The Future of Conflict over Water in Arid Climates

A Major Qualifying Project
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Abstract

Purified water is essential to human life. However, it is not evenly distributed worldwide. Climate change has decreased arid regions' access to clean water. Because of water's necessity to life, the need for countries to quench their population's thirst could lead to international conflict. This paper evaluates ways to prevent a water war and the likelihood of it occurring through conducting interviews with five water experts. Each interviewee was familiar with a different Middle Eastern or North African (MENA) country. The findings concluded that while a water war is possible, advances in technology (like desalination and water reuse) along with increasing infrastructure strengthen a country and ultimately ease the tension on water supply.

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I would also like to thank all of my interviewees for taking the time to share their expertise with me. Without their input, I would not have been able to draw conclusions. Their openness and willingness to enlighten me about their water conflict knowledge greatly educated me on the topic.

Finally, I would like to thank Professor Hansen for sharing his knowledge regarding the INGS MQP. He was always willing to answer my questions and help clarify the requirements for the major.

Executive Summary

Introduction

There are limited freshwater sources on Earth. This limit causes a strain on populations because of humankind's need for fresh water to live. The conflict between the necessity of water and the inability to provide for all in need has risen over the past few decades. Arid regions face the problem of water scarcity because of their climate and population. Arid climates cause a dry atmosphere, which leads to high evaporation rates. Thus, dry arid climates tend to be associated with limited natural water resources. Global climate warming also causes already arid regions to be raising in temperature and thus, further limits access to water. Along with a decrease in water access, populations worldwide are increasing. With population growth comes a higher demand for purified water. This discrepancy between the supply and demand of purified water causes strain in countries like the Middle East.

There are multiple evolving technological advances to ease the tension on the supply chain including desalination and water reuse. Desalination is the process of removing salt and other impurities from water to produce water that is safe to consume. Water reuse purifies wastewater (whether industrial or human-made) to safe drinking conditions. However, these technological advancements cost a great deal and have led to discrepancies between countries that can support their population with technology and the countries that cannot meet their needs because of limits in the economy. This divide could lead to interstate and intrastate conflicts over water.

Background

MENA is an acronym for countries in the Middle East and North Africa. The difference in the percentage of the world population that lives in MENA (6%) and the percentage of the

world's access to freshwater that MENA has (1.4%) showcases the discrepancies in the MENA region's economics and resources. Within the MENA region, there are wealthy countries and countries not doing well economically. With the rise of technological advancements, wealthy countries began investing in desalination and water reuse plants. Desalination is used more than water reuse because of the cultural barriers many populations have with water reuse.

Methodology

The goal of this project is to best understand possible future outcomes between countries over water usage. The objectives are as follows:

1. Understand the history of water and human conflict in the Middle East Region
2. Understand potential water conflicts of the region.
3. Generate future scenarios about potential conflicts in the region.

Findings

This study explored expert opinion on water conflict in the MENA region. Interviews were held with water experts of differing specialties and thus differing ideas of methods to increase water supply in the midst of a water crisis. A finding that emerged from the data was the consensus about how beneficial current technological infrastructure is.

Multiple interviewees mentioned that while wealthy countries are investing in research to make desalination processes more economical, the nations not as economically strong cannot even consider desalination as a supply option. Another large technological advancement discussion in interviews is water reuse. Water reuse is a very plausible option to the interviewees; however, it likely will not be sufficient as the sole water supply option because of population hesitancy. One interviewee emphasized that these infrastructure advancements are necessary to solve the world water crisis.

Some other solutions mentioned by interviewees include patroling a freshwater source, updating pipes, and moving water-dense crops out of arid regions.

Discussion

The findings are important because they evaluate ways to decrease strain on the supply side of potable water. The results hold information on how to provide water to a thirsty community to minimize the possibility of conflict.

A possible next step to further understanding the water crisis is conducting further research on intrastate conflicts versus interstate conflicts. Analyzing the difference between the likelihood of a civil war and a world war informs researchers of where to focus preventative measures. The other two recommendations are to create a respectable water policy between nations and create an international research group/institution to further evaluate international water conflict.

Conclusion

While all interviewees did see a possibility for large-scale conflict over water, none seemed to think it was likely to occur immediately. The countries that are most struggling in finding and providing potable water have realized that war brings lots of damage. The interviewees found countries are focusing on ways to increase water supply and there are lots of alternative methods to explore before starting a water war.

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1.0 Introduction

One of the reasons the Earth can sustain life is because it is the only planet with water in all forms- gas, liquid, and solid. Water provides strength and nourishment to organs, it assists in digesting food, allows bones to move smoothly, regulates body temperature, and helps fight off illnesses, to name some functions. Humankind, however, relies on purified water. This form of water is a very limited resource and not spread evenly across the planet. The conflict between the necessity of water and the inability to provide for all in need has risen over the past few decades.

