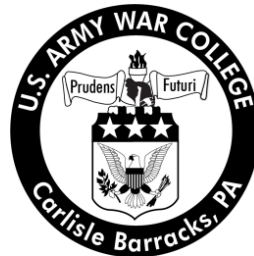


Water: Source of Future Conflict

by

Lieutenant Colonel Robert M. Nugent
Army National Guard



United States Army War College
Class of 2013

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Abstract

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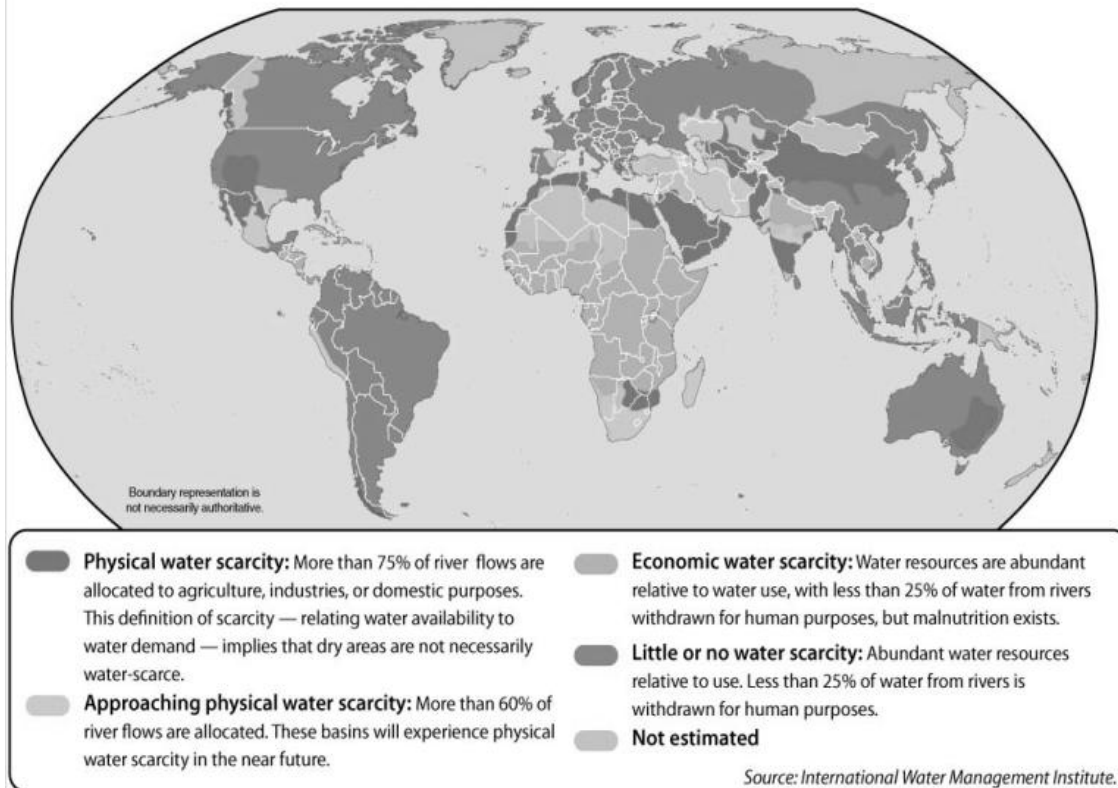
The increased scarcity of freshwater resources will lead to national and international conflicts throughout the world community. As population and consumption rises, the need for freshwater resources will intensify leading to tensions and arguments between neighbors. This paper identifies geographical regions where the limited access to freshwater is likely to lead to growing instability and escalating conflicts. This paper assesses the overall availability of water and demonstrates the way in which its degradation and depletion will cause its supply to shrink. It also analyzes the way in which consumption growth increases competition leading to an unequal social distribution. In response to this problem, the U.S. government must develop and incorporate plans from both political and civilian leaders on the best ways to manage existing water shortages.

Water: Source of Future Conflict

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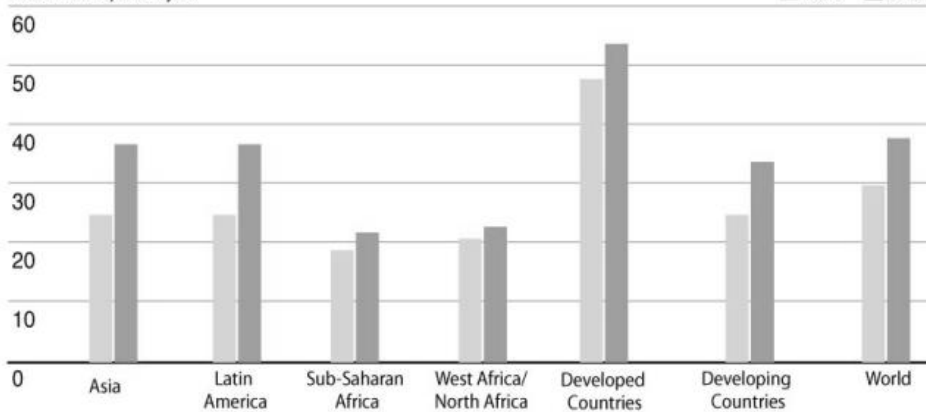
The world population has tripled from 2 billion to 6 billion in the last century.¹ It is expected to rise from the present 6.5 billion to 8.9 billion by 2050, before leveling off.² Water use has more than doubled the rate of the increase in population over the last century.³ Figure 1 shows the numbers of regions that are projected to be short of water by 2025. Depleting water supplies are increasing the risk of internal and cross-border conflicts. As a result, competition between industry, agriculture, and consumers are also increasing. Some of these regions are areas where America's national interests are growing. Areas like Sub-Saharan African countries, Asia and Africa.

