IMPORTANCE OF WATER RESOURCES IN THE MIDDLE EASTERN POLITICS

Prof. Dr. Sayeda Daud
Dean
Faculty of Humanity and Social Sciences
Metropolitan University
Karachi – Pakistan
sayedadaud@gmail.com

ABSTRACT

Water is the lifeblood of all human and natural systems. Although most regions of the world have abundant water resources, availability of drinking water is inadequate in many parts of the world. Current and projected water shortages are nowhere as acute as in the arid countries of the Middle East. While battles have been fought over water allocation in many countries, the greatest potential for a conflict over water is perhaps in the Middle East, where water resources are limited and political tension is high. Water is just one of the issues that may widen the gulf between countries. Cooperation to solve water problems is possible, though difficult. Indeed, joint action on water has the potential to lead to even greater co-operation in the wider political arena. Mutually beneficial, "win – win" solutions are preferable to conflict or stalemate. Conversely, arrangements not arrived at to fairly allocate one of life's most important necessities can only perpetuate conflict. The most pressing environmental problem in the Middle East concerns the ownership, management and use of scarce water resources. Water has frequently been the cause of regional conflicts. Much of the struggle between Israel and its Arab neighbours revolves around the water issues. Indeed, the history of relationship between Israel, Syria, and Jordan for the past 50 years can be viewed as a fight for water. A long-term settlement between Israel and its neighbours will depend as much on the fair allocation of water as of land. Nearby, Egypt fears an appropriation of the Niles waters, on which 60 million of its people are entirely dependent, by the upstream countries of Sudan and Ethiopia. Water problem is linked with other problems of the Middle East. The dispute between Iran and Iraq over Shatt-al-Arab, for example, has its origins in boundary conflicts that go back in history. Arguments between Turkey and Syria over water from the River Euphrates are often linked to Syrian support to the Marxist Kurdistan Workers' Party (PKK) that seeks independence for the Turkish Kurdistan region. Iraqi-

Syrian water disagreements have both masked and resulted from military and political ambitions.

INTRODUCTION

In an area dominated by arid and semi-arid lands, water will always be a limited resource. Droughts, desertification, and water shortages are permanent features of life in many countries of the Middle East. Rapid development is threatening some water resources through pollution. Expanding population is increasing the demands on water resources for drinking, agriculture, sanitation and industry. Increase in the income of some countries – with resultant improvement in living standards – raises the demand for water; as a result, many countries in the Middle East will in future experience chronic water shortages. The list of nations with water shortage problems is likely to expand as a consequence of the accelerated pace of urbanization. (Aggestam, & Sundell-Eklund, 2014). Many commentators confidently predict water to be the next source of conflict in the arid Middle East. In 1979, Boutros Boutros-Ghali remarked that the next regional war would be fought over water, not politics. In 1995, the World Bank reiterated this concern at a water conference in Stockholm, with Ismail Serageldin, the environment vice president declaring that water should "... assume its proper placeas an economically valued and traded commodity". In March 1999, at an environmental conference in London, Mikhail Gorbacheve, stated that water security was the most pressing problem that "is already giving rise to international conflicts". (Beaumont, Blake, & Wagstaff, 2016).

An Arab League report estimates that Arab states can only meet 56% of their water needs, and population growth is expected to widen this gap in the next thirty years. Population growth and lackof technology have reduced the annual per capita share of water in the Arab region to 1,750 cubic meters compared to a world average of 14,000 cubic meters. Feuiherade quoted an Arab league official, "water has become one of the main sources of conflict that threatens the stability and futureof the region". Western delegates at the 1994 Muscat Water Conference warned that "water is a vital and complicated issue and it has to do with politics. While there is a need for water cooperation, there are differences on the extent and shape of this cooperation. (Beaumont, Blake, & Wagstaff, 2016).

There have been speculations on how water can lead to conflict. Areas of potential water conflicts include Israel, which has long standing external disputes and increasing internal difficulties; Turkey, and the downstream countries that rely on the Tigris and Euphrates; and Egypt, which depends on water from the Nile. Demand of water, its control and water quality are amongst the most significant factors.

DISTRIBUTION AND UTILIZATION OF SWEET WATER RESOURCES

Sources of Sweet Water of the World in General

Every Country's survival is dependent on providing its citizens with basic necessities, the provision of clean drinking water being the chief necessity. Without unhindered access to water resources, states cannot deliver many of the basic human needs. The availability of this basic resource has an impact upon all social, environmental, economic, and political issues. Resource problems can affect productivity, which, in turn, affects domestic stability, a component of both national and international behaviour. Additionally, environmental degradation can be irreversible. (Boersma, Andrews-Speed, Bleischwitz, Johnson, Kemp, & VanDeveer, 2014).

Water presents a considerably less-manageable problem. 97% of world's water is contained in the oceans and is of little use; remaining 3% is fresh, of which more than 2% is locked away in the polar ice caps, glaciers, or deep groundwater aquifers. Furthermore, only 0.36% of world's water in rivers,lakes, and swamps is fresh and accessible. The supplies of useful fresh water are finite, and most of the forms in which it is used have no substitute. Our fresh water is made available through the hydrologic cycle in which solar radiation evaporates ocean water, which subsequently falls to land as rain and returns to the sea as runoff through rivers or aquifers. Precipitation, then, is the original source of all fresh water; which is highly variable in its geographical distribution. (Shiva, 2016).

MIDDLE EAST IN SPECIFIC

Despite the promise of desalination technology, the scarcity of water in the Middle East will not go away. High population growth of the region will further aggravate the situation. The scanty sources of water are contained in the four rivers, the Jordan-Yarmuk, the Nile, the Tigris, and the Euphrates. Few additional aquifers play a negligible role. The rivers share two fundamental characteristics. First, the water in each river is virtually exhausted in quantity and quality when it passes through the countries. Second, the yearly volume of water in each is variable, which complicates planning for conservation and distribution . (Chatterji, Arlosoroff, & Guha, 2017). The Jordan-Yarmuk River flows through Lebanon, Syria, Jordan and Israel. Jordan River fulfills 50% ofIsrael's and 75% of Jordan's water requirement. Israel takes 75% of Jordan River's water that reaches the Sea of Galilee and supplies it to the rest of the country through the National Water Carrier. The Kingdom of Jordan diverts the Yarmuk – Jordan River's main tributary into its watercourse, an open concrete flume called the King Abdullah Canal, which loses 50% to evaporation and poor maintenance. The Nile provides 97% of Egypt's water. Its drainage basin extends over eight countries: Ethiopia, Sudan, Tanzania, Uganda, Kenya, Zaire, Burundi, and Rwanda.

Since 1971, the Aswan High Dam has controlled the annual flooding of the Nile Valley. Tigris and Euphrates flow through Turkey, Syria and Iraq before emptying into the Persian Gulf. Turkey has surplus water but is unable to distribute it in consistence to its development plans. (Kuniholm, 2014).

