Water Elites' Perceptions of Water Security in the Middle East and North Africa Region

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WATER ELITES' PERCEPTIONS

OF WATER SECURITY IN THE MIDDLE EAST AND NORTH AFRICA REGION

by

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ABSTRACT

The Middle East and North African region continues to face significant water security challenges. The purpose of this dissertation is to gain a deeper understanding of water elites' perceptions of water security in the MENA region. It is not meant to generalize the findings. Instead, the intention for the research is to identify, explain, and analyze by national elites' contrasting perceptions in Jordan, Iraq, Egypt, and Tunisia.

The study examines water elites' perceptions in four areas: current knowledge level of water security, water resource management, water service delivery, and water-related risk mitigation. These elites' perceptions of water security will help to better align this discipline with other areas of MENA security studies such as cooperation between states; ethnic conflicts; hydro-hegemony; stabilization and nation-building; conflict, armament and regional security; and the nexus of diplomacy, development and defense; terrorism and none-state actors.

The study seeks to find out to what extent, if any, are there significant similarities and differences between water elites' perceptions of the most critical factors affecting water security in the MENA region overall and in the countries within which they live therein specifically. The researcher concludes that demographics and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service delivery, and water-related risk mitigation, in the MENA region overall and in the countries where they live therein. This study adopted cross-country mixed-method research approach using the triangulation system.

ACKNOWLEDGMENTS

Special thanks to my study group members who played critical role in keeping us on track. I am fortunate to be one of the IDV'ers.

DEDICATION

I dedicate my dissertation to my loving and supporting family.

To My Late Mother, Fatimah:

A strong and gentle soul who taught me to trust in Allah, believe in hard work and that so

much could be done with little.

To My Wonderful Wife, Randa:

Whose affection, love, and encouragement, sacrifice and prays of day and night make

me, able to get such success and achievement.

To My Amazing Daughter, Nadine and My Son, Ghadi:

Whose constant encouragement and support make me feel inspired, lively, energetic,

and invigorated throughout this journey. You are God-given gifts that I will always

cherish.

To All Akari Family Members inside and outside Palestine:

I dedicate to you the fruits of research.

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LIST OF ABBREVIATIONS

ACWUA	Arab Countries Water Utilities Association
AEP	As-Samra Expansion Project
AWC	The Arab Water Council
BOT	Build –Operate-Transfer
CAST	Conflict Assessment System Tool
COVID-19	Coronavirus Disease 2019
CPI	Corruption Perception Index
EE	Energy Efficiency
EU	European Union
FFP	Fund for Peace
FSI	Fragile State Index
GDA	Agricultural Development Groups (*Groupement de Développement Agricole)*
GERD	Grand Ethiopian Renaissance Dam
GIZ	The German Society of International Development (*Deustche Gesellschaft fur Internationale Zusammenarbeit)*
HDI	Human Development Indicators
HR	Human Resources
IDP	Internally Displaced Persons
IRB	Institutional Review Board
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
LAS	League of Arab States
MENA	Middle East and North Africa Region
NASA	The National Aeronautics and Space Administration

NATO	North Atlantic Treaty Organization
NGO	None-Governmental Organization
NRW	None- Revenue Water
ONAS	National Office for Sanitation (*Office National de l'Assainissement*)
PDI	High Power distance
QMS	Quality Management Systems
RE	Renewable Energy
RO	Reverse Osmosis
ROI	Return on Investment
SDG	Sustainable Development Goal
SINEAU	National Water Information System (*Systeme d'Information National sur l'Eau)*
SIPRI	Stockholm International Peace Research Institute
SIWI	Stockholm International Water Institute
SONEDE	National Water Distribution Utility (*Société Nationale d'Exploitation et de Distribution des Eaux)*
UN - FAO	The United Nations Food and Agriculture Organization
UN	United Nations
UNDP	The United Nation Development Program
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNFCCC	The United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund,
USAID	The United Stated Agency for International Development
WAJ	Water Authority of Jordan
WDM	Water Demand Management
WIGO	Water Integrity Network Outlook
WRI	Water Resource Institute

CHAPTER I - INTRODUCTION

International competition for natural resources has turned some strategic

resources into central drivers of conflict between and within states in the international

system. Water is a scarce natural resource without any realistic alternatives. Conflicts

over this resource, both within countries and between countries, are sharply increasing

(Gleick 2009).

The primary reasons for water conflicts, whether within or between countries, are

low rainfall, inadequate water supply, and/or dependency on one major water source

(2009). Socio-political tensions; disputes over large-scale projects such as dams in

transboundary river basins, and disputes concerning environmental and resource issues

are potential contributing factors to violent or non-violent water conflicts (2009).

Furthermore, rapid economic growth and demographic expansion in the 21st century have

already transformed access to fresh drinking water into a significant national, regional,

and global challenge. Therefore, water is an integral and critical factor in any state's

socio-economic, political, security, environmental, and health policy considerations.

Water security is increasingly a global challenge in general and in the Middle East

and North Africa (MENA) region specifically. This dissertation focuses on the following

MENA Countries: Jordan, Iraq, Egypt, and Tunisia. A 2018 report by the United Nations

Food and Agriculture Organization (FAO) and the World Bank indicates that the fragile

MENA region in which these states are located is among the most water-scarce regions in

the world (FAO and The World Bank 2018). More pointedly, the report notes that the

scale of water challenge is "unprecedented and requires coordinated responses across

institutions in many locations." (2018). The MENA region has staggering statistical water data shortcomings. Two-thirds of the MENA population lacks sufficient renewable water resources for sustainable growth (World Bank 2018a). Approximately 6% of the world's population lives in the MENA region (FAO-UN, 2011). Nevertheless, it has access to 2% of the world's renewable freshwater and is home to 12 of the world's most water-scarce countries (UNICEF 2017). The MENA region consists of a heterogeneous group of countries, which rely on different sources of water. For example, Iraq depends primarily on surface water, while Jordan and Tunisia depend more heavily on groundwater (UNDP 2013). Egypt depends heavily on both ground and surface water (2013). In addition to the scarcity of water resources, David Brooks argues that water stress stems from three compelling factors: demand for freshwater exceeds supply; much of the region's water is polluted from growing volumes of human, industrial, and agricultural wastes; and the same water is needed simultaneously by different sectors within or wherever it flows across an international border" (1996).