Projected Global Water Scarcity, 2025



Per Capita Water Consumption, 1995 and 2025

Cubic meters/person/year



Source: International Food Policy Research Institute, Global Water Outlook to 2025.

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Figure 1. Map of World Water Scarcity⁴

According to the International Food Policy Research Institute, 1.8 to 2.4 billion people will be living in countries or regions with physical water scarcity by 2025.⁵ This means that more than 60% of river flows will be allocated to agriculture, industries, or domestic purposes.⁶ In addition, another two-thirds of the world population could be under conditions of water stress. Water stress is defined as the point where it becomes difficult for communities to obtain reliable sources of fresh water to use. This condition is normally due to the depletion of resources. This situation will be exacerbated as rapidly growing urban areas place heavy pressure on local water resources.⁷

Human beings require a minimum of five gallons of water per day in order to meet their most basic needs.⁸ Water sources are shared by many countries. Approximately 40% of the world's population lives in river and lake basins that span one or more international boundaries.⁹ "At least 214 basins are shared by more than two countries. Thirteen are shared by more than five countries. Almost 50 countries on four continents have three-quarters of their land in international water basin."¹⁰

The need for water, a basic element of human survival, can readily lead to tensions related to rights and use. A major study by the Comprehensive Assessment of Water Management in Agriculture in 2007 reveals that one in three people today face water shortages.¹¹ The study goes on to report that nearly 1.2 billion people, or one-fifth of the world's population, live in areas of physical scarcity. At least 500 million people are approaching this situation. Another 1.6 billion people, or almost one quarter of the world's population, face economic water shortage (where countries lack the necessary infrastructure to take water from rivers and aquifers).¹² The lack of understanding

between neighboring countries and cultures will lead to conflicts as the demand for water increases and the lack of water continues.

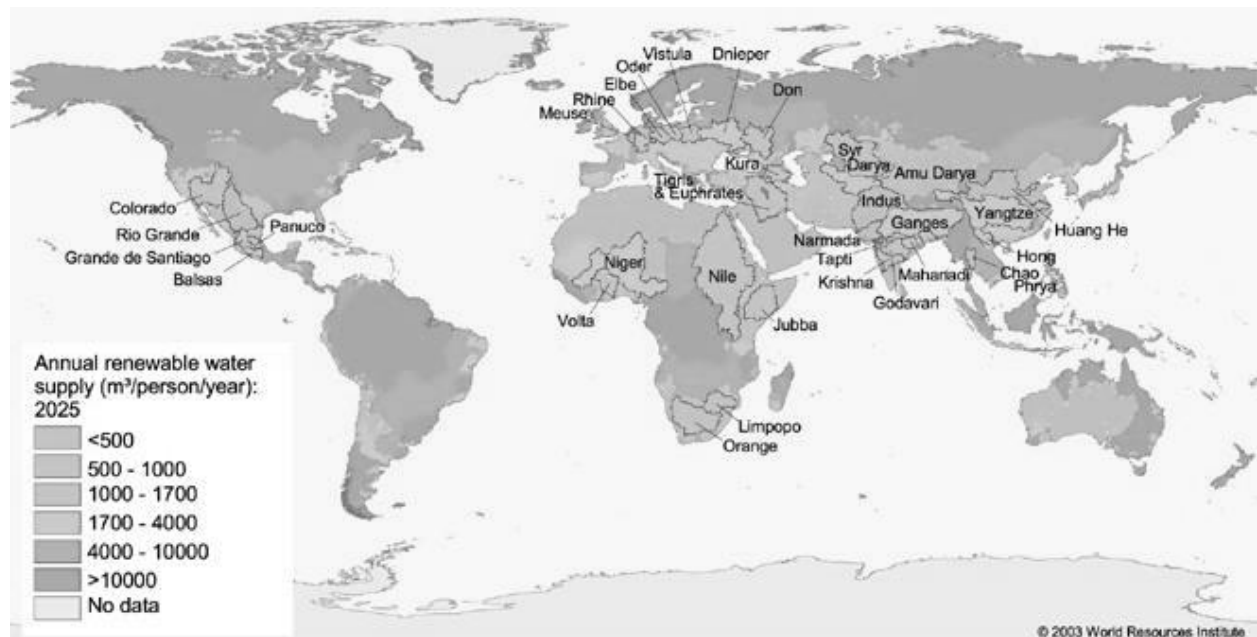


Figure 2. Map of Annual Renewable Water Supply¹³

Figure 2 reflects the conditions of renewable water throughout the world. It shows that there are many individual countries that are in very arid regions that will encounter water shortages in the future. Some of these countries are already considered unstable and any additional internal pressure could undermine the current peace that is being enjoyed. The data shown in Figure 2 indicate water as being one of the largest challenges of the 21st century. The status of worldwide renewable water supports a foreign policy priority that requires the active engagement of the United States. The lack of access to fresh water around the globe increases the risk of famine, instability, state failure, and regional tensions. Water problems will also damage ecosystems, impede developing countries, and hinder the global economy.¹⁴

On March 22, 2012, the National Intelligence Council released an unclassified report called the *Intelligence Community Assessment on Global Water Security*. The report concludes that North Africa, the Middle East, and South Asia will face major challenges coping with water problems. The report also predicts countries that are important to the United States will experience water problems that will: increase the risk of instability and state failure; exacerbate regional tensions; and distract these states from working with the United States on important policy objectives.¹⁵ Several of these countries are friends and partners of the United States including: Kuwait, Bahrain, Saudi Arabia, India, Egypt, Kyrgyzstan.