Additionally, underground aquifers in Jordan, Israel, and the West Bank account for 60% of the sub- region's total water supply. Three aquifers – northern, eastern, and western – lie beneath the West Bank. The water is tapped by wells sunk by the British during the post WW1 period when Palestine was a protectorate of the British Empire under the auspices of the League of Nations. These wells are on land that is within Israel's pre-1967 borders. Israel now gets some 40% of its water through these wells, but in doing so it takes about 85% of the annual recharge of the western aquifer. The protect this vital source, fearing over-use of the aquifer, Israel has prohibited West Bank Palestiniansfrom sinking new wells without a permit. Thus a mounting source of hostility in the region is the paucity of permits issued. The issue of access rights to this water is typical of the complexities of the Middle East, rain falls in Jordan, but water is "released" through the wells in Israel. Though over exploitation of groundwater can potentially bring large-scale human suffering and migration, it isless likely to lead to a direct violent conflict among states. (Beaumont, Blake, & Wagstaff, 2016). On the other hand, disagreement overthe sharing of international river waters can potentially bring violent inter-state conflict to the Arab World. Besides the Jordan River system, the water sharing of two other international rivers in the region may cause serious conflicts in the near future.

EXISTING WATER DISTRIBUTION / UTILIZATION MECHANISM

Water Resource Development Projects

To mitigate water shortages, a number of engineering projects have been initiated in the region. The most significant one is Turkey's Southeast Anatolia Development Project (GAP) proposed in 1936. An ambitious development project, it plans utilizing waters of Euphrates and Tigris with the construction of 22 dams and 19 Hydro Electric Power Plants (HEPP). It also plans to divert waters of the basin, with immense tunnels into the Harran field, where 1.7 million hectares of land is waiting to be irrigated. The project will double hydroelectric capacity of Turkey, making it self-sufficient and will increase the irrigated area in the country by 66%. Construction was initiated on the Ataturk Dam in 1981. Ecological and social impact of GAP was flooding of thousands of Sq Km of land and displacement of the Kurdish occupants. They were settled near the city of Kanya in south central Turkey and near the Aegean Sea in south-western Turkey. Social fallout of the resettlement will unfold in times to come. (Selby, & Hoffmann, 2014).

In 1987, Turkey proposed two "Peace Pipelines" which could supply freshwater from the Seyhan and Ceyhan Rivers in the Adana region. The dual pipelines would deliver potable water to millions. The western pipeline would supply water to Israel, Jordan, Syria and western Arabia. Its eastern counterpart, drawing on waters of the Euphrates and Tigris, could be extended to south of Iraq to refresh the states of Kuwait and Oman via Saudi Arabia Feasibility studies indicated that such a project could be completed at about half the cost of desalination. Only few nations were receptive, and the concept stays shelved. A number of proposals have been made taking advantage of the potential energy provided by the elevation differential of the Dead Sea, which at 1,335 feet below sea level is the lowest point on Earth. (Olsson, 2015). In the early 1990s

Israel developed a plan coupling production of electricity from the elevation difference with the powering of desalination plants. The plan was to take water from the Mediterranean across Israel in a seven-mile concrete lined canaland a twenty-mile tunnel to drop into the Dead Sea. The energy released in the 1,200-feet drop would provide power for desalination. (Duan, He, Nover, Yang, Chen, Meng, Liu, 2016).

The proposal languishes in the political arena, and is only infrequently referred to. A Jordanian proposal of late King Hussein envisions a 168-mile canal from Aqaba, Red Sea to the Dead Sea. Water pumped northward to 660 feet high Mount Deom through a 62-mile canal along the Israeli-Jordanian border would be dropped through 2000 feet into the Dead Sea. The 35 billion cubic feet of water charging down the Arava valley would generate electrical power to drive the biggest desalination plant in the world. 40% of the water taken from Red Sea would become fresh water, with remaining poured into the Dead Sea. Depositing brine would also restore the size of the Dead Sea, which has been reduced by 60 feet since 1960s. Subsequent efforts would be directed at maintaining equilibrium between the quantity of water deposited in the sea and the amount lost to evaporation. The uninhabited valley could house water based recreational facilities, and fisheries. (Tsiouri, Kakosimos, & Kumar, 2015). A World Bank feasibility study released during Israeli Jordanian peace accord signing in 1994 placeda $3-4 billion price tag. Funding is still an issue, but both Jordan and Israel appear to support the project. Jonglei Canal in Sudan is an effort to increase the flow rate of the Nile into Lake Nasser. TheWhite Nile flows into the Sudd, a vast relatively flat region, where it meanders in flooded grasslands, swamps, and small streams, losing 50% of its water to evaporation and transpiration, prior to continuing its journey towards the Nile. While first proposed in 1904, construction on the 360- Kilometer canal did not begin in earnest until 1978. With approximately 100 kilometers remaining, the project was abandoned in 1983 due to the outbreak of civil war in Sudan· (Famiglietti, 2014). When the civil war is resolved in Sudan, Egypt can be counted on to quickly raise the issue of completing the canal. Water shortage can be resolved through more than one type of solutions. Taking one such different solution, a company in Canada has designed a method of shipping water in giant plastic sacks called Medusa Bags. The bags, each the size of two super tankers, would hold some 400 million gallons of freshwater. Since freshwater is lighter than salt water, they would float well enough to be towed across the Mediterranean from terminals in Turkey to the Israeli coast, at a cost per gallon less than that of desalination. (Böhmelt, Bernauer, Buhaug, Gleditsch, Tribaldos, & Wischnath, 2014).

GEOGRAPHICAL IMPLICATION

Middle East, the most arid region of the world, has rivers, which are causes of violence, difficult to manage even if confined within the borders of a single nation. History of land use along the rivers has not been just. Rivers and their flood plans have been the last to be developed, because rivers have often been used for hydroelectric generation and agriculture. This in turn contributes to tension between upstream and downstream regions. The geographical demarcation of the

Middle East states was on political ground and not on geographical basis, which is of course a routine affair. Consequently, Israel, Iraq, Jordan and Syria obtain almost all of their water from sources originating outside their own territory. Iraq and Syria rely on water from the Tigris and Euphrates, which rise in Turkey. Syria, Jordan, and Israel depend on Yarmouk, which flows through the Golann Heights and Jordan. Egypt's sole water supply Nile flows through Ethiopia, Uganda and Sudan. The downstream states fear a stoppage or diversion by the upstream water users. Tension between Turkey and Syria over the Euphrates Dam at Tabqa; the Israeli reaction to Syria's attempt to divert Jordan River tributaries; and the problems of the 1970s between Egypt, Sudan and Ethiopia over Nile waters are all instances of the type of trouble which can be anticipated in the future. (Smith, 2014).