<div align="center">Problem Statement and Purpose of Study</div>

The purpose of this dissertation is to gain a deeper understanding of water elites' perceptions of water security in the MENA region. It is not meant to generalize the findings. Instead, the intention for the research is to identify, explain, and analyze by national elites' contrasting perceptions in Jordan, Iraq, Egypt, and Tunisia.

The study examines four perception areas: current knowledge level of water security, water resource management, water service delivery, and water-related risk mitigation. These elites' perceptions of water security will help to better align this discipline with other areas of MENA security studies such as cooperation between states;

ethnic conflicts; hydro-hegemony; stabilization and nation-building; conflict, armament and regional security; and the nexus of diplomacy, development and defense; terrorism and none-state actors.

Research Question and Hypothesis

This dissertation addresses the following research question and its corresponding hypothesis:

Research Question: To what extent, if any, are there significant similarities and differences between water elites' perceptions of the most critical factors affecting water security in the MENA region overall and in the countries within which they live therein specifically? (measured by the perceptions of water elites of three relevant water security areas: water resource management, water service delivery, and water-related risk mitigation).

Hypothesis: Demographics and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service delivery, and water-related risk mitigation, in the MENA region overall and in the countries where they live therein.

Specification of Case Studies

Water is inherently a multi-dimensional subject. One seeming anomaly is that the selected MENA countries— Egypt, Jordan, Tunisia, and Iraq - have shared and non-shared hydro-political, socio-economic, and cultural attributes (Figure 1). They are in four river basins. The Nile River Basin is the largest and the most contentious water basin

in the world where it is shared by 11 riparian countries (Ethiopia, Congo, Kenya, Eritrea, Tanzania, Rwanda, Burundi, Uganda, Sudan, South Sudan, and Egypt). The waters of the Tigris and Euphrates basins are of great importance to Syria and Iraq, which shares Turkey with both rivers. Difficult issues. Many countries in the Jordan River basin, such as Syria, Palestine, Israel, Lebanon, and Jordan, depend on its waters, but they also have a shared history tainted by conflicts. The Medjerda River is the main river in the Tunis. The River Medjerda river basin extends from north eastern Algeria to north eastern Tunisia. The River is 290 miles long, and the size of its basin is 88,080 square miles (Encyclopedia Britannica 2020).
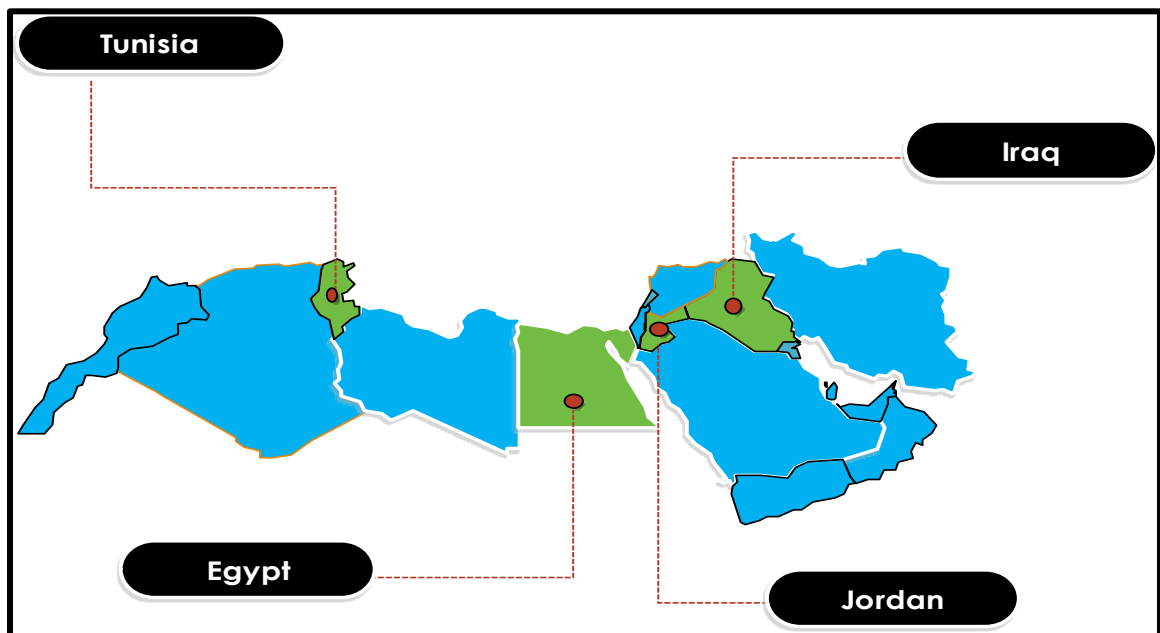
Figure 1. Case Study Locations.

These four countries should be at the same time "similar" and "incomparable" (Sartori 1991:246). They are not only limited to unique geopolitical positions, but their relevant integrated composite indices provide overarching comparative attributes and specifications that help one understand their macro-level dimensions before exploring

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how their water elites perceive water security. The study utilizes six indices: Aqueduct

Water Risk Framework (Water Resource Institute -WRI 2019); population indicator

(World Bank 2019); Fragile State Index (Fund for Peace, 2019); Corruption Perception

Index (Transparency International, 2019); Human Development Index (UNDP, 2019);

and Hofstede's National Cultural Dimensions (Hofstede. 2020).

Aqueduct Water Risk Framework

The Aqueduct Water Risk Framework measures all water-related risks by

aggregating all selected indicators from the Physical Quantity, Quality, and Regulatory &

Reputational Risk categories. Higher values indicate higher water risk (Gassert et al.,

2013).

Some of the selected countries share similar attributes, such as transboundary

river basins (riparian country), but each of them has different overall water-related risk

levels (Table 1). Jordan scored an extremely high water risk level and ranked fifth

amongst 165 countries (Table 1). The other three countries shared approximately the high

level of water risk level and ranked within the 25th percentile amongst the sampled

countries (Table 1).

