarcity is complex, it can be traced back to 1949. At that time, "state-owned logging companies cut down the forests at the headwaters of Beijing's rivers. People were encouraged to farm ever denuded hillsides and mountain tops, and to create more farmland by draining wetlands."[28] In addition, rivers were dammed in order to allow for storage of water for irrigation and industry.[29]

The dams were a brainchild of Chairman Mao Zedong after massive flooding in the 1950s and 1960s.[30] This idea, however, was not realized in Zedong's lifetime, as construction began in 1994.[31] Despite the intentions of these initivatives, China's singular focus on "economic growth and agricultural self-sufficency has left little room for consideration of environmental impacts."[32]

The surplus of dams that exist in China pose a problem since they do not comply with a report from the World Commission on Dams from 2000. This report states that

> *"the end of any dam project must be the sustainable improvement of human welfare. This means a significant advance of human development on a basis*

> *that is economically viable, socially equitable, and environmentally sustainable. If a large dam is the best way to achieve this goal it deserves our support. Where other options offer better solutions we should favor them over large dams."*[33]

The Three Gorges Dam is a perfect example of a dam that was constructed solely for industrial and economic growth while not taking into consideration the environmental and human impacts.[34]

Three Gorges Dam

Located on the Yangtze River, the Three Gorges Dam is a project modeled after the Tennessee Valley Authority project in the United States. The intent of the Three Gorges Dam was to minimize the impact of flooding in the Yangtze River Valley.[35] This is a matter of some concern since, over the past 2,000 years, the Yangtze River has suffered from 215 floods, with a flood in 1998 resulting in 4,000 dead, 14 million people left homeless, and $24 billion in economic losses.[36]

The Three Gorges Dam is a 610 foot high wall running 1.3 miles from bank to bank that has the potential to produce the energy of 15 nuclear power plants when fully operational. It also cost approximately $24 billion to complete construction.[37] The reservoir that the dam created is a narrow lake 410 miles long, 3,600 feet wide, and 575 feet deep.[38]

The construction of the Three Gorges Dam also brought landslides, water quality issues, ecological problems, and siltation.[39] Additionally, the government ordered over 1.2 million people from cities and towns along the Yangtze River banks to be displaced due to the construction of the Three Gorges Dam.[40] What was intended as an aid to a problem has ended up causing more issues with water and water scarcity in China.

Water transfer projects also appear as an attractive and effective way to counter water scarcity in China. The extreme differences in climate between northern and southern China mean that water resources are naturally uneven.[41] The differences are incredibly obvious. While northern China possesses 44 percent of the population and maintains 65 percent of total cultivated land, it has less than 13 percent of the total renewable water resources. Southern China, by comparison, maintains 56 percent of the population, 35 percent of the total cultivated land, yet has 87 percent of the total renewable water resources.[42]

The issues in northern China are exacerbated by many factors. First, agriculture in the north is highly dependent on irrigation due to the dry climate. Second, several water intensive industries, such as fossil fuel production, iron mining, paper and pulp mills, and the

chemical industry, in the north result in exploited and polluted rivers. This has resulted in riverbeds drying up and being unable to be replenished due to insufficient rain.[43]

Up to this point, China has focused on long-term, engineering-heavy projects to deal with the water scarcity issue. Not only are these “fixes” incredibly expensive, they also posed significant difficulties with agriculture and the ecological framework of the country, while making the citizens deal with forced migration to make room for these projects.[44]

China plans to invest $650 billion on projects that they hope can remedy, or at least slow the progress of, the water scarcity problem between 2011 and 2020. However, there is no guarantee that will improve the situation at hand since China has spent $112 billion between 2006 and 2010 to no avail.[45] The most well known water transfer project in China is the South-North Water Transfer Project, an engineering project on an incredibly large scale. This project has significant issues with regard to displaced persons and pollution of resources and has not proven itself as actually helping the problem at hand.

South-North Water Transfer Project

South-North Water Transfer (SNWT) Project seeks to balance the uneven distribution of water within China.[46] This initiative links the Yangtze River with the Yellow River, and its intent is to transfer water from the water heavy south to the arid north via three pipelines in the eastern, central, and western parts of the country. Unfortunately, the project has brought extreme hydrologic and environmental consequences such as saltwater encroachment on the East route, extreme resettlement of the population in the Middle route, and would impact small rivers on the West route.[47] It is expected to transfer approximately 45 billion cubic meters of water a year at a cost of approximately $79.4 billion.[48] Despite the cost, the Chinese government views the SNWT as an excellent tool for maintaining internal stability.[49]

Cities and industries reap the greatest benefits from the SNWT Project. "The eastern route will provide water for domestic and industrial water use for Shandong and Jiangsu provinces. The central route is to provide water for more than 20 cities, including Beijing and Tianjin."[50] The individuals who will benefit the least from this project look to be the farmers.