DEMOGRAPHIC EFFECTS

Population, its distribution, and its movement affects environmental deterioration. Expanding Middle East population settlements increase the extraction from rivers, aquifers and reservoirs. During the next 30 years, the pressure on water resources worldwide is going to increase dramatically due to population growth, urbanisation, industrialisation and global warming. All nations will need more water to sustain their population and meet their economic expectations. An assessment of the impact of these global factors on the Middle East is necessary to understand the scale of the water shortage facing the region. Growing pressure on the world's freshwater resources is, a reflection of the world's rapidly growing human population; more people need more useable water. The world now uses three times more water than it did 40 years ago, and it is becoming harder and harder to get freshwater. Countries of the Jordan and Tigris-Euphrates Basins, with the exception of Turkey, currently have relatively small populations. However, all of them have very high population growth rate. (Elsayed, Enshasy, Wadaan, & Aziz, 2014). Their population will double by 2040 or earlier (see table 1). This is three times the rate of population growth predicted for developed countries. Furthermore, the creation of Palestinian controlled areas may encourage Palestinian refugees to return from elsewhere to the Middle East, increasing the rate of population growth.

Table 1: Population Data

Country	Mid-1991(M)	Natural % Increase	Population Doubling Years
Iraq	17.1	2.7 – 3.9	2017
Israel	4.9	1.6	2043*
Jordan	3.4	4.1	2011

Lebanon	3.4	2.1	2023
Syria	12.8	3.8	2013
Turkey	58.5	2.2	2030

*Population growth depends on the level of immigration especially from the former Soviet Union.

The drought of 1998-99 has already reduced the Sea of Galilee to its lowest recorded level and is stillfalling. The Banias River has also reached an all-time low and several springs in the Golan Heights have dried up. Droughts are not unusual in this area; the last one occurred in 198991 and caused a 15% drop in Israel's irrigated acreage. The impact of these two factors is shown in Table 2. It is estimated that while 1000M of water per person per year is necessary for a moderately developed country a sophisticated water management system like Israel can also suffice by providing 500M per capita. (Maystadt, Tan, & Breisinger, 2014).

Table 2: Water Availability

Renewable resources per capita / cubic meters per year			
Country / Year	1960	1990	2025
Israel	1024	467	311
Jordan	529	224	91
Lebanon	2000	1407	809
Syria	1196	439	161
Iraq	14706	5285	2000
Turkey	N/A	3520	N/A

There are two crucial points from these water availability figures: -

Shortage of Water

Israel, Jordan and Syria will face acute problems by 2025, while the shortages will start to bite far earlier. Iraq, Lebanon and Turkey have water supply above the suggested minimum of 500 M per person per year. Turkey is in a strong position to defend her own interests but only at the expense of those downstream.

a. Over Consumption. Countries faced with scarce resources are likely to consume more than the available water. This will cause serious long-term damage and, ultimately, reduce further the water resources available in the area.

The only exceptions to the extreme population growth areas appear to be Israel and Turkey, which are projecting growth rates approximately half those of their neighbours. An additional spike in the population growth of Jordan after the Gulf War was the result of a major migration of Palestinians from Kuwait. In Israel, the continued immigration of Jewish peoples is responsible for the population increase. The largest contribution to the increasing population, however, comes from the indigenous beliefs. Religious and economic influence of these people blunts the Western "zero population growth" mentality. To solve this problem, an intensive application of engineering skills, and a level of cooperation amongst peoples of the region, not seen until now, will be required. (Prüss-Ustün, Bartram, Clasen, Colford, Cumming, Curtis, Fewtrell, 2014).

Environmental Aspects

The connection between environmental degradation and political instability has received little attention until the last few years. Researchers such as Jessica Mathews, Peter Gleik, and Thomas Homer-Dixon, however, have marshalled strong arguments for including environmental perils within definitions of national security, and indeed, when these connections are examined, logical links between environment and political stability can certainly be determined. The environmental impacts of the water situation in the Middle East are both personal and society-wise.

Due to a shortage of water in areas likes the West Bank and Iraq, waterborne diseases such as typhoid, cholera, and amoebic dysentery have spread. When untreated sewage water is used to irrigate vegetables, cholera can break out as it did in 1989. (Whittington, Waterbury, & Jeuland, 2014). At the regional level, it is disquieting to learn that in an area of considerable seismic activity, Turkey's Southeast Anatolia Development Project (GAP) rests along one of the country's most active fault zones. The advisability of such projects and the adequacy of current design methodologies are still hotly debated within the civil engineering community. Full development of the Anatolia project could reduce the Euphrates; flow by as much as 60%. This could severely jeopardize Syrian and Iraqi agriculture. The relative trickle that will come into Iraq will be highly salianized and virtually useless. Attempting to harness the environment also has some unexpected consequences. In the 1950s, the Israelis drained Lake Huleh and the marshes that surrounded it. They diverted the Jordan River into canals that ran around their newly created fields. However, draining the Huleh marsh exposed a thick layer of peat that proved ruinous to the agricultural scheme. Attempts to grow crops ended in disaster. The nitrogen in the peat poisoned the grain. When the peat dried, winds blowing through the valley kicked it up into a toxic dust. Then, the dried out peat bogs began to spontaneously ignite into fierce underground fires that were extremely difficult to extinguish. As a result of this farmers are being persuaded to re-flood at least part of the area. (Mabon, 2015).

The work by Daniel Hillel on the environmental impact of major water projects in the Middle East provides further thought. While those with a fascination for technical approaches to the World's problems are in awe of such engineering feats as Egypt's Aswan High Dam and Turkey's Ataturk Dam, damage to the delicate balance in the world's ecosystem to such intrusions can be

even more awesome. The Aswan High Dam is currently collecting 120 million tons of silt each year as part of the yearly run off. This is the soil, which for millennia has enriched the shores of the Nile River Valley and made the land so abundantly fertile. Without that annual deposit of new enrichment, farmers have had to turn to chemical fertilizers. (Groll, CKulmatov, Ikramova, & Normatov, 2015). These fertilizers find their way down rivers in the form of field run off and degrade the soil with chemical build-up. Heavy irrigation also leads to a build-up of salt in the soil that destroys fertility. Prior to the construction of the dam, the natural flood cycle of the Nile would not only deposit silt that formed the basis of the rich farmland along the shoreline, but the rapid rise and fall of the river would provide a self-leaching action in which the accumulated salt in the soil would be washed away. Now that the river is maintained at an artificially high level throughout the year, the water table in the region has risen bringing the salt closer to the surface. When coupled with the lack of leaching action from the flood waters, the result is a constant build-up of salt in the once fertile soil. In addition, the containment of the silt by the dam has eliminated the yearly renewal of the delta region, leading to its erosion as well as the decline in the fertility of the delta soil. (Salloukh, 2017).