Social and economic development initiatives require an increased allocation of groundwater and surface water as population increases. This is necessary to sustain all domestic, agriculture and industrial activities. As a result, the pressure on water resources intensifies leading to tensions and conflicts among users. Excessive pressure is placed on the environment. The demand for freshwater resources leads to worldwide pollution and increased water scarcity.¹⁶

Water scarcity is defined as the point in which the aggregate impact of all users impinges on the supply or quality of water.¹⁷ Under prevailing institutional arrangements, it is where the demand from all sectors, including the environment, cannot be satisfied fully.¹⁸ Water scarcity is a relative concept and can occur at any level of supply or demand. Scarcity may be a social construct; a product of affluence, expectations and customary behavior. Or, scarcity may be the consequence of altered supply patterns. Climate change is an example of an altered supply pattern. Scarcity has various causes that are able to be remedied or alleviated.¹⁹

A society that faces water scarcity has options. First, the government can force massive relocation of its citizens to other areas that are less stressed. This is difficult because, people are oftentimes unwilling to depart and lose the rights and lineage associated with the property they own. A second option is for the government to expand irrigation by diverting more water to agriculture and building more dams. This option is very expensive and may have negative impacts on the environment. For example, withdrawing ground-water may cause the land to subside. Aquifers can become saline or may accelerate other types of ground-water pollution. Withdrawing surface water implies there are several changes. First, there are changes to the natural hydrology of rivers and water streams. Second, there are changes to water temperature. Third, there are other alterations to the natural conditions that will sometime deeply affect the aquatic ecosystems associated with these water bodies.²⁰ Better education of the region's population can help them to use current water resources more efficiently.

Countries could do more with the water that they currently use by engaging in better water management practices. For example, growing tomatoes with traditional irrigation systems requires far more water than growing tomatoes that use drip systems. This example suggests that even our daily diet has an effect on our overall water needs.²¹ Growing a pound of corn can take between 100 and 250 gallons of water.²² This depends on soil and climate conditions, as well as irrigation methods. However, growing the grain to produce a pound of beef can require between 2,000 and 8,500 gallons.²³ This next example suggests that weighing more cost effective produce can impact the types of produce grown and use of water.

In most countries, the agriculture sector is the predominant consumer of water.²⁴ Historically, large-scale water development projects have played a major role in poverty alleviation by providing food security, protecting the population from flooding and drought, and expanding opportunities for employment. For example, China's dam development in the early 1980's sparked an unprecedented reduction in poverty.²⁵ Economic reforms immediately sparked agricultural growth. The rural prosperity that resulted directly propelled the dramatic growth of non-farm enterprises. This growth boosted employment and earnings.²⁶ China gave favorable treatment to farmers. The country divided the land equitably and raised producer prices that allowed farmers to benefit directly from harder work. Farmers also benefited from earlier state investment in rural infrastructure. This was in the form of basic health care and primary education for its citizens.²⁷ All of these factors contributed to an upsurge of "pro-poor" growth soon after the economic reforms were introduced. This is even before China had a national anti-poverty program. Vietnam followed a similar pattern of development during its early transition to being a sovereign nation. The country experienced positive results similar to China.²⁸

Irrigated agriculture has played a major role in the development of rural economies and poverty reduction.²⁹ At the same time, poor communities tend to suffer the greatest health burden from inadequate water supplies. Poor health for these populations makes it difficult to escape the cycle of poverty and disease.³⁰ Growing scarcity and competition for water stand as major threats to future advances to alleviate poverty; this is especially evident in rural areas. The rural poor are viewing entitlement

and access to water for food production, livestock and domestic purposes as more critical than access to primary health care and education.³¹

Water scarcity is directly related to poverty. Unclean water and unsanitary conditions plague poor people across the world. Poor people view access to water scarcity as a common resource that is guaranteed to them. They view it as a right and any obstruction in obtaining access disrupts their lives and impedes their ability to provide sustenance. Water scarcity is often influenced by how institutions make decisions on the development of infrastructure. It involves equitable decisions and how those decisions affect the population way of life. It is about choices and the way they are managed to distribute resources equitably.

Strategic thinking involves understanding the impact that certain initiatives may have on stakeholders. It must be clearly understood what the second and third order effects of implementing changes may have on the livelihood of the local residents. Creative thinking on a strategic leader's part will minimize the impacts that these changes may bring to any region. One approach would be to lessen or decentralize the control of countries that have the majority of rights to the water. Making more of a cooperative decision making process could alleviate some tensions. All stakeholders would be part of the decision making process regarding crafting the Nile River agreement. The problem must be looked at from a fresh perspective that suggests unorthodox solutions which may look unsettling at first. A decentralized approach might be the only means of managing the problem. The conditions must be set so that all interested parties are willing to share the burden. The process must involve having quality people with open minds working to achieve a common goal.

While access to safe water and sanitation have been recognized as priority targets through the Millennium Development Goals, there is increasing recognition that this is not enough.³² Millions of people rely on water for their daily income or food production. Farmers, small rural enterprises, herders and fishermen all need water to secure their livelihood. As the resources become scarce, an increased number of these workers will see their sources of income disappear. Silently, progressively, the number of those who are “water losers” increases. These “losers” are those who are at the tail end of the irrigation canal or are downstream of a new dam which is the result of excessive groundwater drawdown.³³

The steady increase of people living within small cities exacerbates this challenge locally. The water that supports ecosystems, fish, animals and invertebrates must be left to follow its natural pathways through the worlds’ landscapes.³⁴ The two main factors driving the amount of food we will need are population growth and dietary change.³⁵ With rising incomes and continued urbanization, food habits change towards richer and more varied diets.³⁶ Oftentimes there is an increased consumption of staple cereals. However, this leads a shift away from cereals towards livestock and fish products. These are high-value crops that consume more water.³⁷