Table 1

Few Selected Country Comparative Attributes / Specifications

COUNTRY / River Basin	Current Overall Water Stress (WRI, 2019)		Population Indicator (World Bank, 2018)		Fragile State Index (FSI) 2019 of 178 countries	Corruption Perceptions Index (CPI 2019) 180 Countries		Human Development Index (HDI) 2019 of 189
	Country Ranking (1-165)	Score / Label	Ranking Of 220 Countries/ Economies	Million		Score	Rank	
Jordan / Jordan River	5	4.56 Extremely High	89	10.07	69 Elevated Warning	48	60	102
Tunisia / Medjerda River	30	3.67 High	76	11.78	95 Elevated Warning	43	74	91
Iraq / Tigris and the Euphrates	42	3.13 High	38	40.41	13 Alert	20	162	120
Egypt / The Nile River	43	3.07 High	14	98.42	34 High Warning	35	106	116

Jordan. Jordan is the world's second water-poorest country (UNDP, 2018). It has historically been affected by the conflicts in neighboring countries such as Palestine, Iraq, and Syria. The Jordan River is around 350 km long (Ionides, 2003). It originates from the footsteps of Mount Hermon on the border section between Israel-Syria-Lebanon and ends in the Dead Sea. The conflict over the Jordan River is mainly between Israel on one side with the other riparian countries of the river on the other: Palestine, Syria, Lebanon, and Jordan. The Jordan and Yarmouk rivers have historically been the primary sources of

running water in Jordan (Haddadin, 2002). After Israel diversion of the Jordan River and its tributaries to the Sea of Galilee and then pumping it out of its natural surroundings to the Negev Desert, tension has increased in the region, leading to the emergence of a severe water problem. The water stress crisis has intensified as the country continues to provide a safe-haven for the influx of refugees escaping violence created from the neighbouring countries such as Iraq and Syria (2002).

Tunisia. Although Tunisia is a small North African country with a total land area of 164,000 square kilometers—approximately the size of Washington State—the annual rainfall differs greatly depending on the region. While the north of the country has a mild Mediterranean climate, the south is a semiarid desert. The inequality of water supply both in quality and quantity makes managing water resources more difficult. For example, the northern region provides almost 82% of the total surface water (Benabdallah 2007). According to the World Bank (2014), the sudden increase of the urban population in Tunisia has put enormous pressure on water resources. This situation was exasperated with the influx of Libyans fleeing the civil war that was erupted in Libya in 2011. According to a study conducted by Brooking Institute, the estimates of total refugees in Tunisia is one million—10 percent of its Population (Karasapan 2015).

Egypt. The primary source of Egypt's water comes from the Nile—the longest river in the world. It originates from Central African countries and Ethiopia and ends in the Mediterranean Sea in Egypt after passing through Sudan. Most of the Nile's water comes from Ethiopia, and the current conflict over the river is mainly between Egypt and Sudan on the one hand and Ethiopia on the other. The Blue Nile, originating at Lake Tana in Ethiopia and the principal tributary of the Nile River, supplies approximately

65% of the Nile (FAO 1997). The Ethiopians are the process of building the Grand

Ethiopian Renaissance Dam project on the Blue Nile. This project has become a

significant dispute between Egypt and Ethiopia since the former considers it an imminent

and strategic security threat to its existence.

Iraq. Iraq relies on the Tigris and Euphrates rivers for most of its water resources.

The area between the Euphrates and the Tigris has seen some of the world's great

civilizations. The two rivers originate in southeastern Turkey. The Euphrates flows from

Turkey to Syria and then to Iraq. They meet in southern Iraq to form the Shatt al-Arab,

which ends in the Persian Gulf. Turkey is in a severe dispute with Iraq over the two rivers

(Dohrmann and Hatem (2014). It is implementing massive water projects, which caused a

significant reduction in the amount of water flowing to Iraq. Iraq sees this as a severe

threat to its water supply, as the two rivers make up 98% of Iraq's water resources. The

Iraqi Ministry of Water Resources (IMWR) considers sustaining the "water security" as

the cornerstone in its strategic vision (IMWR, 2019).

Population Indicator

According to the World Development Indicators database, (World Bank, 2019),

the MENA region has a combined population of around 449 million inhabitants (as of

2018). Egypt has the highest number of population amongst the four selected countries

and ranked 14th amongst the world countries. Both Tunisia and Jordan have almost a

similar size of population (Table 1). Clear majorities of the populations of the selected

countries believe in Islam, and their dominant language is Arabic.

Fragile State Index (FSI)

This index is an annual assessment of 176 countries produced by the Foreign Policy Magazine and the non-profit organization the Fund for Peace (FFP) using the latter's proprietary Conflict Assessment System Tool (CAST) (FFP 2020).

FSI is a crucial methodology that helps in identifying both the normal pressures that all states experience and those that pushing a state toward the brink of collapse and conflict (2019). The higher a state is ranked on the list, the more vulnerable it is. FSI has four sets of indices and 12 categories of indicators against which nations are measured. These are cohesion indicators (security apparatus, factionalized elites, and group Grievance); economic Indicators (economic decline, uneven development, human flight, and brain drain); political Indicators (state legitimacy, public services, human rights and rule of law); and finally, social and cross-cutting indicators (demographic pressures, refugees and internally displaced persons, and external interventions).

Table 1 provides a quick comparative summary of the level of fragility of the four selected countries. For example, Iraq made it into the lower 13th rank of the FSI. Iraq and Egypt are tied for the title of "alert" and "High Worsening" categories. They are ranked in the lowest first quartile, with Iraq (13th) and Egypt (34th). In contrast, Jordan (69th) and Tunisia (95th) both score higher in the overall FSI. They are among the upper second - quartile countries surveyed in 2019 and within the "elevated warning" category (FFP 2020).

There are two FSI's sub-indicators that are relevant to the study: Factionalized Elite and public services (Figure 2). The Factionalized Elites indicator "considers the fragmentation of state institutions along ethnic, class, clan, racial or religious lines, as

well as brinksmanship and gridlock between ruling elites" (2020). The Factionalized

Elites Indicator's average for 2019 was 6.5 points (0 [low] - 10 [high]). For example, the

highest value was in Somalia: 10 index points, and the lowest value was in Switzerland: 1

index points. In 2019, FSI showed that Iraq scored the highest point amongst the selected

four countries in the Factionalized Elites and dropping down slightly in Egypt in that

same year. During the same period, Jordan and Tunisia scores were lower (Figure 2).