The Egyptians need to control the opening of the Aswan Dam and the Nile River containments to restore the flow of significant quantities of water and accompanying silt. Controlled release offers the potential for a solution to current irrigation, soil saline build-up, and loss of crop fertility problems in Egypt. In addition to these problems, the sinking of the pyramids and the infestation of the population with a formerly rare, but deadly bacteria in near epidemic proportions compounds this region's problems. Almost unbelievably the sinking of Pyramids and the bacterial epidemic are also directly related to water control. Despite wastage of 20 million gallons per day (average) through evaporation from Lake Nasser, scientists have shown that of the remaining water, a large quantity seeps into the ground and makes it waterlogged, thereby reducing its capacity to support heavy structures, e.g., the pyramids. (Onda, Crocker, JKayser, & Bartram, 2014). In travelling underground, the water also comes in contact with a snail known to be a carrier of a deadly bacterium. When the water reappears above ground in streams or is pumped out of wells, it brings the bacteria with it. Daniel Hillel in his book Rivers of Eden refers to the major irrigation projects as grandiose engineering schemes based on "one dimensional science" and "linear logic". He points out that the historic annual pulsation of the water table due to flooding created an automatic self-leaching cycle in which the salts were flushed away by the Nile itself. The root cause of conflict in the Middle East, Hillel argues, is in the destruction of the region's traditional way of life through ill-fitted modernisation and environmental degradation. Unable to sustain their traditional lifestyles and the ecological methods of farming, millions of farmers and rural folk are migrating from their land. They gather in overcrowded cities without infrastructure, adequate housing, sanitation or employment. The resultant deprivation and bitterness spawn's extremism. "The situation is made worse", Hillel argues, "by the precarious nature of the Middle Eastern states, which were deliberately designed as unstable systems by the European powers". The Kurds, for example, were divided between three different countries and much of Lebanon was consciously handed over to the minority Christians. Many political

decisions were deliberately taken to initiate the vicious cycle of unrest in the region. (Khan, 2017).

FUTURE ENVIRONMENTS

Geopolitical SituationA post 9/11 situation in the backdrop of war on terrorism has increased the apprehension many had about the clash of civilizations. Opinions about the Muslim world are judged in the pretext of terrorism only. The genuine and legitimate demands of Muslim world are no longer viewed from a balanced standpoint in UN. The land mark events of capture of Afghanistan,hunt for Osama Bin Laden, invasion of Iraq, capture of Saddam Hussein and the search for Weapons of Mass Destruction are some of the new names to the old desires of west to dominate the Middle East through the state of Israel. Every conflict has multiple overt and convert causes, and it may be that water will catalyse existing flammable ethnic, religious, or historical enmities. Conversely, environmental security issues, such as tensions over scare water resources, may serve as a useful vehicle to promote communication and goodwill among potential regional combatants. Thus, while it may lead to conflict, water resource scarcity may also advance the foreign policy objectives of the United States or any other nation. (· Boersma, Andrews-Speed, Bleischwitz, Johnson, Kemp, & VanDeveer, 2014).

Population

So long as the supply of fresh water is provided by the hydrologic cycle, the world's rising population primarily dictates the demand for water. The earth's population is growing faster than at any time in its history, with nearly 90 million people born each year. The current world population figures of 6 billion are too abstract for many people to grasp, but it can be put in context by following facts. At the beginning of the 20th century there were only 1.6 billion people, and in 1950, the world population was only 2.5 billion. It required from the beginning of time untilapproximately 100 years ago for the world's population to reach 1.6 billion. Today, less than a century later, the earth is home to an additional four billion. This exponential rate of increase is not predicted to taper off for some time. Developing nations, account for 95% of this population increase. It is difficult to see how the hydrologic cycle will keep pace with the demands of this exploding population. Increased development, industrialization, and growing affluence expand the per capita demand for water, in part because increased wealth generates demand for animal protein, such as beef and chicken, which require greater quantities of water[26]. (Caplan, 2015). An increasing population requires increased irrigation and dams, and generates ever-increasing quantities of untreated pollutants, both of which can affect adversely the quality of water in a state or region.

Thus, water passed to downstream users, even in water-rich regions, is often contaminated by toxic and hazardous wastes, pesticides, and fertilizer, its use may also be limited by increased salinity due to multiple iterations of irrigation. Some statistics indicate that global water demand for irrigation, household, and industrial use will increase faster than the rate of population growth.

Population growth increases the demands on governments struggling to maintain legitimacy in the eyes of their people. The figure that best communicates population pressure is doubling time, the time in which the population of a country is expected to double. With current population trends, the worldwide per capita supply of water will fall out by approximately 33% by the year 2025. If this situation comes to pass, one can expect additional competition for scarce resources, territorial encroachments, regional instability, and conflicts. In such an environment, certain concepts should be of importance to strategists to solve water conflicts. (El-Katiri, 2014).

International Laws / Obligations on Water Issues

Given the failure of the riparian states of the Middle East to agree on water issues, and the sensitivity of the wider world to conflict in the region, this would appear to be an appropriate scenario for the use of international law to settle disputes. However, drafting an acceptable body of law on riparian issues has been a difficult and long-drawn out process. Most treaties on water issues are bilateral and relate to a specific river or basin and there are few relevant multilateral treaties. Three groups, the institute of international law, the International Law Association and the International Law Commission of the United Nations (ILC), have drafted resolutions on international law covering riparian issues. Unfortunately, the resulting resolutions have embodied different interpretations of the rights, and wrongs, of the use of water by states from a common river source. The ILC, arguably the most authoritative body, drafted the UN Convention on the Law of Non-Navigational use of International water courses. The convention is based on equitable usage and an obligation not to cause appreciable hardships to other users. 9 El-Katiri, 2014). It is not the law but the will of people / states, which make any law a success or failure. In addition to the will or otherwise, international law, at least on this subject, is not very clear and mostly not adhered to by the states due to lack of any centralized enforcement body or mechanism. Some have suggested that all states giving aid, and the international funding agencies, should collaborate and demand an integrated economic development plan as the price for financial support. However, achieving the required level of collaboration among this diverse funding group could be as difficult as getting states to agree on the principles of international riparian law. International law is therefore unlikely to produce a solution to the impending water crisis unless the states concerned are themselves willing. (Majone, Villa, Deidda, & Bellin, 2016).

WATER A POTENTIAL SOURCE OF CONFLICT

History

What stands in the way of success of Middle East water crisis is neither the dearth of water nor any lack of engineering talent to make it available for consumption? International borders and ancient animosities that they engender are the barriers to solution of the water crisis. Interestingly these borders were arguably set, quite arbitrarily, by the European powers in such agreements as the Sykes-Picot accord of 1916.