Despite this, the Ministry of Water Resources, Zhu Ruixiang, made the claim that once the SNWT Project is completed,

> *"the present conflicts caused by competitive water users of agricultural, industrial, domestic and ecological shall be alleviated. Water demand of agriculture and ecologic system shall be med and over-exploitation of groundwater shall be controlled."*[51]

While this makes the SNWT Project appear to be the answer to the water scarcity problem, there is no way it can truly solve the water crisis in China because of the pollution issues already in play. There is concern by the government about China of the water quality along the eastern segment of the project. This segment will be focused primarily on existing surface water in the way of canals, riverbeds, and lakes that are already polluted. The concern is that additional run-off from factories and farms, along with the wastewater from new industrial parks along the eastern segment, would pollute the water to such an extent that it would not be fit for use.[52] As a result, the majority of funds for the eastern segment are earmarked towards the construction of pollution control facilities along the route.[53]

The SNWT has several consequences, mostly negative. While the south does have the preponderance of annual precipitation, it is unknown what the impact of

transferring that water out of the area might cause. The imbalance caused may lead to severe environmental issues. Additionally, while the north needs more access to water and that need will only continue to increase, the south will be dealing with climate change and increased consumption as well. This demand can lead, via the SNWT, to scarcity everywhere.[54]

Finally, the environmental damage from the SNWT could be equally detrimental to the overall health of China. The Yangtze River is so polluted that there are over 400 water treatment plants used in the entire SNWT project. Even with this treatment, the water quality in the Yangtze is still considered very poor.[55] Additionally, the different ecosystems of the Yangtze and Yellow Rivers could cause environmental damage that is severe.[56] Since about 40 percent of China's wastewater finds its way to the Yangtze, when water is diverted, there will be less water available to dilute the pollution present in the Yangtze, which will have potentially serious impacts on biodiversity.[57]

Security Concerns

This economic cost of water scarcity translates into security problems in the form of civil unrest. While the Chinese government is forced to make decisions on the water resources in the country, the potential for violent

protests is great and the separation between the “have” and “have nots” will only increase.[58] Rising inter-ethnic tension over the distribution of water is a significant risk factor for environmentally-related conflict.[59] These demonstrations could become a potential threat to CCP party control in China. While not a traditional security threat, water scarcity has the potential, if not handled by the Chinese government appropriately, to become a serious threat to domestic Chinese stability.[60]

While the internal security threats that China could face are significant, the international threats can not be ignored. The biggest impact on the international scale deals with the impacts that the dams and water transfer projects in China have on neighboring nations. For example, dams on several rivers in China have impacts on neighboring countries that share those rivers.[61]

> *“These concerns [water scarcity] significantly increase the risk of heightened political conflict and instability. China already considers water to be a crucial strategic asset. The depletion of its most important source of water will only enflame conflict between itself and many of the region’s inhabitants. Furthermore, water scarcity will bring to the forefront looming concerns and potential conflict over water allocations between China and the governments of neighboring nations, such as India, Bangladesh, Vietnam, Cambodia, Thailand, Laos, and Burma, which also rely heavily on water resources originating in Tibet.”*[62]

Ethnic unrest, mass migration, and declining economic conditions brought on by water scarcity erodes a country's ability to interact in an effective way on the international stage.

The United States has taken note of the seriousness of the situation of water scarcity in China. The U.S. House of Representatives Subcommittee on Europe, Eurasia, and Emerging Threats, of the House Committee on Foreign Affairs met in November 2014 to examine the issue of water sharing conflicts and the threat to international peace. The Honorable Dana Rohrabacher (R/CA) stated during that meeting, "water is a common staple of life, but where it is scarce it is a strategic resource that nations compete to control.[63] The Director of National Intelligence, James Clapper, stated in 2013 that the severity of scarcity involving natural resources is as a national security threat equivalent to global terrorism, cyber warfare, and nuclear proliferation.[64] One of the reasons behind this is that "terrorists, militants, and international crime groups are certain to use declining local food security to gain legitimacy and undermine government authority."[65] As water is essential for food security, the two go hand-in-hand.