Many regions around the world deal with shortages of water. However, some areas are more prone than others to interstate violence over water shortages. In regions where countries compete for access to water, the relations between the countries are likely to be unstable. In regions where water supply is scarce, combat sometimes seems to be the only way to resolve the problem.³⁸ Water systems usually arise in one country and pass through other before reaching the sea or oceans. The rivers and lakes

that come off these larger water systems are typically shared by more than one country. Water scarcity induces competition between users and different interests are at stake. Equitable solutions between public and private users; rich and poor residents; and rural and largely populated cities are difficult to maintain. The states where these systems originate are the states that try to gain the most control over the water. This is the case along river systems like the Nile River Basin, the Mekong River Basin, and the Tigris and Euphrates River Basin.³⁹

Nile River Basin

Water scarcity is the primary water management challenge in the Nile River Basin. The Nile River is the world's longest river and stretches 4,130 miles long.

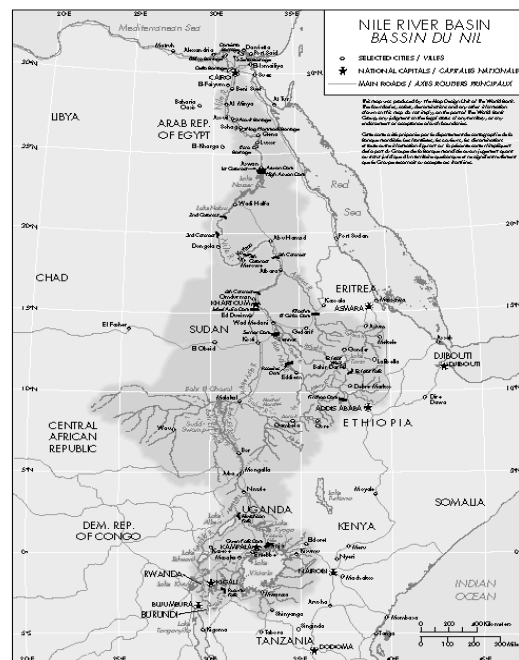


Figure 3. Map of Nile River Basin⁴⁰

The basin is home to an estimated 160 million people that depend on the water for: navigation; drinking; waste disposal; irrigation; and hydroelectricity generation. The

Nile River has been the most significant source for sustaining human life in Egypt and Sudan. The Nile's tributaries, lakes, and rivers collect and disperse water in nine African countries before it reaches the Mediterranean Sea as can be seen in the map at Figure 3.⁴¹ Of Egypt's 80 million people, 70% live along its banks.⁴²

Currently, concerns about water scarcity have been limited to drought periods, such as the prolonged drought that gripped the region from 1978 to 1987.⁴³ The driving increase of population growth is placing tremendous strain on a system and increases the demand for an already scarce resource. In 1929, England acted on behalf of its East African colonies and gave Cairo the right to veto upstream projects.⁴⁴ An accord with Sudan in 1959 gave Egypt the lion's share of the Nile water.⁴⁵ Under the agreement, Egypt was allocated 55.5 cubic kilometers (km³) and Sudan 18.5 km³ per year of the water, respectively.⁴⁶

African nations, which have gained independence from colonialism in the past six decades and have undergone population growth, say the agreement needs revising. Egypt's Nile Delta is under climatic change and rising sea levels. Cairo is located in a watershed where the majority of the available water is being used. Any increase in water consumption requires the additional water to be imported from existing water basins or it is diverted from farmers using it for agriculture. The competition between farmers and cities for more water is intensifying.⁴⁷

The economics of water use do not favor farmers in this competition, simply because it takes so much water to produce food. For example, it takes 14 tons of water to make a ton of steel worth \$560. However, it takes 1,000 tons of water to grow a ton of wheat worth \$200.⁴⁸ Agriculture becomes the residual claimant for countries that are

preoccupied with expanding the economy and creating jobs.⁴⁹ Farmers, it seems, are losing the battle. They are faced with a shrinking water supply as well as the shrinking share of that shrinking supply.⁵⁰ The Egyptians have threatened to use military force to ensure their control over the headwaters of the Nile, because, the country has no other water source. Sudan, Ethiopia, and Uganda have constructed various river projects to increase their annual water withdrawals. These actions impact Egyptian control over the Nile. Four Nile basin upstream countries bypassed Egypt and signed a new agreement aimed at redistributing their share of the Nile water. The four countries included: Tanzania, Uganda, Rwanda, and Ethiopia. The new treaty was partially funded through loans from the World Bank, the International Monetary Fund and the gas-rich state of Qatar. The new treaty's goal serves to help the upstream countries build new projects. Many of these projects are dams which are used to generate hydroelectric power for more development projects. However, the construction of these dams may be in violation of the 1929 Nile Basin Agreement. These dams may restrict the volume of water reaching the downstream countries; chiefly Egypt and Sudan. The Grand Ethiopian Renaissance Dam is an example of a structure being built by Ethiopia which will be Africa's largest hydroelectric facility. The dam is being constructed 40 kilometers (km) upstream from Sudan on the Ethiopian portion of the Blue Nile. Egypt considers the dam to be a problem. The country thinks the construction indicates that Ethiopia is willing to challenge the previous treaties on sharing the waters of the Nile.