Water Resources – A Common Heritage

Each of the four rivers crosses a number of international borders on its journey to the sea. When coupled with the long-standing animosities of the region, these border crossings can significantly impact otherwise sound opportunities for improvement. The dual "Peace Pipelines" of Turkey are an excellent case in point. The "Peace Pipelines" would have taken excess water from Turkey and distributed it throughout the region, but it generated little or no interest in the area. The lack of interest was largely attributed to the unwillingness to become dependent upon another nation for critical resources. "In this region, a Turkish Foreign Ministry official Burhan Ant stated in Ankara, interdependence is understood as the opposite of independence. Every country here seeks a kind of self-sufficiency in every field, because they don't trust others. A similar situation had occurred in the late 1970s when the late Egyptian President Anwar Sadat offered a proposal to build a pipeline from the Nile River to the Israeli Negev desert asa demonstration of friendship. Many other countries along the Nile River objected as did some people in Egypt, but possibly the most telling objections came from Israelis who believed it was dangerous to depend upon a former enemy for such a vital resource as water. (Qin, Kong, Liu, He, Yang, Jorgensen, 2014).

History of Conflict

There is a long history of conflict over water issues. In the 1950s, fighting broke out between Israel and Syria across the demilitarized zone, when Syria attempted to stop Israel frombuilding its National Water Carrier system. When Syria subsequently tried to divert the headwaters of the Jordan River away from Israel in the mid-1960s, Israel used air strikes to take down the water diversion facilities. These military actions were the precursors to the 1967 Arab-Israeli War, whichled to the occupation of West Bank and control over much of the headwaters of Jordan by Israel. In the final stages of the 1967 War, Israel shelled the Unity Dam site shared by Jordan and Syria on the Yarmuk River. In 1975 Syria and Iraq nearly went to war after the Iraqis dispatched troops to the Syrian border. Disagreement was the sharp drop in water level of Euphrates caused by Syria and Turkey filling reservoirs behind two new dams. One promising aspect of this latter incident was the attempt to involve the Arab League in mediation of the situation. (Pappé, 2014).

An agreement was reached through the good offices of Saudi Arabia. Additional water was made available to Iraq and open conflict was averted. When Turkey was approached about turning off the water to Iraq during the Gulf War, it refused, stating it would never use water as a weapon. This, a positive sign, clearly indicates Turkish sensitivity to the threat that it poses to other nations. However, this Turkish maturity is somewhat newly acquired. Only the year before Turkey had threatened to cut off water, if Syria did not cease fomenting discontent amongst the Turkish Kurds. Neither the Iraqis nor the Coalition Forces seemed to have any prohibition concerning the use of water as a weapon during the Gulf War. The retreating Iraqis destroyed most of Kuwait's extensive desalination capacity, and the oil spilled into the gulf threatened to contaminate desalination plants throughout the region. The destruction of Baghdad's modern

water supply and sanitation system bythe Coalition Forces was so complete that the Iraqis are still suffering severe problems. (Owusu, Asumadu-Sarkodie, & Ameyo, 2016).

National Security Implications

Shortage of water in the Middle East is a source of considerable economic and human angst. Former Secretary General of the UN, Boutros Ghali, (when Finance Minster of Egypt), late King Hussein of Jordan, and the late President Anwar Sadat of Egypt all stated that water was the single issue that could still force their respective countries to war. Middle East is a region in flux. Significant progress was made in the peace process involving Israel, Jordan and the Palestinians. Syria was a participant in the coalition against Iraqi aggression, and had initiated open dialogue with the western world. All these changes were heading in positive directions. But the uncertainty of post 9/11, invasion of Iraq and close proximity of Syria has affected the country directly. Further continuation of change in the Syrian society may well endanger the status of the current ruling party, which is supported by less than 15% of the population. Turkey has seen a change in its position of importance within NATO with the demise of the Soviet threat. When coupled with its internal domestic and political problems, one sees a country that has lost some ofits stability. Egypt is also a nation in crisis between runaway population growth, and domestic unrest sponsored by a growing Islamic radical movement fed by continuing economic difficulties. (Owusu, & Asumadu-Sarkodie, 2016).

Even the seemingly positive events surrounding the likely return of the Golan Heights have serious stability repercussions. Recent debate in Israel has raised the consideration that the withdrawal from the Heights will slash the available warning time should Syria take offensive action against Israel. The net effect of this lost reaction time may put tremendous pressure on Israel to take pre- emptive action even while Syrian actions are subject to interpretation. Middle East is very importantin geopolitics and the competition over scarce water resources in such an arid region qualifies for serious consideration. (Zografos, Goulden, & Kallis, 2014).

Political Implications

Tension has mounted between Turkey and Iraq over the use of the Tigris and Euphrates Rivers, which originate in Turkey and flow through Iraq. Turkey has invested time and effort into projects designed to augment their process of development, and one of their fundamental goals is to develop water resources within their borders. Turkish government plans to use irrigation and power generation potential of the Tigris and Euphrates to maintain and expand their industrial and agricultural goals, which would be devastating for Iraq. Construction of Turkish hydroelectric dams would mean an approximately 66% decrease in Iraqi water supplies. The conflict of interests is critical. Turkey needs the water to develop; Iraq needs the water to survive. Turkey, with its abundant water resources, stands to be in a position of a major regional power in the future. (Moore, 2014). The Turkish government is making plans to sell water from the Sihoon and Jihoon rivers to Arab nations in exchange for goods and services it requires. The Arab need for water is far greater than the Turkish need for the goods and the exchange will be very one-

sided. Furthermore, if the Arab nations succeed in purchasing Turkish water, they have a distinct advantage over nations like Iraq and Syria. Turkey can also hold the threat of dams over Iraq, demanding oil in exchange for leaving the river networks alone. The potential for conflict rises as rapidly as the water dwindles. It is possible that a strong alliance between Israel and Turkey along with Upper Nile counties such as Kenya, Uganda and Ethiopia could prove disastrous for the nations sandwiched in the middle. Shouldsuch an alliance occur; would Egypt, Sudan, Syria, Iraq, Jordan, Lebanon and West Bank face the possibility of having their water supply cut off? In that event, the dry countries may not be able to summon the military power to defend their right to fresh water. The agreements reached can easily be disregarded in the volatile Middle East. (Zarfl, Lumsdon, Berlekamp, Tydecks, & Tockner, 2015). Jordan and Israel signed an accord in which Jordan was allotted 50 million cubic meters of water. Despite Jordan'\s historical and natural right to the water, Israel chose not to abide by those terms of the treaty. There are no real mechanisms to force Middle Eastern countries to abide by water agreements, and there is no real way to punish them if they choose not to follow the terms of such agreements. The situation is dismal, and it will continue to deteriorate until assured agreements under some international safeguards can be reached about water and its use. Battles fought over Middle Eastern land and oil have been explosive and violent, but compared to land and oil water is critical for survival. Many predict that nothing will compare to the carnage of a war over water. (Watson, Dudley, Segan, & Hockings, 2014).