The public services indicator refers to the presence of basic state functions in

providing essential services such as water and sanitation (Figure 2). It takes into

consideration to whom these services are provided– "whether the state narrowly serves

the ruling elites, such as security agencies, presidential staff, the central bank, or the

diplomatic service while failing to provide comparable levels of service to the general

populace – such as rural versus urban populations" (2020). Iraq scored the highest

amongst the four selected countries. Jordan and Tunisia's ranking were the third and

fourth.
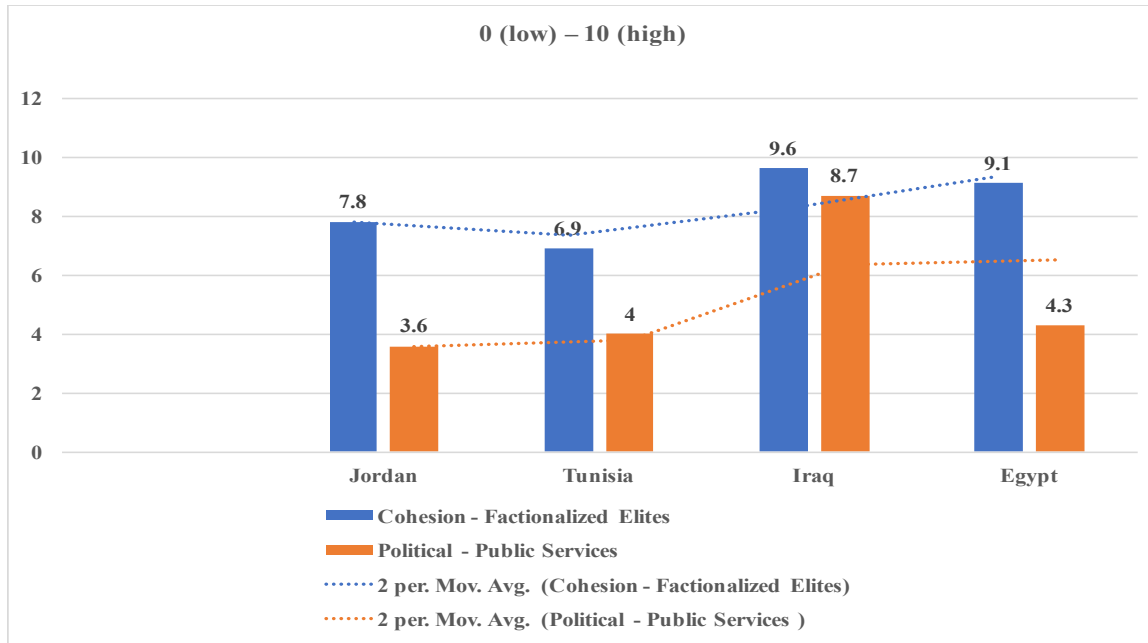
Figure 2. Fragile State Index (FSI) Factionalized Elites and Public Services Sub-indicators for the Selected Countries (FFP 2019).

Corruption Perception Index (CPI)

This index is an annual assessment of 180 countries and territories produced by the non-profit organization Transparency International. CPI ranked these them based on their perceived levels of public sector corruption, according to experts and businesspeople, who uses a scale of 0 to 100, where 0 is highly corrupt, and 100 is very clean (Transparency International 2019). According to the 2019 CPI's report, more than two-thirds of countries score below 50 on this year's CPI, with an average score of just 43 (2019). The Middle East and Northern Africa regions fall behind the overall average by four points (2019).

In the MENA region's countries, power elites have a powerful influence on government policies and transferred public funds and state assets for their benefit and influenced them at the expense of their citizens (2019).

With a score of 48, Jordan is the best performer amongst the four countries, followed by Tunisia (43). Iraq and Egypt are significant decliners on the CPI. They score 20 and 35, respectively (Table 1).

Human Development Index (HDI)

The HDI is a summary measure for assessing 189 countries "long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living" (UNDP 2019). "To ensure as much cross-country comparability as possible, the HDI is based primarily on international data from the United Nations Population Division (the life expectancy data), the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (the mean years of schooling and expected years of schooling data) and the World Bank (the Gross National Income per capita data)" (UNDP 2020).

The HDI values for Egypt, Jordan, and Tunisia put them in the high human development category. The HDI value for Iraq put it in the medium human development category. In ranking out of 189 countries, Tunisia is positioned at 91, Jordan at 102, Egypt at 116, and Iraq at 120.

Hofstede's National Culture Dimensions

It is altruistic to explore the relationship between elites and culture as there are interrelated implicit and explicit attributes. Cultural differences can take a variety of shapes, such as symbols, heroes, rituals, and values (Hofstede et al., 2010). Elites are not necessary Heroes. Geert Hofstede (2010), a Dutch social scientist, and anthropologist defines heroes as "persons who possess characteristics that are highly prized in culture and thus serve as models for behavior."

Hofstede developed a six-dimensional model (6-D Model)) that he used in combination to describe the differences of many national cultures around the world (2010). A comparative overview of the 6-D cultural ranking of Iraq, Egypt, and Jordan, excluding Tunisia, is provided in Figure 3.