Regions without the necessary access to water for the size of their population are primarily in arid regions. Some of the arid regions worldwide include the Western coast of South America and the United States, the southwestern region of Africa, and most notably northern Africa and the Middle East. These arid climate regions face the problem of water scarcity because of the climate and population. Arid climates cause a dry atmosphere, which leads to high evaporation rates. Thus, dry arid climates tend to be associated with limited natural water resources. Global climate warming also causes already arid regions to be raising in temperature and thus, further limiting access to water. Along with a decrease in water access, populations worldwide are increasing. With population growth comes a higher demand for purified water. This discrepancy between the supply and demand of purified water causes strain in countries like the Middle East.

There are multiple evolving technological advances to ease the tension on the supply chain including desalination and water reuse. Desalination is the process of removing salt and other impurities from water to produce water that is safe to consume. Water reuse purifies wastewater (whether industrial or human-made) to safe drinking conditions, which is usually set by water treatment experts of the area. However, both of these methods require a lot of energy

and thus cost a great deal. This limits the amount of plants countries can build based on what their economy can support. Discrepancies have evolved between countries that can support their population with technology and the countries that cannot meet their needs because of limits in the economy. For example, the United Arab of Emirates (UAE) has built up dozens of desalination plants that now support the majority of their freshwater supply. However, because of South Sudan's relative newness as a country and civil unrest over the better part of the past decade, they do not have the finances to create a water reuse plant and they don't have water access to create a desalination plant.

Ultimately, purified water is needed for human life, but global warming is shrinking access to freshwater sources and the increasing global population is increasing demand for purified water. This global issue divides countries up by their ability to provide for (or create ways to provide for) their population's water needs. This divide could lead to interstate and intrastate conflicts over water.

This paper explores interstate and intrastate conflict in the Middle East and North Africa. The goal of this project is to best understand possible future outcomes between countries over water usage. To meet this goal, interviews were conducted with five experts that work with water on an international scale. These interviews asked questions aimed to gain their insight into the water crisis, especially in relation to the country they are most familiar with. The interviewees were experts in countries with a variety of economic levels, as well as scientific and political stances. Some similarities found between interviews were the success of technological advancements like desalination and water reuse. Infrastructure has shown notable increases in water supply and is seen by some as a necessary step to solving the water crisis. While the interviewees did speak of a possibility for international conflict over water, none seemed to think

it was likely to occur in the near future. This paper is split into 6 primary sections: Introduction, Background, Methodology, Findings, Discussion, and Conclusion. The next section, Background, will dive further into some preliminary knowledge about the water crisis.

2.0 Background

The Background section consists of sections 2.1- Desalination, 2.2- Water Reuse, and 2.3- Conclusion. This section lays out background information regarding the research conducted for this paper. While a defining trait of the Middle East and Africa's topography is desert land, it has not always been an arid climate. Scientists have studied geology and the ever-evolving earth for centuries (Dennis Dean, 1992). Some of these findings, like the creation and separation of the landmass commonly known as Pangea, describe changes in a land's location, climate, etc. (Le Pichon et al., 2021). To further investigate the previous environments of current arid climates, scientists explored deeper, older land in these regions and discovered a large crocodile skeleton in Tunisia (Fanti et al., 2016). Thus, the land the skeleton was found in had to be able to support a creature with a primary mode of transportation being through the water.

The location of continental and oceanic plates has changed thus causing temperature shifts worldwide. Most of the large changes, like continental movement or a transition between an ice age and a time of global warming, occur over many human life spans (Edward J. Tarbuck et al., n.d.). We are currently in a new epoch- the Anthropocene which began with the commencement of human's impact on the ecosystems and geology of Earth. However, because of industrialization, some changes have been notable in temperature across the Earth over a single human lifetime. Mining for nonrenewable resources and burning them leads to an increase of greenhouse gases, which absorb the sun's heat and trap it in Earth's atmosphere, causing a rise in temperature world-wide. A warmer environment leads to lots of other problems like evaporation and melting of the ice caps (Cook et al., 2016). This change in the amount and quality of water affects the access countries have to safe, drinkable water. Figure 1 below showcases the availability of natural sources of fresh water worldwide. The darker blue colors

represent nations that have a high amount of freshwater resources, like Russia and Canada. The countries with the least access to fresh water are represented in orange, like the UAE and Libya. This map showcases that countries in Northern Africa and the Middle East have scarce fresh water available.