Riparian countries refer to those countries that share the river basin with Egypt. These are the countries that will not likely stand Egypt dictating the conditions under which the Nile river water is allocated. The agreement was signed in 1929. Many of the

African nations were still underdeveloped. Today, countries in the region suggest that the conditions that were present at the time of the treaty have changed substantially. These countries argue that a new agreement must be developed and refer to the *Clausula rebus sic stantibus* principle of international law.⁵¹ This principle allows for treaties to become inapplicable because of fundamental changes in circumstances.⁵² The imbalance of the 1929 treaty is evident in that it favors Egypt's control of the Nile river water over the other Riparian states. These states argue that the agreement was created to secure the Nile water for Egypt. As a result, the rights of the Sudan and other countries are limited. Mistrust and instability will surface when a downstream riparian country, that is highly dependent on river water, becomes militarily and economically stronger than upstream countries. This is the case with Egypt. It depends on the Nile and is far stronger militarily, politically, and economically than Sudan or Ethiopia. According to international law, an agreement made between two parties cannot have a binding effect on a third party without its consent.⁵³

The Nile Basin Initiative (NBI) is a step forward to ease tensions. The idea of equitable utilization, shared cooperation, and efficient ways to manage existing water are definite steps in the right direction. However, mistrust and suspicion among the riparian states still exist. The Initiative departs from the past practice of each country making unilateral decisions to use the water of the Nile River in order to support their countries' needs. Despite NBI's success, there are still challenges. It is difficult to determine reasonable and equitable solutions to water sharing. In addition, sustaining a cooperative agreement over an extended period of time is hard to maintain. The dominance of the British government over the basin States gave rise to an

unconventional relationship between Britain and Egypt. This unconventional relationship was reflected in the agreements made by them about the water of the Nile.⁵⁴

The Nile waters could lead to greater interdependence through cooperation and mutual benefits rather than becoming a source of conflict.⁵⁵ By coming together to jointly manage their shared water resources, countries could build trust and prevent conflict. In the face of potential conflict and regional instability, the Nile basin countries should continue to seek cooperative solutions. The political will to develop a new legal framework for managing the Nile should continue. One should not minimize the prospects of war over water.⁵⁶

In 1967, the efforts by Jordan and Syria to dam the Jordan River caused the Six-Day War between Israel and its neighbors. Israel adopted a policy to divert water from the Jordan River to the Negev Desert.⁵⁷ This policy was the source of tension between the two countries. This angered Arabs to the extent that they threatened to divert the water flow into Lake Galilee. Syria was bombed by Israel in 1965 and 1966 soon after they began implementing their policy of diverting water from Israel.⁵⁸ On April 7, 1967, Israel attacked the Syrian artillery positions and the Golan Heights. This was the first step towards the outbreak of war. Six Syrian MiG fighter planes were shot down during this operation while the situation became worse when Israeli jet planes deliberately started flying low over Damascus. The actions of Israel are an indication that nations will act militarily when their access to resources are at risk.⁵⁹

Mekong River Basin

In 2012, President Barrack Obama shifted the focus of U.S. foreign policy from Europe and the Middle East to the Asia Pacific region. This shift indicates that the 21st Century will be viewed as the Asian century and it is mainly due to the economic rise of

China. Along with the economic growth comes the need for additional resources to support the nation. One such resource is the availability and access to fresh water.

Water-related conflicts are visible in the Mekong River Basin in Southeast Asia. The Mekong is one of the world's largest free-flowing river systems. However, China, Laos and other countries in the region are now driving to harness these water resources, particularly for hydropower production.⁶⁰ Water use is dominated by agriculture needs, primarily irrigation. Rapid economic growth in the region, including large population shift from rural to urban areas, increased pressure on water supply and the quality of water resources. The Mekong River is the 7th longest river in Asia and the 12th longest in the world.⁶¹ It stretches 2,700 miles long across six countries to include: China, Myanmar, Vietnam, Thailand, Cambodia and Laos.⁶² The river produces the resources needed to maintain the livelihood of its citizens who live along the river banks primarily through irrigated agriculture and fishing.

The people of the Lower Mekong Basin are among the poorest in the world. Around 40% of the population in Cambodia, Laos and Vietnam live beneath the poverty line which is defined as the minimum level of income needed to adequately survive.⁶³ Even for Thailand, the wealthiest of the four Lower Mekong Basin countries, poverty remains a critical issue. The Thai population that lives within the Mekong watershed area lags far behind the rest of the country socially and economically. The population growth rates in the region are 1.7% for Laos and Cambodia.⁶⁴ The population of the basin has doubled over the last 30 years.⁶⁵ In Cambodia alone, the population is expected to increase from an estimated 12 million today to 20 million in 2020 - most of

which will be facing severe poverty unless a very significant increase in agricultural production takes place.⁶⁶



Figure 4. Map of Mekong River Basin⁶⁷

Figure 4 shows a map of the Mekong River and the countries that it flows through. The Mekong River provides hydroelectric power through dams. Three of these dams were built in China and more are planned. These dams are now threatening the water supply, the livelihood of those living downstream, and the relations between China and its southern neighbors.⁶⁸ China's booming economy has produced larger factories and increased power plants that require huge amounts of water used for processing and cooling. As people become more affluent they take more showers, use more water for drinking, and require more sewage cleaning.⁶⁹ The percentage of water used in the municipal and industrial sectors in northern China has increased from 21% in 1997 to 29% in 2010 and is expected to reach 35% in 2030.⁷⁰ Water shortages are

blamed on the increased demands of new industries and reckless development. Other contributing factors include an expanding population, mismanagement of resources, and an increased use of agricultural resources.