| Egypt | Iraq | Jordan | Tunisia Data N/A |
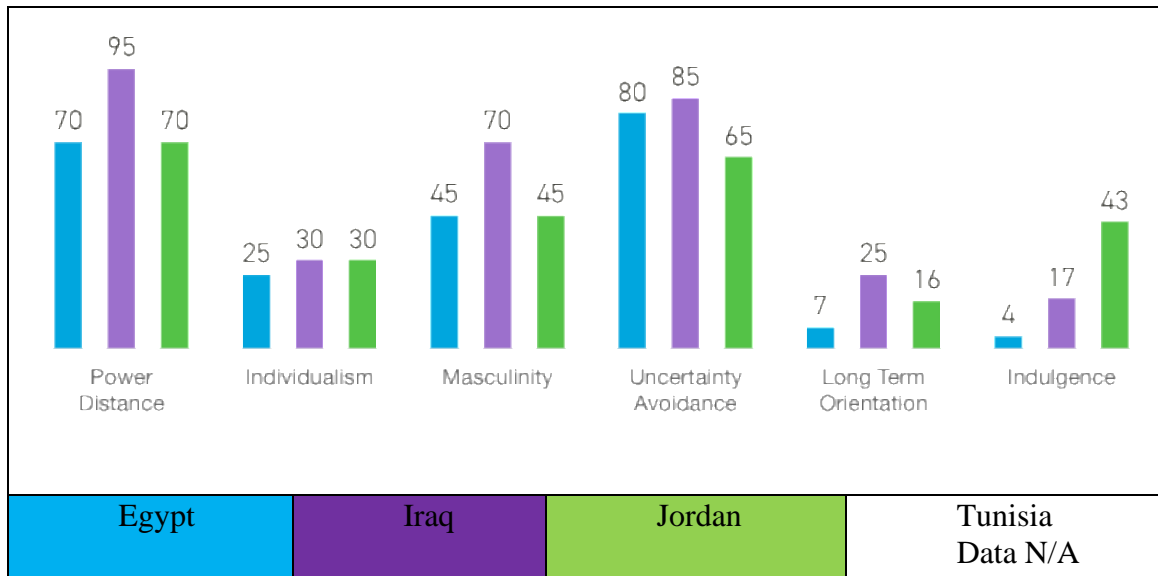
Figure 3. Country Comparison- Hofstede's National Culture Dimensions (6-D Model).

The Power Distance Index (PDI). The Power Distance Index (PDI) refers to "the degree to which the less powerful members of the organization accept and expect that power is distributed unequally. The main issue is the degree of human equality that underlies the functioning of each society" (2010).

According to Hofstede Insight Network (2020), the MENA societies score high in the PDO Index. This means that they are more likely to follow a caste system that does not allow for a major upward movement of their citizens. Inequality in power and wealth may allow growth within society. This creates a situation in which leaders have ultimate power and authority (2020). The rules, laws, and regulations developed by those in power reinforce their leadership and control. It is not unusual for a new leadership to emerge

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from armed conflict or a coup d'état - absolute power, rather than diplomatic or democratic election (2020).

High Power distance (PDI) indicates a high level of inequality of power and wealth within a country. The people in a MENA country such as Iraq, Egypt, Jordan or Tunisia, have an expectation and acceptance that leaders will separate themselves from the general population or group and this condition is not necessarily subversive of the population, but is accepted by society as their cultural heritage (2020).

As shown in the PDI Index (Figure 3), Iraq ranked the highest (95), followed by Egypt (70) and Jordan (70). The PDI index does not have current data on Tunisia, but since it is part of the Arab World, it is assumed that there will not be there a significant variance from the other three countries, especially from Jordan.

Individualism versus Collectivism Dimension. Individualism versus Collectivism Dimension refers to the degree to which people are included in each society (Hofstede 2010). In some societies, people are seen individually, and in other societies, they are evaluated in a common way (2010). In the collective society, the individual has an integrated relationship with the community and is subject to the provisions of other groups in the same society (2010). These groups are linked with unquestioning loyalty and support for one another when a conflict arises with another group in the same society (2010).

With an average score of 28 of Egypt (25), Iraq (30), and Jordan (30) on this dimension, they are all considered collectivistic societies.

According to Hofstede Insight Network (2020), Egypt's score (25) assigns it as collective society. This is evidenced by a close and long-term commitment to the member

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"group", whether it is a family, an extended family or an extended relationship. Loyalty in collective culture is crucial, and it overcomes most other societal rules and regulations. Society fosters strong relationships where everyone bears responsibility for their fellow group members. In collective societies, the crime leads to shame and loss of face, the employer / employee relationships are viewed morally (such as the family bond), considerate employment and promotion decisions that are grouped within the employee, and management is group management.

Iraq' score (30) assigns within the range of the collective society status. It is evidenced by the long-standing commitment to the member "group", whether it is an extended family or family or an extended relationship (2020). Loyalty in collective culture is crucial and society strengthens strong relationships where everyone bears responsibility for their fellow group members. In such societies, the crimes such as corruption and bribery lead to shame and loss of face, the employer / employee relationships are viewed morally. Considerate employment and "promotion decisions take account of the employee's in-group" (2020). In the end, management is group management

Like Iraq, Jordan's low ranking of 30 in this dimension means that it is considered a collective society. This is evidenced by a close and long-term commitment to the members of the "group", whether it is a family, an extended family or an extended relationship. Loyalty in a collective culture is crucial and transcends most of other societal rules and regulations. Society fosters strong relationships where everyone bears responsibility for their fellow group members and the employment and promotion decisions grouped within the employee and management are group management.

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Tunisia is not covered in the index, but it should be similar to Morocco (46) to an extent, as they share commonalities in culture, history, and geography as they are part of the western part of the MENA region. Hence Tunisia is still a collective society, but it has more aspects of an individualistic society than the others in its group. This score is manifest in a close long-term commitment to the member 'group'. Loyalty in a collectivist culture is paramount and over-rides most other societal rules and regulations (Hofstede 2020).

Masculinity versus Femininity Dimension. Masculinity versus Femininity Dimension refers to how emotional roles are distributed between genders; it is usually problematic for most societies to find a solution if it goes by the theme of 'tough' masculine and 'tender' 'feminine.'

Egypt and Jordan both score 45 on this dimension and is thus considered a relatively Feminine society. Tunisia is similar to an extent to Morocco, which has a score of 53. In Feminine countries, the focus is on managers strive for consensus; people value equality, solidarity, and quality in their working lives. Conflicts are resolved by compromise and negotiation. Focus is on well-being; status is not shown (Hofstede 2020). Iraq's score of 70 is closer to the masculine society, which indicates that the society will be driven by competition, achievement, and success.

Uncertainty Avoidance Dimension. Uncertainty Avoidance Dimension refers to the **"**extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these**" (**2020).