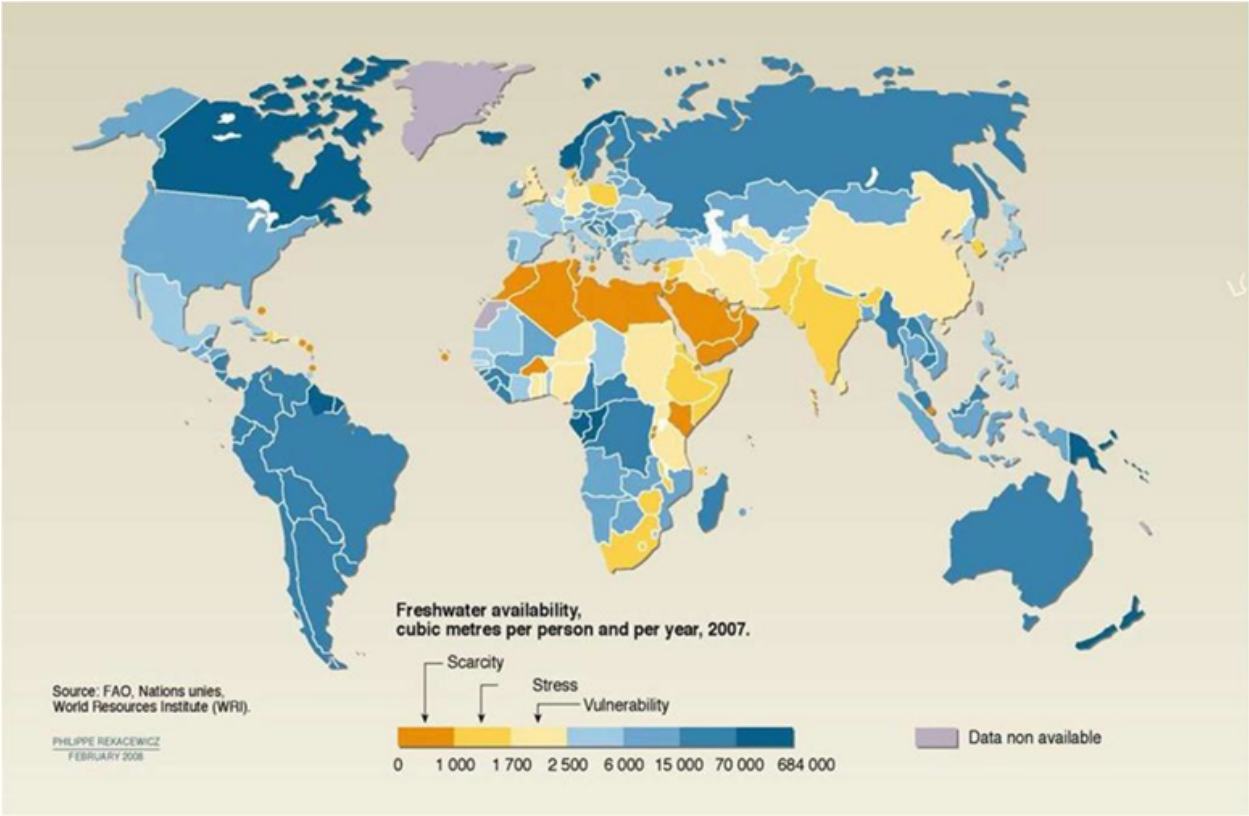

Figure 1: *Freshwater Availability* (*Freshwater Availability*, 2008).

According to The World Bank, renewable water resources have decreased by 75% between 1950 and 2000 in countries in the Middle East and Northern Africa. (Lampietti et al., 2009). The line is predicted to continue to decrease, by almost 40 percent by 2050.