Attempts to Control Water Crises

In the post-cold war era population growth, advanced media andease of travel gave birth to a new culture of global village. These changes are becoming international as more and more people across national borders to search for work, food, and better living conditions. It has become vital for all the nations of the world to examine their national policies keeping in view the new realities. Desalination has become an important technological development in the search for fresh water for many Middle Eastern countries. The process involves processing seawater and removing the salt and chemicals. It seems to be the perfect solution as many water-starved nations have access to coastal territory. However, desalination is not without drawbacks and problems. Building the plants requires huge investment and continuous flow of energy. Producing energy at large scale yields pollution. The plants have a definite life and are good vulnerable targets. Many Saudi Arabian desalination plants were damaged by Persian Gulf oil leaks, and Iraqi troops were ordered to disable Kuwaiti desalination plants during the Gulf War in 1991. (McDonald, Weber, Padowski, Flörke, Schneider, Green, Balk, 2014).

Many international agencies have committees or special projects set up to deal with global water conservation. There are also a few organizations that deal solely with water issues. Green Cross International (GCI) is emphasizing the need for co-operation between Middle Eastern states to bring about long-term solutions. For GCI, it is critical for Middle Eastern nations to work together, combining all their technology and research to find a common solution that will benefit all. Sadly, it is difficult to stem consumption of ground water and to control desalination when

the countries thatare consuming or desalinating water are driven by a demon like thirst. Humans can live weeks without food, but only about 3 days without water. (Madani, 2014).

CRISIS RESOLUTION METHODOLOGIES

Future of Water and the Middle East

What will the future hold for the Middle East? Without a solid and concrete approach to the problem, involving all nations and giving every state an equal opportunity to work for a solution, the outlook is bleak. It is tempting for states with more water to take advantage of their superior resources at the expense of states with little water in order to turn
a profit. It is also tempting for the waterless states to fight states with water to provide for its citizens. A war can, however, only provide a short-term solution. If Middle Eastern states work together to solve the water crisis, the benefits are two-fold. First, the crisis itself will be averted. Secondly, the co-operation will build mutual trust and respect. It may provide the opportunity for a lasting peace in an area plagued by war. U.S and Western countries would remain not immune to water shortage and the tensions associated with it. A water war in the Middle East would affect the West in many ways, including rising fuel costs and diminished trade with that area. By sharing western technology and combining it with Middle Eastern experience in water conservation, we maycome up with an answer to the water problem. (Postel, 2014).

Water Distribution Mechanism

Only a comprehensive global policy, implemented by forcing the hostile nations in the region to co-operate with each other in the name of the environment, peace and mutual survival, will avert a cataclysmic water war. UN must restructure International Law to force compliance to shared use of the available water. Peter Gleick emphasized these issues quite forcefully in his articles "Water and Conflict: "Freshwater Resources and International Security". "International Security 18". Such laws must equally be applied to stop the use of the environment asan issue of conflict, prevent conflicts over access to resources, and avert military responses to the consequences of environmental dangers. In the international arena, politics, economic, and other factors have traditionally been considered more important than using International Law to protect environmental resources. (Lawless, & Blake, 2016). Current situation regarding fresh water in the Middle East requires implementation of international law and directives with same effectiveness as those concerning non-proliferation and control of environment (Kyoto protocol). Both Isaac and Peter Gleick in their book "Water and Peace in the Middle East" argue that the UN and international aid agencies must co-operate by using International Law and the UN charter on peaceful resolution of disputes, to create an effective compromise over these overused water resources. International Law is completely ineffective regarding regulation, distribution, management or sharing of water without any enforcement mechanisms. International bodies, along with the US, must develop 'teeth' to back up and implement their policies and mandates. Sanctions must be put on nations that violate any International agreement. (De Chatel, 2017).

A large part of the Middle Eastern resource dispute concerns the equitable utilization of shared waters. The uneven distribution of resources such as water is one of the key factors posing a risk to international peace in the future. When a nation like Israel feels like they are being treated unfairly solely because they are downstream from the main water supply, which is controlled by their Arab neighbours, it is easy to see how a conflict is within the realm of possibility. Therefore, these nationsmust share data on disputed water resources to promote co-operation. With the assistance ofinternational joint commissions, which base themselves and their action on the principles outlined inthe UN charter, the development and success of co-operative measures in the Middle East can be achieved. (Lonergan, 2018). However, first of all a comprehensive law needs to be made at international level, whichwould be comprehensive and positively endorsed by all, then the mechanism for its implementationbe checked out. All parties must be included in treaties and they should be flexible enough to adaptto long-term changes and new developments in water resource data. The outlining of these basicconcepts and their implementation should be made effective through international commissions. (Goldschmidt 2018). United States must play a vital and leading role in brokering of a peaceful settlement in a conflictover water. Solutions may be difficult and complicated due to varying ethnic, ideological, politicaland religious tensions. Peter Rogers in his book Water in the Arab World concludes that, "Theanswer to the water crisis should not be a quick fix through water transfer. The initial phase of anaction plan should emphasize a joint institutional approach to sustainable management based onthe exchange of information and experience and the design of viable options to benefit thecountries sharing water resources". Desalination, storing and directing water are other technologicalsolutions. The situation is delicate and these solutions must be examined in greater detail beforedeveloping an ultimate solution acceptable to the entire Middle East. (Shiva, 2016).

Over the next few decades an absolute limit will be reached on the availability of water in the Middle East. By the year 2025, one-third of the world's population will face an acute water shortage and much of this shortage is centralized in the Middle Eastern region because too many nations are fighting over limited resources. The solution would be to develop a way to increase the amount of water available from what is currently thought to be achievable. Thus, a viable alternative to the problem is to find and extract additional water from the sea. Unfortunately, because of contamination problems, desalination has become an extremely difficult and complex task. The desalination issue must be considered seriously because the amount (of water) at our disposal is simply not sufficient to meet the essential demands. Desalination projects are very costly and, asyet they may not be cost-effective or of competitive value. But when one takes into account the exponential population growth and the 10-20 years' time frame that a project of this magnitude would take to implement, the nations in the Middle East must begin to plan now for their survival in the future without adequate reserve of freshwater. This is stressed in a report by Isaac, in his book 'Water and Peace in the Middle East'. "We are at the end of the era of freshwater as our sole resource; we must adapt ourselves towards desalination. This process requires a carefully planned multidisciplinary approach"(Chatterji, Arlosoroff, , & Guha, 2017).