Egypt and scores 80 and 85, respectively, on this dimension and thus have a high preference for avoiding uncertainty. Jordan (65) and Tunisia (probably like Morocco 68)

score lower on this dimension. Countries exhibiting high Uncertainty Avoidance maintain rigid codes of belief and behavior and are intolerant of unorthodox behavior and ideas.

The Long-Term Orientation Dimension. The Long-Term Orientation Dimension describes "how every society has to maintain some links with its past while dealing with the challenges of the present and future, and societies prioritize these two existential goals differently" (2020). Countries or societies that score high on this dimension take a more pragmatic approach than normative societies that score lower.

Egypt's very low score of 7 indicates that its culture is very normative. The other two countries (Jordan and Iraq) score higher than Egypt but still within the low score of the normative culture category. In such societies, and people have a strong concern with establishing the absolute Truth and focus on achieving quick results (2020).

The Indulgence dimension. The Indulgence dimension is defined as "the extent to which people try to control their desires and impulses, based on the way they were raised. Relatively weak control is called "Indulgence," and relatively strong control is called "Restraint." Cultures can, therefore, be described as Indulgent or Restrained" (Hofstede Insight 2020). Relatively weak control is called "Indulgence," and relatively strong control is called "Restraint." Cultures can, therefore, be described as Indulgent or Restrained (2020).

With a very low score of 4, Egypt is shown to be a very Restrained country, whereas Jordan (43) is the highest in this dimension amongst the group. Societies with a low score in this dimension tend to cynicism and pessimism. People with this orientation

have the perception that their actions are Restrained by social norms and feel that indulging themselves is somewhat wrong.

In sum, the Hofstede's six-dimension model provides distinctive comparative and contrasting attributes and specification for the two case studies: (1) Iraq and Egypt and (2) Jordan and Tunisia.

Significance of the Study

Water security is a relatively unique research subject. Current economic, demographic, and geopolitical trends in the Middle East and North Africa have elevated water security to the forefront of national, regional, and international security debates. Still, contemporaneous published water studies addressing the MENA region have not fully explained its effects on economic development (Droogers et al. 2012). No previous research study has addressed water security from the perspectives of national water elites. Individual elites both within and between different countries vary in the extent to which they view water as a national, regional, and international security risk.

As the concept of water security remains a "popular but contested" subject (Pahl-Wostl et al., 2016), it still can accommodate debates as a "battleground of ideas" (Zeitoun et al., 2013). It is a systematic investigation, including research development and evaluation, designed to develop or contribute to the existing body of generalizable knowledge on water security by shedding light on what could explain the variations or similarities in MENA water elites' perception toward this issue.

Organization of the Dissertation

Including this introductory chapter, the dissertation is divided into seven distinct chapters. As demonstrated by the above sections, Chapter I provides a brief overview of

the following: background, problem statement and purpose of study, specification of research question and hypothesis, preview of case studies, significance and contribution of the study, and organization of the dissertation. Specifically, Chapter II provides a review of relevant literature and scholarly research focusing on water security and international relations, elite theory, water elites, and the relevance of water security in the Middle East and North Africa region in general and in Iraq, Egypt, Jordan, and Tunisia. The research methodology and design are outlined and discussed in Chapter III, with a detailed explanation of the mixed-methods approach to collecting data in two sequential phases (survey and interview). Chapters IV and V each present two interconnected case studies for this dissertation. The first covers Iraq and Egypt, whereas the second covers Jordan and Tunisia. A comparative analysis and discussion of the two case studies are provided in Chapter VI. The final chapter will answer the research question, assess the extent of the validity of the hypothesis, suggestion for further research, limitation of the study, and concluding observations. Additionally, terminology, references, and appendices supplement the seven chapters that comprise the study.

CHAPTER II – REVIEW OF RELATED LITERATURE

The review of the relevant literature on the perceptions of water elites of water security in the Middle East and North Africa (MENA) region presented in this chapter is divided into three thematic parts. It will first consider water security within the international relations context. The review will then focus on water security as it applies to the MENA region and its selected countries. The final section will present the elite theory and its relationship to water security.

International competition for natural resources has turned some strategic resources into central drivers of inter- and intra-state conflict. Water is one such scarce natural resource without any realistic alternatives. The irony of water is that it supports life in all its facets. However, it can also become deadly in sudden flood or storm. Rapid economic growth and demographic expansion in the 21st century have already transformed access to fresh drinking water into a significant national, regional, and global challenge. Therefore, water is an integral and critical factor in any state's socio-economic, political, security, environmental, and health policy considerations. As a result, there have been tremendous efforts to address a wide array of water policymakers and international security and environmental scholars.

Water is termed as the "essence of all living things" (Westall, 2018). This notion implies that no living being can survive without water, for it is based on all the life functions in an organism. Once found in abundance on earth, water is increasingly becoming a depleted resource in the modern world (Brauman, 2016). In 2018, the World Bank, along with the United Nations, noted that about 36% of the world population currently lives in areas suffering from the water crisis (Chen, 2018). This threat has

escalated over the past few decades for several causes, including overuse of water, polluting water resources, extensive water usage for agricultural purposes, and misuse of water on a global scale, and others (Arfanuzzaman, 2017).

Securing water resources is the increasing need of the hour. In this context, another important concept is 'sustainable development.' In 2015, at a historic   summit, the United Nations adopted the 2030 agenda for Sustainable development. The Sustainable Development Goals (SDGs) were installed at the core of this agenda (Smith Stafford, 2017). The term refers to creating a way of life through which the current generation of the world can fulfil its need for resources without compromising future generations' capacity from meeting their needs (Freedman, 2018). Water security is the sixth goal among the 17 goals specified in the Sustainable Development Goals (SDGs) (Varady, 2016). Consequently, sustainable development will remain a pure myth if the concept of water security is not turned into a reality (Allen, 2018).

Only a water-secure world can strike a balance between understanding the value of water and its usage in meeting human life requirements. The process of securing water would lead to harnessing or nurturing the productive power of water while diminishing the negative effects of its absence (Kisakye, 2018). A water-secured world is expected to reduce poverty, secure advances in the various spheres of life like education, and subsequently increase living standards. Water security is achieved when the water resources in the area are adequate in meeting the needs of the people living there, and there is little or no threat of the depletion of water supply (Kato, 2019).