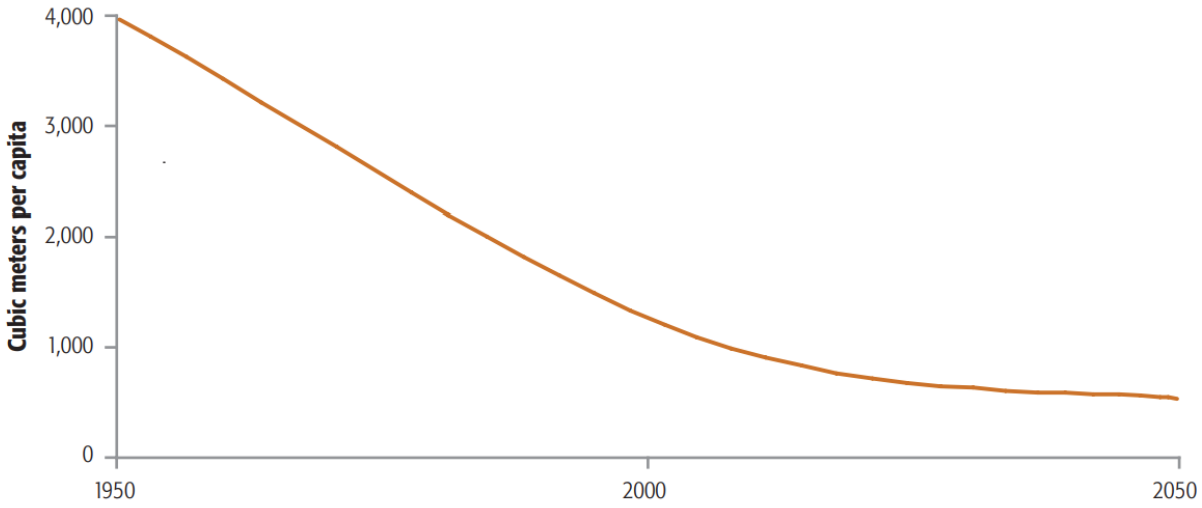

Figure 2: *Graphical representation of Arab Countries' water stress from 1950-2050* (Lampietti et al., 2009).

The MENA region is an acronym for countries in the Middle East and North Africa that hold approximately 6% of the world's population (*Population, Total - Middle East & North Africa | Data*, n.d.). Additionally, it holds approximately 66% of the world's access to oil, but only 1.4% of the world's access to fresh water (Llamas & Custodio, 2002). The 4.6% difference of the world population that lives in MENA (6%) and the percentage of the world's access to fresh water (1.4%) showcase the percentage of the population that does not have access to drinkable water. Figure 3 below better indicates water supply in countries in MENA graphically. The black line at 1000 m^3/person/year is the water scarcity threshold. Hence, any country below this line would be considered to have scarce access to water. The only countries above the line are Iran, Iraq, Turkey, and just barely Lebanon.

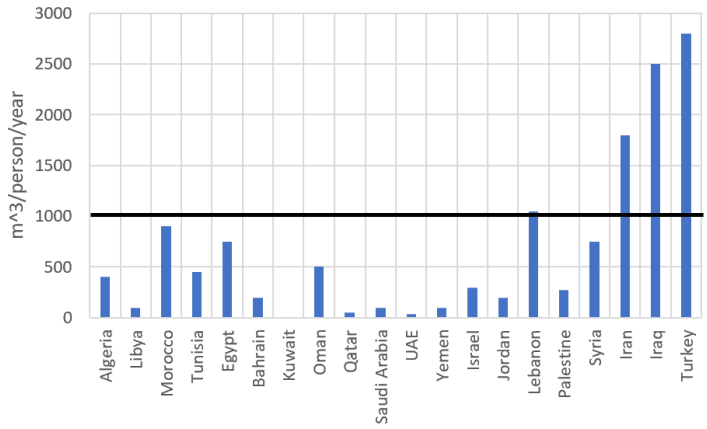

Figure 3: *Estimated annual renewable supply of water available per person in 2010 vs. Country (Siddiqi & Anadon, 2011).*

Figure 4 below graphically represents water used by MENA countries. The amount of water consumed by countries does not have as large of a difference as the amount of water produced by countries.

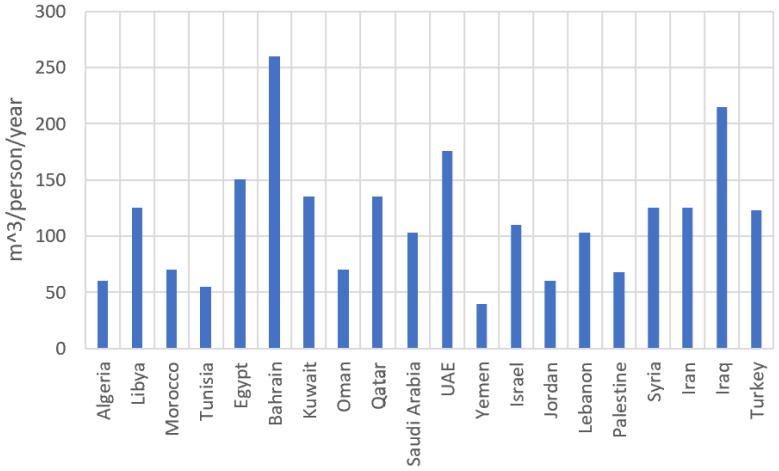

Figure 4: *The urban water use for MENA countries vs. Country (Siddiqi & Anadon, 2011).*