Isaac and others advocate the use of solar powered desalination as a realistic solution to solve the shortage of water problems in the next 50-100 years. Along with their ability as the world's peacemakers and law enforcer the US and some of the Western countries have the technical expertise and the resources to assist the region to develop cost-effective desalination plants. US andother Western countries are the only trusted mediators able enough to overcome Arab-Israel and Inter-Arab enmity. The best way that this could be achieved is through solar-powered desalination ofbrackish groundwater. This would clean up the contamination problems currently associated with the main seashore aquifer in the Middle East. International consortium such as the UN should help in providing the funding, expertise, and protection of the desalination plants as a part of its policy on international peace and global environmental protection and earth's resources management for sustainable development (Postel, 2014). Some contend that desalination is too costly, but a conference in the summer of 1996 revealed that the cost of desalination has decreased to $.50 per cubic meter, which is cheaper than importing water or building peace pipelines. But, as Peter Rogers indicates in his book Water in the Arab World, desalination is still three to four times more expensive than conventional sources of freshwater. He agrees with Isaac and finds that the cost of water desalination would be around, $.40 to $.60 per cubic meter. Isaac concludes his article on desalination by declaring that, "We are at the end of the age of dependence upon natural freshwater resources, and that we must adjust, and look towards desalination. This process requires cooperation between Israel and Jordan, in order to implement a carefully planned multidisciplinary approach. Both parties bear the responsibility for beginning a new trend in the most vital matter for essential human survival; we can bear the burden if we start a new era of co-operation. Environmental threats will replace nuclear weapons as the largest threat to the international political arena in the twenty-first century. International policy must quickly adjust to be able to predict and react to these challenges. International co-operation and desalination are only two examples of possible regional solutions. Other ideas range from mountain aquifers, dams, and peace lines, all of which contain both positive and negative sides. The water shortages in the Middle East will continue to be a major source of conflict in the region until a multilateral plan is developed to appease each nation. Most definitely, it is not a simple task.

CONCLUSION

Water supply in the Middle East is a complex issue with significance hard to appreciate by those from temperate northern latitudes. Due to the region's arid climate, water has always been a core national concern, however, the supply is reliant on the exploitation of four main rivers, the Jordan-Yarmuk, the Nile, the Tigris, and the Euphrates. The demand is threatening to exceed sustainable supply, making water a possible cause of conflict. Three sets of factors, regional politics, the scale of increase in demand and the availability exploitation of alternative supplies of water, will determine whether the water crisis will culminate into a war in the region or otherwise. Water supply is inextricably enmeshed in the factious, antagonistic web of regional politics. In the

Jordan Valley, all issues are dominated by the Arab-Israeli conflict. For Israel, water is a vital resource for the creation and development of the Jewish State. Water has also been used as a tool in the pursuit of wider political goals, for example in the expulsion of the Palestinians from Jordan. The hostility of her neighbours means Israel is only willing to release control of this key asset if it's supply, and her national security, are assured. Jordan, equally reliant on the Jordan River, is too weak to be able to dictate solutions and suffers most from the riparian conflict. Lebanon has a relatively plentiful watersupply that is coveted by her stronger neighbours. Syria's main goal is the restoration of her territorial integrity without making major concessions to Israel; water is a tool in the pursuit of that aim. Conversely, Syria's central concern in the Tigris-Euphrates Basin is water supply. Turkey, Syria and Iraq have vigorously pursued their own water management plans with little regard for the interests of their neighbours. All are reliant on the exploitation of the Euphrates for their future economic success. Once again, water supply is complicated by wider political factors including a border dispute between Turkey and Syria, long-standing personal animosity between the leaders of Syria, Turkey and Iraq, the Kurdish issue and Iraq's isolation following the second Gulf War.

Water is, therefore, a vital national interest of all states and one on which their future economic success depends. Yet, there is no tradition of co-operation over water supply; instead, it has been a source of friction and conflict. The causes of dispute remain and there is little sign of an emerging consensus. Global factors are dramatically increasing the demand for water. The Middle East's population growth, one of the highest in the world, will significantly increase domestic demand. Urbanisation, industrialisation and higher standards of living will exacerbate the problem. Global warming is likely to reduce the available water supply while political considerations will prevent a reallocation of water away from the agriculture sector, the major user of water in the area. The increase in demand has already started and will escalate rapidly in the near future. Some states, particularly Israel, are undertaking major water conservation programmes, expanding their desalination capacity and improving the utilization of existing resources. These measures can only delay demand exceeding supply, not prevent it. Other states lack the resources or technology to improve their water usage. There are proposals for co-operative ventures that could provide alternative water supplies but none have so far received the political support essential to transform them into reality, due to vested interests. While all states recognise water supply as a problem, none have found a way to separate this issue from the long history of suspicion and antagonism that typifies international relations in the area. When demand does exceed supply, water may be used above the sustainable rate. These problems are exemplified in the Occupied Territories, now increasingly under the control of the Palestinian Authority.

International law on riparian issues is not clear-cut and states have widely differing interpretations, suiting their own convenience. Furthermore, international law is not mandatory or easily enforced. There is no generally accepted arbitration system to defuse water disputes. In sum, demand for water is rapidly outstripping sustainable supply in the Middle East and there is

no sign of states co- operating to find a solution. This will cause a confrontation and the issue is vital enough to cause war. The intense international pressure and the strong military powers of Israel and Turkey, the states who currently control the water supply, may prevent a war on this issue. However, given the fractious history of the area and the central importance of water, this may perhaps be an optimistic view. The last war in the Middle East was over oil; if there is another war, it will almost certainly be over water.

Finally, the water crisis in the Middle East is inexorably interconnected with political, economic, geographical and religious issues. The water environment is diverse and dynamic. It is vast and encompasses many countries with histories of conflict over many issues. Therefore, there is not quick solution to the present problems. But there is no doubt that a comprehensive solution must be found to avert the present crisis turning into a catastrophic conflict in the near future. It's not merely for the short-time interest of the people of this region, but for the survival of mankind, that co-operation and mutual understanding need to be established wherever there are problems and conflicts over water resources. Failing this will erode the delicate balance in our eco-system and eventually affect all human being.

RECOMMENDATIONS

In order to solve the water crises in the region the following recommendations are made: -

a. There are two basic categories of solutions to water resource limits: Increasing freshwater supply, by increased catchments of winter floodwater, importing water, wastewater reclamation,

and desalination of seawater, or decreasing freshwater demand by using water-efficient techniques in agriculture.

b. An efficient system to recycle the city wastewater for high value agriculture should be looked into. This would ensure more crops per drop of water.

c. Activate the role of civil society local communities, women, the private sector, the non-governmental organisations and other institutional actors in resolving the problem.

d. International law regarding water distribution, control of pollution and treatment of water, before it leaves the frontiers of a state, should be formalised. The UN should enforce this law and introduce a mechanism to check its implementation.

e. The regional countries must develop cooperation for joint undertakings for the explorationof water resources and their even and fair distribution.