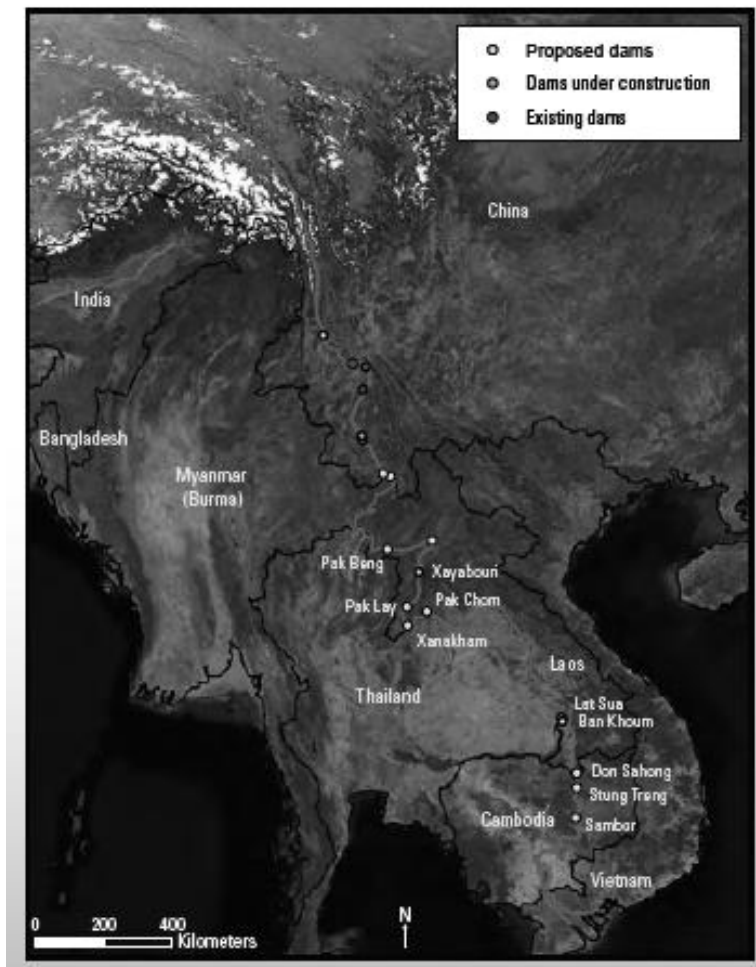


Figure 5. Map of River Basin Dams⁷¹

Figure 5 depicts the proposed constructions plans for the Mekong River. It signifies that the amount of upstream dams will decrease the flow of water reaching to the lower stream countries. In times of conflict, nations upstream may be tempted to cut off the flow of water and prevent their enemies from having access. In addition, terrorists could target dams and possibly blow them up. Countries unable to secure and

provide water for their citizens might collapse. The mere possibility of a country providing enough guards to secure their dams will create a financial hardship that results in a stifled economy. Affluence comes with a price. Citizens expect more from their state or society when economic progress is made. The increased use of toilets, showers, and washing machines has placed an increased demand on scarce water supplies. This is also the case when there is an increased consumption of meat and alcohol where more grain is used; requiring more water.

About 85% of all water in China is used for irrigation. However industrial and urban water use is growing. Much of its use is inefficient. China requires 23 tons of water to produce one ton of steel, compared to six tons of water needed in the United States, Japan, or Germany.⁷² With the increased need for water resources, China increased their dam construction projects. China's geography and its population distribution are at the root of the need to increase these construction projects. An estimated 44% of the nation's populous lives in the northern and northeastern provinces. Approximately 58% of its cultivated land is located in this area. However, only 14% cent of the country's total water resources are found in the region. This is the area where most of the serious water deficits are found.⁷³

A report in May by the United Nations Environment Program and the Asian Institute of Technology warned that China's plan for a cascade of eight dams on the Mekong, which it calls the Lancang Jiang, might pose "a considerable threat" to the river and its natural riches. Water shortages will prevent affected countries from producing enough food and electricity. It poses a risk to their citizens and affects the economic growth of food markets across the world. Relations between China and its neighbors in

mainland Southeast Asia could be severely damaged. Southeast Asian governments have not greatly expressed their uneasiness with China's growing power and influence. Cambodia, Laos, and Thailand have presented plans to dam their sections of the Mekong River. These plans have prompted Vietnam to object.

The ongoing crisis in Sudan's Darfur region is an example of what could happen on a wider scale between now and the 2030s between China and the other nations that uses the Mekong River. Militants and extremist groups may rise up against the government and accuse them of ignoring the needs of the rural farmers in favor of urban areas. Terrorists may see this as an opportunity to undermine the existing government. Beyond the problems of water scarcity will be those associated with water pollution, whether from uncontrolled industrialization or from the human sewage expelled by the big cities. The dumping of vast amounts of waste into the Mekong River threatens the health and welfare of large portions of the riparian countries.⁷⁴

Although the Mekong is widely regarded as a Southeast Asian river, its source is in the glaciers high in Tibet. Nearly half of the 2,700 mile river flows through China before it reaches Southeast Asia. There is no international treaty governing the use of these trans-boundary rivers. China is in a dominant position and controls the Mekong's headwater. China believes it has the right to develop its section of the river as it sees fit, and as done so without consulting its neighbors, let alone seeking their approval.⁷⁵ It is this type of thinking and unilateral action by China that could result in future instability and conflict surrounding the Mekong River Basin.

Tigris and Euphrates River Basin

The Euphrates and Tigris Rivers demonstrate another potential flashpoint over water. Turkish dams on the upper Euphrates and Tigris Rivers are the source of water

for the Mesopotamian basin. They pose similar problems for Syria and Iraq. Turkey's diversion of water to irrigate mountain valleys in eastern Turkey reduces the water flowing downstream. Conflicts resulting from water scarcity easily could destabilize whole areas within the region.