2.1 Desalination

While the Industrial Revolution brought harmful greenhouse gases that led to worldwide patterns of increasing temperatures, it also led to large-scale technological advancements. As the world started losing access to water, wealthier countries invested in methods to purify water to a drinkable standard. One of these technological advancements is desalination. Desalination converts high saline water into freshwater. There are multiple methods of desalination. The most common are reverse osmosis and multistage flash. Multistage flash desalination vaporizes the water, which leaves behind brine (a heavily salt mixture of water impurities) and creates a cooled vapor, which is potable water. Reverse osmosis pushes pressurized water through a membrane to once again create brine and potable water on opposite sides of the membrane. However, the price range for these purifying methods is typically between $1.7–9.5/kgal which is approximately two or three times the cost of a traditional water source (Ziolkowska, 2015). While wealthier arid countries such as Saudi Arabia and the UAE can afford to invest in desalination, the majority of MENA countries cannot invest in the number of plants that they need, if they can invest in any. Figure 5 below shows the difference between countries' desalination capacity based on the technology. The dark blue, or multi-stage flash (MSF), is the most common desalination plant type.

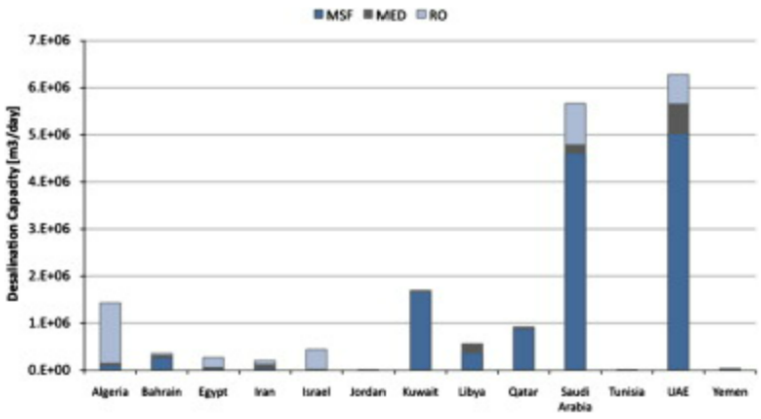

Figure 5: *Installed desalination capacity by type of desalination process versus Country* (Siddiqi & Anadon, 2011).

Countries that can afford to invest in desalination have seen great benefits. The majority of potable water used by the UAE is desalinated water (*Water - The Official Portal of the UAE Government*, n.d.). With the addition of these plants, the UAE was then able to support a growing population with the increase of water supply. Because of the success of desalination, there have been lots of improvements to decrease the production and maintenance costs. In fact, a study conducted by Yuan Zhou et al. in 2005 found that desalination unit costs dropped each year "about 5.3% in last 40 years" (Zhou & Tol, 2005). These costs have dropped largely because of other water purification models being introduced. As can be seen by Figure 6 below, seawater desalination tends to have the highest unit cost. Other methods, like water reuse, follow a trend of lower unit costs.

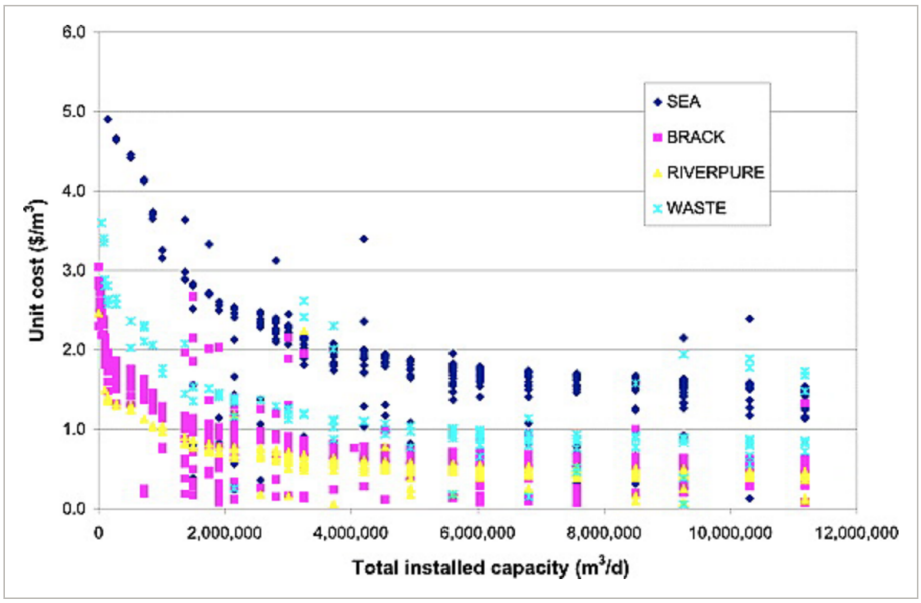

Figure 6: *Unit costs versus total installed capacity by the RO process* (Zhou & Tol, 2005)