Proposed Water Strategy Ideas

"Outside of the box" thinking will be necessary to deal with this issue in China. A sound water strategy is necessary for China. Chinese environmental NGO's and the media are the most effective in this crisis. Their work in

> *"publishing maps of polluting factories, pushing local officials to publish legally-mandated pollution statistics, protesting excessive dam construction, developing building energy efficiency standards, and documenting the public health consequences of pollution"*

can be instrumental in affecting the crisis.[66] However, Chinese government officials worry about the amount of information that is given to the public and the media is advised not to publicize too much about water issues. Environmental activists may even be arrested if seen to be challenging government officials.[67]

Water tariffs are another option. With the inexpensive price of water in China, many believe that if prices were raised or a tariff was imposed, conservation among the citizens of China would increase. Even a change in the way water is priced could impact usage. Farmers pay for water based on area to be irrigated, not amount of water used. However, there are cities and provinces that are more willing to pass up water from transfer projects

and dams than increase the price of water for their citizens.[68]

One option that seems to have positive results, and is incredibly low cost, is rainwater harvesting. Over 21 million Chinese already harvest rainwater and Beijing has over 55 pilot projects that encourage the use of rainwater harvesting. The potential of rainwater that could be utilized annually, as estimated by the Beijing Municipal Water Authority, is 230 million cubic meters of rainwater.[69] According to Che Wu, a professor at the Beijing Institute of Civil Engineering and Architecture, “unlike rainwater harvesting in rural areas, urban rainwater utilization isn’t just important for saving water, it’s also important in abating urban flooding, groundwater depletion, and rainwater runoff pollution, as well as improving urban ecosystems.”[70]

The need for water efficiency in the agricultural practices of China is something else that needs to be addressed. China’s Ministry of Agriculture has introduced a program that would use plastic film and mulch in order to reduce surface evaporation of water. It has also introduced strains of drought-resistant crops and implemented the use of low-flow sprinkler systems.[71]

Interstate conflict, while not a concern now, could be one in the future if water resources in China aren't managed properly. India and Pakistan, specifically, stand to lose the most without better water management practices. The Tibetan Plateau is an untapped water resource for China and serves as the origin of many of China's neighbors rivers, particularly the Indus, Ganges, and Brahmaputra. The Brahmaputra River is essential to the water supply in India and if China were to utilize the Tibetan Plateau, it would lead to a crisis in India.[72]

China is not alone in dealing with water scarcity. India and Pakistan are also struggling with water scarcity. The struggles for water surrounding the Tibetan Plateau could lead to armed conflict between China, India, and Pakistan. This is significant since there is a need for stability in this region due to the growing economic importance of these countries on the world stage.[73]

There is a long history of interstate conflict over water dating back to 2500 BC. While most conflict over water is intrastate, the interstate conflicts impact the regional stability and security impacts are far reaching. "Water can be used as a strategic military tool as well as the cause of serious internal disputes."[74]

China would be well-served to create water sharing agreements with neighboring nations in an effort to mitigate potential interstate conflict. Many of the already completed or planned projects dealing with water in China already impact neighboring nations, such as dam projects along the Mekong, which have impacted Vietnam, Laos, Cambodia and Thailand.[75]

The most serious issue may be China's intention to utilize the Tibetan Plateau and the damming of the Brahmaputra River. This could be the greatest source of interstate conflict with water. Without a water sharing agreement in place, any action from China to take water from the Tibetan Plateau would escalate tensions between China, India, and Pakistan and the situation could become volatile.

Conclusions

All of the above information gives evidence to the incredibly complex, difficult, and potentially disruptive issue of water scarcity in China. While there are many security issues in China, water scarcity trumps all others for many reasons, both internally and externally to China. Water scarcity, in and of itself, will not lead China to war. The political and economic ramifications from water

scarcity, however, have the potential to lead to civil unrest that could impact the international stage.

China has benefited in the past 20 years from strong economic progress and growth, making them a model to follow for other developing countries. The water crisis, however, is a threat to those gains.[76] The economic costs of projects directed at increasing water supplies, infrastructure improvements, and health issues due to water contamination in China reach several billion dollars annually.

It is unknown whether the Chinese government will be able to deal with this water crisis effectively. However, water scarcity will continue to be one of China's most significant challenges for the next 30 years.[77] The concept of "human security" could be the biggest issue when it comes to water scarcity. Freshwater scarcity, when combined with other issues, such as population growth and infrastructure problems, can escalate quickly into a national security issue.[78] "Water security can be the catalyst for large-scale migration and ethnic conflicts, which ultimately, in more dire situations, can result in a decline in effective governance, potentially leading to a 'failed state'."[79] While not the most traditional security issue facing China, water scarcity is a growing security

issue. It is a security issue that, if ignored, will significantly impact China.

China has a severe water crisis on its hands. Political pressures keep adequate conservation efforts from taking hold and the demand for water throughout the country continues to rise. The economic and political issues that surround the water scarcity issue have significant impacts on security within China and across the globe. If the Chinese government continues to fail in their handling of the water scarcity issue, the effects could, at their worst, lead to national collapse and destabilization for neighboring countries. Ignoring the water crisis in China can be catastrophic.

Notes

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