References

Aggestam, K., & Sundell-Eklund, A. (2014). Situating water in peacebuilding: revisiting the Middle East peace process. Water International, 39(1), 10-22.

Beaumont, P., Blake, G., & Wagstaff, J. M. (2016). The Middle East: a geographical study (Vol. 13): Routledge.

Boersma, T., Andrews-Speed, P., Bleischwitz, R., Johnson, C., Kemp, G., & VanDeveer, S. D. (2014). Want, waste or war?: the global resource nexus and the struggle for land, energy, food, water and minerals: Routledge.

Böhmelt, T., Bernauer, T., Buhaug, H., Gleditsch, N. P., Tribaldos, T., & Wischnath, G. (2014). Demand, supply, and restraint: determinants of domestic water conflict and cooperation. *Global Environmental Change, 29*, 337-348.

Caplan, N. (2015). Futile Diplomacy, Volume 3: The United Nations, the Great Powers and Middle East Peacemaking, 1948-1954: Routledge.

Chatterji, M., Arlosoroff, S., & Guha, G. (2017). Conflict management of water resources: Routledge.

De Chatel, F. (2017). Water sheikhs and dam builders: stories of people and water in the Middle East: Routledge.

Duan, W., He, B., Nover, D., Yang, G., Chen, W., Meng, H., . . . Liu, C. (2016). Water quality assessment and pollution source identification of the eastern Poyang Lake Basin using multivariate statistical methods. Sustainability, 8(2), 133.

El-Katiri, L. (2014). A roadmap for renewable energy in the Middle East and North Africa.

Elsayed, E. A., El Enshasy, H., Wadaan, M. A., & Aziz, R. (2014). Mushrooms: a potential natural source of anti-inflammatory compounds for medical applications. Mediators of inflammation, 2014.

Famiglietti, J. S. (2014). The global groundwater crisis. *Nature Climate Change, 4*(11), 945.

Goldschmidt Jr, A. (2018). A concise history of the Middle East: Routledge.

Groll, M., Opp, C., Kulmatov, R., Ikramova, M., & Normatov, I. (2015). Water quality, potential conflicts and solutions—an upstream–downstream analysis of the transnational Zarafshan River (Tajikistan, Uzbekistan). *Environmental Earth Sciences, 73*(2), 743-763.

Khan, S. (2017). Nuclear proliferation dynamics in protracted conflict regions: a comparative study of South Asia and the Middle East: Routledge.

Kuniholm, B. R. (2014). The origins of the Cold War in the Near East: Great power conflict and diplomacy in Iran, Turkey, and Greece: Princeton University Press.

Lawless, R., & Blake, G. (2016). The Changing Middle Eastern City: Routledge.

Lonergan, S. C. (2018). Water and conflict: Rhetoric and reality Environmental conflict (pp. 109-124): Routledge.

Mabon, S. (2015). Saudi Arabia and Iran: power and rivalry in the Middle East (Vol. 132): IB Tauris.

Madani, K. (2014). Water management in Iran: what is causing the looming crisis? Journal of

environmental studies andsciences, 4(4), 315-328.
Majone, B., Villa, F., Deidda, R., & Bellin, A. (2016). Impact of climate change and water use policies on hydropower potential in the south-eastern Alpine region. *Science of the Total Environment, 543*, 965-980.
Maystadt, J.-F., Tan, J.-F. T., & Breisinger, C. (2014). Does food security matter for transition in Arab countries? FoodPolicy, 46, 106-115.
McDonald, R. I., Weber, K., Padowski, J., Flörke, M., Schneider, C., Green, P. A., . . . Balk, D. (2014). Water on an urbanplanet: Urbanization and the reach of urban water infrastructure. Global Environmental Change, 27, 96-105.
Moore, C. W. (2014). *The mediation process: Practical strategies for resolving conflict*: John Wiley & Sons.
Olsson, G. (2015). *Water and energy: threats and opportunities*: IWA publishing.
Onda, K., Crocker, J., Kayser, G. L., & Bartram, J. (2014). Country clustering applied to the water and sanitation sector: A new tool with potential applications in research and policy. International journal of hygiene and environmental health, 217(2-3), 379-385.
Owusu, P. A., & Asumadu-Sarkodie, S. (2016). A review of renewable energy sources, sustainability issues and climatechange mitigation. *Cogent Engineering, 3*(1), 1167990.
Owusu, P. A., Asumadu-Sarkodie, S., & Ameyo, P. (2016). A review of Ghana's water resource management and thefuture prospect. Cogent Engineering, 3(1), 1164275.
Pappé, I. (2014). *The modern Middle East: a social and cultural history*: Routledge.
Postel, S. (2014). The last oasis: facing water scarcity: Routledge.
Prüss-Ustün, A., Bartram, J., Clasen, T., Colford, J. M., Cumming, O., Curtis, V. Fewtrell, L. (2014). Burden of disease from inadequate water, sanitation and hygiene in low-and middle-income settings: a retrospective analysis of data from 145 countries. *Tropical Medicine & International Health, 19*(8), 894-905.
Qin, N., He, W., Kong, X.-Z., Liu, W.-X., He, Q.-S., Yang, B., . . . Jorgensen, S. E. (2014). Distribution, partitioning and sources of polycyclic aromatic hydrocarbons in the water–SPM–sediment system of Lake Chaohu, China. Science of the Total Environment, 496, 414-423.
Salloukh, B. F. (2017). Persistent permeability?: regionalism, localism, and globalization in the Middle East: Routledge.
Selby, J., & Hoffmann, C. (2014). Beyond scarcity: rethinking water, climate change and conflict in the Sudans. GlobalEnvironmental Change, 29, 360-370.
Shiva, V. (2016). Water wars: Privatization, pollution, and profit: North Atlantic Books.
Shiva, V. (2016). Water wars: Privatization, pollution, and profit: North Atlantic Books.
Smith, D. (2014). The state of the Middle East: an atlas of conflict and resolution: Routledge.
Tsiouri, V., Kakosimos, K. E., & Kumar, P. (2015). Concentrations, sources and exposure risks associated with particulate matter in the Middle East Area—a review. Air Quality, Atmosphere & Health, 8(1), 67-80.
Watson, J. E., Dudley, N., Segan, D. B., & Hockings, M. (2014). The performance and potential of protected areas.Nature, 515(7525), 67.

Whittington, D., Waterbury, J., & Jeuland, M. (2014). The Grand Renaissance Dam and prospects for cooperation on the Eastern Nile. *Water Policy, 16*(4), 595-608.

Zarfl, C., Lumsdon, A. E., Berlekamp, J., Tydecks, L., & Tockner, K. (2015). A global boom in hydropower damconstruction. Aquatic Sciences, 77(1), 161-170.

Zografos, C., Goulden, M. C., & Kallis, G. (2014). Sources of human insecurity in the face of hydro-climatic change.Global Environmental Change, 29, 327-336.