2.2 Water Reuse

Water reuse is turning wastewater (whether from human waste or industrial waste) into fresh water. This process has been gathering popularity over the past few decades (National Research Council et al., 2012). As more countries have explored purifying their wastewater, the population's unrest at the idea of purifying wastewater became apparent due to cultural barriers. In fact, some countries have a large portion of citizens that are not comfortable with consuming wastewater, or any food that has been grown with wastewater. A study in Libya found that "51% of the population of Tobruk [a major city in Libya] have shown their reluctance to consume food crops irrigated with treated wastewater" (Abdulla & Ouki, 2015). This hesitancy complicates the growth of water reuse and will have to be properly addressed before implementing water reuse on a wide scale.

2.3 Conclusion

Plate tectonics shift the earth's structure and lead to temperature shifts over the centuries. While the MENA region has an arid climate in the 21st century, the change in temperature over the centuries has shifted the climate. Because of the dry air that encapsulated MENA countries, their natural water sources are drying up. To increase drinkable water sources, countries able to afford technological methods of water purification invest in the technology. The technological water purification methods discussed in this research are desalination and water reuse. Desalination purifies water saturated with saline while water reuse purifies wastewater. Because of the large energy consumption, few countries are able to build enough plants to cover their water supply issues.

Because of the lasting presence of water scarcity and the necessity of water for human life, a conflict could emerge between nations over water sources. This study explores the present and future water conflicts in MENA. The next section, Methodology, will explore these issues and outline how the research was conducted.

3.0 Methodology

The goal of this project is to best understand possible future outcomes between countries over water usage. As stated previously, the objectives of this project are the following:

1. Understand the history of water and human conflict in the Middle East Region
2. Understand potential water conflicts of the region.
3. Generate future scenarios about potential conflicts in the region.

The following sections will further detail the steps that this study followed in order to achieve those stated goals.

3.1 Objectives

Objective 1: Understand the history of water and human conflict in the Middle East Region

The Middle East was not always the arid land that it is today. By conducting research, the interviewer will be more prepared to understand the change over time in how people retrieved water. As water levels continue to dip, it becomes harder for people to access it. Since water is a necessary part of life, if water sources become too depleted, communities will either have to design ways to purify water so it's potable or face some conflict to get access to another area's purified water.

The creation of desalination opened new doors of water access to wealthy countries. However, because of the high prices associated with creating and running these machines, they are not a solution all nations can pursue. As some countries invest in methods to purify the ocean water around them, others have to find alternate ways to quench their population's thirst. By taking adequate time to understand this dynamic, the interview questions can better cater to these changes and differences.

Objective 2: Understand potential water conflicts of the region

In order to best understand the current situation between nations in the Middle East regarding potable water access, interviews will be conducted. Three to five experts will be asked questions inquiring about their experience with the science side or political side of how desalination is affecting possible future water wars. Example interview questions can be found in Appendix A.

Interviews will be held over zoom. Interviews will then be coded according to common answers and themes between interviews.

Objective 3: Generate future scenarios about potential conflicts in the region

The interviewees will likely have some overlapping and contrasting opinions due to their differing expertise. These commonalities and differences will be analyzed and compared. The similarities will be viewed to draw a plausible conclusion for the future of relationships between nations in regard to water usage. The disagreements can be used to identify the range of perspectives interviewed.

4.0 Findings

This study explored expert opinion on water conflict in the MENA region. Interviews were held with water experts of differing specialties and thus differing ideas of methods to increase water supply in the midst of a water crisis. The interviewees and a description of their job title can be found in Appendix B. The interviews explored plausible freshwater sources in these arid climates. The Findings section found that technology, infrastructure, pipe leakage, and agriculture are the main methods to increase the supply of fresh water, and decrease the likelihood of a water war.

4.1 Technology

All interviewees were familiar with the emergence of new water purification technology over the past few decades. A finding that emerged from the data was the consensus regarding technological infrastructure. A former water tech CEO said:

> There's really no water treatment problem that we don't know how to solve. There's no water that we don't know how to clean. It’s the non-technology barriers to entry and scale that are the real problems (regulation, finance, price vs. cost of water, etc.).

The main technologies used for water purification explored in this paper are water desalination and water reuse.

4.1.1 Desalination

Desalination as a type of water purification technology has been gaining popularity due to its efficiency. As stated in section 2.1, desalination runs saline water through a membrane to ultimately create a purified permeate and salty brine. Desalination plants have been built and maintained worldwide to assist in solving the water crisis.