Figure 6. Map of Tigris Euphrates River Basin⁷⁶

The Tigris and Euphrates Rivers, originating in Turkey and cutting through both Syria and Iraq, have experienced drastic reductions in water flows in recent years due to Turkey's aggressive dam construction and regional droughts. For many years the prosperity of Iraq depended on the ability to cultivate and farm along the rich waterways of these rivers. Since 1975, Turkey's extensive dam and hydropower construction has reportedly reduced water flows into Iraq and Syria by approximately 80% and 40%

respectively.⁷⁷ The reduction of water negatively impacts the farmers and residents who rely on the rivers for their livelihood.

These rivers became a shared resource with the potential for interstate conflict between Turkey, Syria and Iraq. Iraq has historically been the predominant user of water from these rivers and a large network of *Karez*, or man-made underground irrigation channels, has existed there for centuries.⁷⁸ This region of the world is mixed with different cultures, languages, ethnicities and religions. Few regions in the world are intertwined with such diverse cultures. Iraq remains a fragile state that is deeply traumatized and driven by thirty years of war, sanctions, occupation, and civil strife.⁷⁹ The most serious risks to Iraq's internal instability come from the overlapping and interacting effects of renewed ethnic or sectarian conflict. Additionally, there is an irreversible breakdown of the current constitutional order. Either of these conflicts could arise along any of the major fault lines in Iraq: Shia-Sunni, Arab-Kurd, or intra-Shia.⁸⁰ Such diversity has the potential for misunderstandings. Lack of fresh water to fulfill the needs of the citizens may lead to additional tensions in an already over-heated atmosphere of political hostility. This is exemplified through the political turmoil of the Arab Spring.

Since the 1960's, Iraq and Syria have experienced a fourfold increase in population. Turkey's population has doubled.⁸¹ Each of these countries experienced rapid growth in demand for the resources used by their citizens. Sharply rising population combined with dwindling water supplies creates a problem for countries in this region. In the water-rich regions of North America and Northern Europe, the average per capita availability of water varies between 1,500 and 20,000 cubic meters

per year.⁸² In the Middle East, the average per capita availability of water for many countries falls far below 500 cubic meters per year.⁸³

In 1975 Turkey implemented the Southeast Anatolia Project (the commonly used acronym GAP is derived from the Turkish name *Güneydoğu Anadolu Projesi*), a massive dam-building scheme that encompasses the construction of 22 dams and 19 hydropower plants across the Tigris-Euphrates basin. The plan requires hundreds of miles of irrigation canals and an estimated 10% of the surface area of Turkey. One projection states that, when completed, GAP will reduce the flow of water into Iraq by approximately 80% and into Syria by about 40%.⁸⁴ This reduction in the flow of water to Iraq could be problematic. Historically, these two countries have been the principal users of these water resources. Declining flows into Iraq have reached a crisis point with Syria beginning to construct dams along the Euphrates River.⁸⁵

Turkey's decision to build new dams drew immediate criticism from both Syria and Iraq. Both countries knew that any additional dams built by Turkey would reduce the amount of water readily available for them. The completion of Syria's Tabqa Dam in 1975 brought Syria and Iraq to the brink of war. In 1990, Turkey mobilized its forces when it cut the Euphrates to fill the Atatürk Dam, temporarily reducing water flow into Syria and Iraq by approximately 75%. Iraq in retaliation, threatened to blow up the dam. The threat of action by Iraq drew a drastic response from Turkey. They threatened to cut off the water flow to Syria and Iraq completely.

Water management between these countries is a difficult issue and a failure to adequately address it may potentially lead to conflicts. The frequency of droughts in Iraq in recent years has increased the likelihood of conflict in the future. The

Intergovernmental Panel on Climate Change projects a changing climate and the potential for a permanent decrease in rainfall.⁸⁶ This projected drop in rainfall coupled with rapidly increasing populations reflects ongoing potential for future conflicts.

Turkey's GAP construction is expected to be complete in 2017.

Iraq threatened to take its case for an increase in water flows from Turkey and Syria to the United Nations. This indicates Iraq is not comfortable with the underlying decisions by Syria and Turkey. This could be viewed as a precursor to an increasingly aggressive stance by Iraq towards its northern neighbors. As water is the most fundamental and crucial resource to sustain life, the seriousness of water shortages in Iraq inflicted by Turkey and Syria should not be underestimated. U.S. interests to a great extent would be achieved by closer engagement with senior government officials in Ankara and Baghdad. The immediate effect might be a reduction of tensions over Kurdistan with other positive externalities eventually emerging should stronger ties develop between these two emerging regional powers. This could start with a series of bilateral meetings sponsored by the U.S. missions in Baghdad and Ankara.⁸⁷

Analysis

This paper reviewed the problems associated with water scarcity within Nile River Basin, Mekong River Basin and the Euphrates –Tigris River Basin. These three rivers could be sources of interstate conflict in the 21st century. These examples reaffirm that tensions concerning water can cause regional instability and be factors leading to war. An important aspect to solve water conflict in these three basins is to develop solutions that involve international cooperation and population control. Cooperative agreements over shared water resources presupposes the existence of legal framework. It cannot be sustained without a legal arrangement in place.⁸⁸ Past attempts

to cooperate and create institutional schemes were doomed to failure. This is mainly because they addressed the problem on a small scale and did not also attract the confidence of all the riparian states.⁸⁹

The Nile Basin Initiative is the best hope for success. Despite the current success, there are still challenges facing it. It is very difficult to determine what a reasonable and equitable solution to water sharing is and the sustainability of an agreement and cooperation over an extended period of time is hard to maintain. It is difficult to enforce agreements that cross boundaries. For example, if one of the parties decide to defect or go against the laid out plans, enforcing the original agreement will take a lot of effort by the governing body to monitor and sanction. Negative actions by defectors can disrupt original agreements.⁹⁰

Moreover, the current use of this water is in question. Egypt wants to agree to a position that maintains status quo, and then puts forward the notion that the agreement is unchanging and sacrosanct.⁹¹ It is advantageous for Egypt to keep things the way they are. Egypt and Sudan use the majority of their water for irrigation of cash crops in order to generate a national economy, buy food, and create foreign exchange. Ethiopia calls for the agreement to be revised or eliminated completely. It will be difficult to maintain long term cooperation when the perceptions of the problems are not similar to each participant. It is will be difficult for Egypt to make concessions on a development that may negatively impact the amount of water it needs to maintain its growing population.