Water Security and International Relations

Security is an opaque and contentious issue. It is an "essentially contested" concept (Buzan 1984). According to Wolfers (1962), security measures both "the absence of threats to acquired values," and "the absence of fear that such values will be attacked." Therefore, it is a multi-dimensional concept: political, economic, societal, and environmental (Moller, 2000).

The pursuit of security is a fundamental and enduring endeavor in international relations (IR). Security studies subfields can be state-focused, such as national security and international security, or human-focused, such as human security. The literature review tackles the debates of prominent contributions of the realism school scholars such as Hans Morgenthau in what was known as traditional realism which was later modified as a result of transformations that defined the structure of the international environment. A new theoretical piece was added to it in the form of the new structural realism with Kenneth Waltz (1979). One of the important contributions within the realist perspective was the emergence of the two offensive-defensive approaches within the framework of what was known as neoclassical realism.

Thomas Hobbes (1668), a classical realist, stated in Leviathan that without security, "there is no place for industry… no arts, no letters, no society." He suggests further that "kings, and persons of sovereign researcherity, because of their independence, are in continual jealousies, and the state and posture of gladiators; having their weapons pointing, and their eyes fixed on one another… and continual spies upon their neighbours; which is a posture of war" (1668).

Classical Realism appeared, in its traditional form, with the contributions of Hans Morgenthau (1948) and Edward Hallett Carr (1939), Karl Paul Reinhold Niebuhr (1944) , and other early realist thinkers who tried to adapt their thinking to the terrible events of the twentieth century. They were accompanied by many manifestations of turmoil and insecurity and the exacerbation of conflicts and wars, so these scholars' writings came to express that era. This perspective dominated the field of international relations during the Cold War period that followed the Second World War (Burchill et. al., 2001).

In his book titled "Politics among Nations: The Struggle for Power and Peace," Hans J. Morgenthau agrees with Hobbes' contention that every individual engaged in a perpetual quest for power (Morgenthau 1948). In this book, he presents the following "*six principles of the realist view of power politics:*

1.Political realism believes that politics, like society in general, is governed by objective laws that have their roots in human nature

2. The main signpost that helps political realism to find its way through the landscape of international politics is the concept of interest defined in terms of power.

3. Realism assumes that its key concept of interest defined as power is an objective category which is universally valid, but it does not endow that concept with a meaning that is fixed once and for all.

4. Political realism is aware of the moral significance of political action. It is also aware of the ineluctable tension between the moral command and the requirements of successful political action.

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5. Political realism refuses to identify the moral aspirations of a particular nation with the moral laws that govern the universe. As it distinguishes between truth and opinion, so it distinguishes between truth and idolatry.

6. The difference, then, between political realism and other schools of thought is real, and it is profound. However much the theory of political realism may have been misunderstood and misinterpreted, there is no gainsaying its distinctive intellectual and moral attitude to matters political."

The neo-traditional realism focuses on the importance of internal factors in in the interpretation of foreign policy: After completely denying the interference of internal factors in explaining external behavior in the classical realism, Neo-Classical Realism attempted to reduce the severity of the separation between the internal and external environments, so that it presented positions described as moderate (Burchill et. al., 2001). This constitutes a positive initiative to review the levels of analysis adopted in the interpretation of external behavior and to give importance to internal determinants as well as systemic determinants. Neoclassical realism, in turn, is divided into what is known as offensive realism-defensive realism debate (Mearsheimer, 2001). Both theories acknowledge the role and influence of the internal structure and the perceptions of the decision maker on the orientations and objectives of foreign policy, but this does not prevent the existence of differences between them.

Defensive realism assumes that the anarchy of the international system is less dangerous, that security is more available than it is missing, and thus it is making a theoretical concession by reducing the international systemic incentives, and making it not control the behavior of all countries (2001). It began to acknowledge the existence of

distinct foreign policies, and thus recognition on minimal effects of internal structures on external behavior. The key advocates of Defensive Realism are Stephen Van Evara (1999), Robert Jervis (1976), Joseph Grieco (1997).

Offensive realism emerged as a response to the defensive realism. It criticized its basic premise in that the state and in the context of international anarchy only searches for its security, seeing the opposite of that that anarchy constantly imposes on states to maximize and increase power. Offensive realism scholars believe in the increasing possibilities of war whenever some countries can easily invade another country, and thus the state of absolute anarchy will continue. However, what distinguishes this argument from Waltz's structural realism is the failure to acknowledge that the interpretation of the foreign policies and international outputs of various countries is based on the idea of anarchy. Fareed Zakaria asserts that the focus on the foreign policy of countries must include internal and systemic variables and other influences that are specific to international politics that can be explained by these variables (Zakaria, 1992).

These new attitudes towards neoclassical realism constituted a profound shift in the realist school with regard to the boundaries between what is internal and what is external. To open the way for the necessity of reconsidering the impact of internal determinants in directing foreign policy, and removing that rigid separation between them.

The key proponents of the Offensive realism school are Robert Gilpin (1981), Randall Schweller (2004), Eric J. Labs (1997), Fareed Zakaria (1998), John J. Mearsheimer (2001), Stephen Walt (1990).

According to the realist school, there are two core assumptions in the international system of anarchy and states being principal actors. Kenneth Waltz (1979) argues that the international system's anarchy prompts states to preserve their survival, inadvertently causing a balance of power to emerge (1979).

One of the state's leading security functions is to preserve its survival by protecting and managing the critical natural resources within its territory (Retter et al., 2020). All countries vary significantly in the extent of their dependence on natural resources. They also differ in the availability of adequate supply to secure their well-being and national existence. Water, as a natural resource, is "in insufficient supply for current consumption in some areas both because the region (Middle East) is arid and because the water there tends to be unevenly distributed" (Snow, 2008).

In response to the realist school, Alexander Wendt, a constructivist, wrote his masterpiece tilted "Social Theory of International Politics" in response to the neorealist school led by Kenneth Waltz who wrote the Theory of International Politics in 1979 (1999). He focuses on the security of state-society complexes (1999). Furthermore, advocates of the English school, such as Barry Buzan, contend that ideas, rather than merely material capabilities, shape international politics (2004).