UAE is a leader in technological advances of water supply through processes like desalination. Because of UAE's wealth, they've invested in these methods to provide water to their population and have become reliant on the source. While many countries are investing in desalination and building plants when they can afford it, most do not have nearly as many as the UAE.

The difficulty with relying on a process like desalination to hydrate a population is the high price of construction and upkeep of the machinery. The interviewee from the UAE mentioned the largest factor in cost "is the power consumption and the dramatic changes of the cost of power plummeting down as a result of solar renewable resources." While wealthy countries are investing in research to make the desalination process more economical, the nations not as economically strong cannot even consider desalination as a supply option. This discrepancy in access between the ability to buy into clean water or not ultimately demonstrates the unequal distribution of fresh water.

4.1.2 Water Reuse

An emerging water supply source is reusing wastewater. Three interviewees are heavily investing in research in this. Water reuse is a purification process of wastewater (both industrial and human-produced). Most nations have a standard that must be met if the water will be used again so that no dangerous chemicals would be consumed. The water tech company that an interviewee was previously a CEO of evaluated improving water reuse processes to cleanse the wasteful process we currently adopt of using water and then making it unusable.

> It's one thing for you to have enough water to do what you have to do (manufacture, farm, produce, power, etc.), but you also have to make sure that the discharge of polluted water doesn't have a lasting effect on the environment and future water supply.

China is an example of a country that did not consider what they deposited back into the freshwater supply system and now a large portion of their original freshwater sources contain polluted waters. He said that if we can get to reuse all water used, then the water shortage crisis would be solved, especially when a stable population is involved.

However, the greatest struggle is not creating the technology to reuse wastewater- it's the cultural barrier. Most of the nations in arid climates have a culture of heavily disapproving of water reuse. This cultural barrier makes advancements in technology difficult. While this is a very plausible option, it likely will not be sufficient as the sole water supply option because of population hesitancy. The environmental and water engineer interviewee says that the best way to overcome this cultural barrier is to limit health risks by holding high standards. If public opinion can be influenced on these points of culture, he states the importance to have strong facts about clean water produced. Any inefficient treatment plants can produce a low-quality effluent, create even more negative stigma, and expose the public to a significant threat. He emphasized that these plants should be shut down once identified. The expert from Libya was a key part of the startup of a sewage treatment plant and spoke of the inefficiencies in his plant when he first began the position. He had to invest in research to improve efficiency and ultimately increase the output (and quality) of potable water.

4.2 Infrastructure

Roads, buildings, canals, and other man-made structures that support the functionality of life are all infrastructures. A nation's infrastructure showcases its wealth and the needs of its population. For example, a wealthy state in an arid climate may have desalination plants lining its shoreline, while another arid climate state without as much economic stability may have wells in every town as necessary infrastructure.

The former minister of water in a Middle Eastern country that was interviewed has worked with transboundary water conflicts for years. He mentioned the best way to assist undeveloped countries in their need for water is rooted in their finances. Infrastructure has shown notable increases in water supply and is seen as a necessary step to solving the water crisis. Unfortunately, he pointed out that there is not a 'magic solution' to this problem but there are options of steps to take. The first and cheapest option is demand management to teach the community the value and preciousness of water. The second option is supply management which is the introduction of innovative technology, like desalination and water reuse.

While assembling new buildings to purify one nation's water brings great benefits to that nation, it could hurt other neighboring nations. Many technological water purification methods create a bi-product of dense, heavily mineralized water. If a nation upstream of a freshwater source decides to deposit their brine back into the source, downstream nations are exposed to the upstream nation's unpurified water. The former minister of water in a Middle Eastern country when interviewed pointed out the importance of upstream countries considering what they've deposited back into the stream because that's directly what the downstream is having to drink. When this relationship is not respected, the downstream countries may struggle with access to potable water. This could cause points of tension between nations. Educating populations further about this relationship and how they affect each other could strengthen transboundary relationships, as stated by the interviewee.

Additionally, the senior environmental engineer interviewee brought up the idea of authorities (public water companies or governmental bodies) to guard freshwater resources to ensure the water deposited back into water bodies meets standards and to prevent over-abstraction. This would be an investment, but it would show to the public how important

the source is and ultimately help decrease groundwater depletion. It would especially help solve the conflict between upstream and downstream nations.

4.3 Pipe Leakage

Transportation of water is a key part of making potable water available to the population. However, there are faults in the current ways of transporting and using water. A common issue of a city's water source is leaking in water pipes. One expert from a large water purification company in the region asserted that one of the biggest ways for countries in the region to secure their water supply is to address water loss at the municipal level. The interviewee stated

> A lot of these countries have very high water leakage and we've got to stop that. That I think that is the number one thing that can be done in cities, where about 50-60-70% of the water leaks.