The mighty river of Mekong plays a crucial social and economic role in the lives of the six countries through which it flows. Regional co-operation on the management of

the river and its related resources is imperative. The Mekong River Commission was created for this purpose. The Commission came to be fully recognized in 1995, with the signing, by Cambodia, Laos, Thailand and Vietnam, of the Agreement on the Co-operation for the Sustainable Development of the Mekong River Basin.⁹² There are also challenges that accompany the Commission's success. The lack of any enforcement capabilities weakens the foundation upon which the cooperation agreements were made.

The perception of unfair distribution comes about when the actors have different preferences over the cooperative arrangement. This is especially true in this case where the coordinating actions are being conducted across international boundaries. In order to sustain economic growth, water consumption will increase. The tendencies for the upstream countries to manipulate the resources available to support their own internal needs will inherently aggravate the neighbors downstream. The inadequate understanding of how the Basin functions as a system will continue to be a challenge. For instance, the changes in the water levels that result from upstream water will have a great impact on the downstream agriculture.

In the case of the Nile and Mekong Rivers, equitable agreements are difficult to reach when one riparian country holds greater geographic and military power over the other countries.⁹³ The large majority of water originates in Turkey and Turkey has the most advanced military power. This country has less incentive to work cooperatively with Syria and Iraq and to approach negotiations with a "basket of benefits" outlook.⁹⁴ The lack of effective local participation, the absence of formal agreements on international water allocations, the limits on pollution, and the economic and military

power imbalance between upstream and downstream countries makes it difficult for cooperative agreements to last. In addition, a greater focus on legal institutional arrangements is necessary. It is absurd to implement integrated policy without some form of legal bindings. A common policy, including a supporting legal framework, is vital for implementing integrated, trans-boundary, river basin management.⁹⁵

Recommendations

The issue of water scarcity can be very volatile and complex. The case studies presented reveal there are differences in the economic value of water between who shares access. The central issues that remain are twofold: first, what is the best way to increase downstream access to water?; and second, what is the best way to secure the nation's food supply, while diffusing potential tensions?

Politically, the United States must use diplomacy to engage with the senior political leaders of all the countries who are experiencing current and future water scarcity. There must be face-to-face interaction in which the United States is able to leverage its interagency capabilities in order to facilitate increased dialogue. Discussions should focus on the best ways to manage the use of the water by upstream countries without jeopardizing the rights of the riparian countries located downstream. Interactions should be meaningful, stress regional cooperation, and demonstrate institutional support to develop sustainable agreements on the use of water. This can be achieved by using the “whole of government approach” with an emphasis on diplomacy and development. Senior political leaders must engage and promote understandings of cross borders cooperation. In addition, it is important to identify the root causes of water scarcity and emphasize the importance of developing joint solutions that involve local community leaders. Addressing the root causes that contributes to the mismanagement

of water is the most productive way to develop manageable solutions related to water scarcity. The importance of meaningful trans-national water management policies cannot be ignored.

Additionally, the United States should work to support the development and implementation of a multinational organization that manages issues related to water access. It is important to advise competing countries on the benefits of developing national programs that promotes changes in water consumption practices. The policies developed must provide incentives to citizens who voluntarily implements practices that preserve the use of water. Education is the most important element related to successful, long term conservation of water. The public should be advised about the current water conditions and the expected long term effects if changes are not adapted. This is achieved through using all means of communication to include messaging by: mass media, flyers or cell phones. Cooperation rather than conflict is the best outcome to achieve.

There is also a role for the U.S. military to shape events before they lead to conflict, thereby reinforcing the lead effort of the State Department's diplomatic efforts. The U.S. Pacific Command (USPACOM), U.S. Central Command (USCENTCOM) and U.S. Africa Command (USAFRICOM) should address water scarcity and its effects on national, regional, and global peace and security in their deliberate and contingency planning processes. These geographic combatant commanders should leverage available non-governmental organizations and private sector experts to work with senior political government officials regarding sound policies on allocation, distribution and use of water. Combatant commanders should invite industry experts in the field of

agriculture, engineering, economics to exchange ideas on how to best address water scarcity. The intent is to identify recommendations on ways to prevent a regional crisis from developing. Specialized planning cells within the staff must monitor these contingency plans and be prepared to respond. The goal is to provide the combatant commander the necessary situational awareness information required. This will enable them to make the appropriate decisions to offset a crisis before it becomes a conflict or humanitarian issue.

Conclusions

In the future the United States could be drawn into major crisis due to water conflicts. Understanding the economics of water scarcity and understanding the shortcomings of the areas mentioned in this paper will be paramount to regional stability. Increased populations will increase tensions for water as more people compete for a dwindling resource. Additional population and economic growth will increase tensions even in the areas that have been able to cooperate in the past. The fact that formal agreements for water management between trans-boundary countries are not universal will only increase the potential for conflicts. Taking proactive steps like cooperative agreements, shared knowledge base, and political leader engagement is prudent. These steps will ease the tensions between these countries and minimize the cause for conflicts.

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