Improving piping is a costly process, but reaps large benefits. The interviewee that spoke on this issue addressed the wasteful nature of water pipe leakage. He did recognize that it is not a commonly sought-after solution, which was further emphasized with the absence of other interviewees' mention of pipe leakage. However, because of the high percentage the interviewee mentioned in the quote above, it's a finding that should be considered.

4.4 Agriculture

Due to the cultural stigmas, when water reuse is implemented, it is commonly used in irrigation. Even without the complexity of water reuse, irrigation in most arid climates faces difficulties. The interviewee from the UAE pointed out that for food security, countries like to have their own supply of food to rely on. Countries in arid climates that decide to grow their own food however put an unnecessary strain on already limited water. These crops need more water than they would if in a moist environment.

The interviewee from the UAE mentioned the growing emergence of a government buying or renting land in another country's more diverse climate to support food growth. Then, water-intensive crops can be grown in a climate with more access to water. An example of this is wheat fields in Saudi Arabia. After losing crops and using excessive amounts of water, they exported their fields and seeds to Sudan because of their access to the Nile.

This method of exporting crops introduces international relations and thus the relationships between countries need to be evaluated. The UAE interviewee noted that if a wealthy arid country outsources its crop to a country struggling financially, the wealthy country is taking away some of the other nation's access to water. The interviewee saw these relationships as likely occurring between countries in good standing.

5.0 Discussion

The Discussion section further dives into the implications of the findings. It consists of the significance of the results and some recommendations.

The findings are important because they evaluate ways to decrease strain on the supply side of potable water. Countries around the world are struggling to provide this necessary resource to their people. These results hold information on how to provide water to a thirsty community to minimize the possibility of conflict. By easing the tensions on the supply chain, the tensions of a possible water war also decrease.

A possible next step to further understanding the water crisis is conducting further research on intrastate conflicts versus interstate conflicts. Analyzing the difference between the likelihood of a civil war and a world war informs researchers of where to focus preventative measures.

A recommendation for the next steps regarding governments is to create policies that are respected by both parties. The former water tech CEO mentioned in his interview that there are multiple countries that have created water agreements but did not embed repercussions and thus the agreements are essentially useless. To create a strong and respectable agreement, experts from both countries should be represented when creating an agreement. Having a policy that is respected between different nations forces a line of communication, which leads to discussions over problems rather than immediate war.

Another recommendation from this research is to create a team composed of people that truly understand the degree of this water scarcity problem worldwide. All team members should be able to handle transboundary water issues. These members would ultimately be part of a transdisciplinary research institution focused on water conflict. This team would educate each

other on their beliefs and backgrounds to further brainstorm effective and achievable next steps. Once the next steps are identified, there is a large chance that the public needs to be educated on how to mitigate the problem. The team would be responsible for contacting people and resources that can teach the population. While there are a variety of non-profits and large multinational organizations (such as the UN) that focus on water, there is not currently an organized research group for the water conflict internationally.

6.0 Conclusion

Research for this project was conducted through interviews held with five water experts in differing expertise worldwide. The experts spoke on the advancements in water technology, and how they have propelled the water supply chain, mainly for economically wealthy countries. Interviewers demonstrated that water technology has moved forward enough to solve the water crisis through processes like desalination and water reuse. However, the barrier of high prices and cultural beliefs, especially for undeveloped countries, prohibits this solution on a large scale.

Recommendations include conducting deeper research on intrastate conflicts versus interstate conflicts, forming a respectable water policy between nations, and creating an international research group/institution to further evaluate international water conflict.

While all interviewees did see a possibility for large-scale conflict over water, none seemed to think it was likely to occur immediately. The countries that are most struggling in finding and providing potable water have realized that war brings lots of damage. The interviewees found countries are focusing on ways to increase water supply and there are lots of alternative methods to explore before starting a water war.

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Appendix A

1. Please talk about your expertise regarding global water
2. How do you view the future of water and its impacts on peace and political stability?
3. A big side effect of desalination is its cost and energy intake. For countries that cannot afford to pay those high bills, what does their future look like in regards to a water war?
4. What steps need to be taken by governments to avoid water wars?
5. What steps can be taken by civilians to avoid water wars?
6. Do you have any other recommendations of names of water experts that would be interested in talking to me?

Appendix B

Interviewee #1	The managing director of a multinational water purifying company based in the UAE
Interviewee #2	A founder and executive director of a 501c focused on increasing water supply in South Sudan
Interviewee #3	A senior environmental and water engineer in Libya
Interviewee #4	Former Minister of water in a Middle Eastern country and author of dozens of technical papers
Interviewee #5	Former water tech CEO and current professor & investor