Water Security

The concept of water security is a holistic and broad social construct. It is becoming an increasingly common focal point for players and stakeholders in national, regional, and international circles. As such, much of the relevant academic literature in security studies has provided different definitions of water security, thus sparking discussions on the strengths and weaknesses of various water security frameworks and

approaches (Allan 1994). Security studies focuses on the state as the principal unit of analysis within the international system. This is problematic when thinking about water because the unit of analysis is not always the state (McMahon 2017). Cook and Bakker argue for compatibility of water security with other concepts in the global water discourse, such as IWRM (2012). A summary of water security literature from the perspective of international organizations is provided by the UN-Water (2013). It provides a platform on water security amongst United Nations agencies. According to the Water Resource Institute, water security is an important issue driving state stability and safety in many regions of the world (2020).

The Relevant Concepts of Water Security

The concept of water security is at times achieved by implementing water distillation methods, installing pipelines between water sources and users, issuing water licenses with various security levels, and finally, war (Dadson, 2017). One of the most common threats to water security is water scarcity, which is attributable to many factors, including less or low rainfall, climate change, excessive use of available water, increased population in the specific area. Environmental threats, including natural disasters, biohazards, and others, can also potentially damage water security. The areas of the world that are more likely to lack water security are places with low rainfall, a rapid increase in population, lesser freshwater sources, and international competition. The World Resources Institute recently published data in which it was stressed that 10 out of the 22 Middle East countries are at "high risk" of facing water scarcity due to over usage of the available water resources. Among the remaining 12 countries considered, Iraq and Egypt

suffer from the shortage of water supply because about 80% of the countries' available water is extracted and used in the irrigation process.

In addition to water security, three related (and interconnected) terms must be defined: water stress, water scarcity, and water risk.

Water security. Water security is "the reliable availability of an acceptable quantity and quality of water for production, livelihoods, and health, coupled with an acceptable level of risk to society of unpredictable water-related impacts" (Grey and Sadoff 2007). Furthermore, a panel of United Nations Experts on Water defined "water security" as "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (UN-Water 2013). Additionally, it referred to as the availability of water in a reliable quantity that meets the collective needs of health, livelihood, irrigation, and production, together with the presence of water-related risks at an acceptable level (Hoekstra, 2018)

Water Stress. The second term is "*water stress*," which refers to "the ability, or lack thereof, to meet human and ecological demand for water" (The Pacific Institute) (figure 4). The direct and indirect effects of water stress, such as migration, food shortages, and general destabilization, have significant effects on national security, which spill over to other countries (WRI 2017).
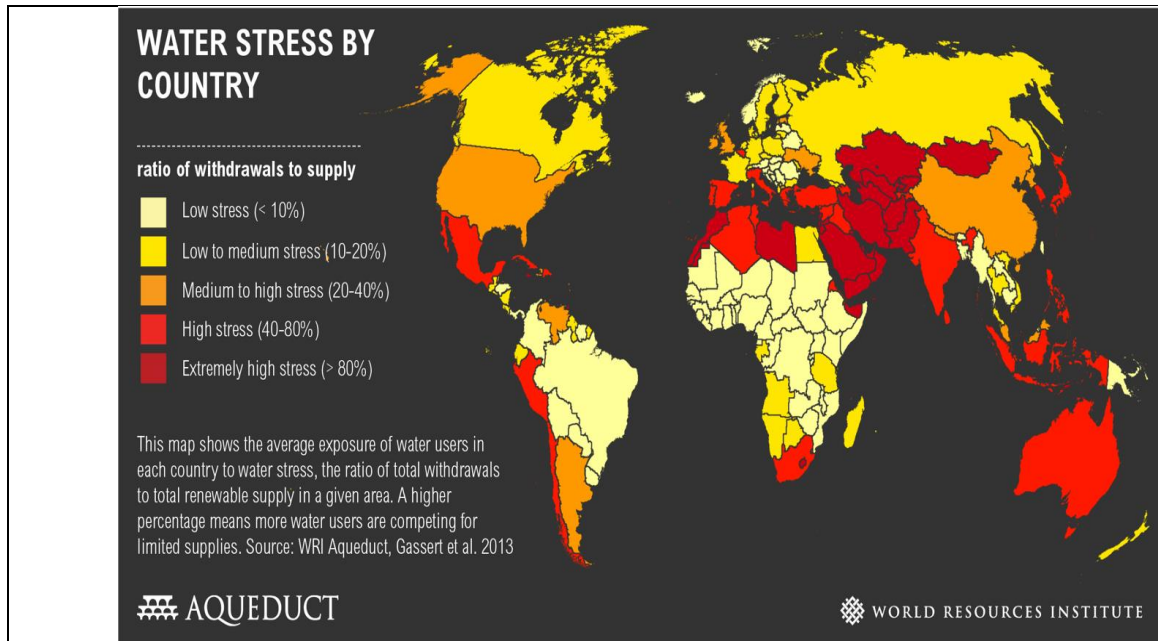
Figure 4. *Water Stress by Country – 2017*

Water Scarcity. The third relevant term is *water scarcity*. The Pacific Institute
(2020) defines it as the "physical volume of, or lack thereof, of water supply in a given
region." Water scarcity is typically calculated as a ratio of human water consumption to
available water supply in each area, such as the Middle East and North Africa region."

Compared to scarcity, "water stress" is a more inclusive and broader concept. It
considers several physical aspects of water resources, including water scarcity, water
quality, environmental flows, and water accessibility. An area is experiencing water
stress when annual water supplies drop below 1,700 m3 per person. When annual water
supplies drop below 1,000 m3 per person, the population faces water scarcity, and, once
below 500 cubic meters, "absolute scarcity" (The Pacific Institute 2020).

Water stress increases the likelihood of disputes over water, as people and
countries compete for scarce resources. In Council of Foreign Relation CFR's "Water and

US National Security," researcher Joshua Busby (2017) argues that this risk is maximized when water stress and weak governance intersect.

Water Risk. The fourth term is *water risk*, which refers to "the probability of an entity experiencing a deleterious water-related event" (The Pacific Institute 2020). "Water risk is felt differently by every sector of society and the organizations within them and thus is defined and interpreted differently (even when they experience the same degree of water scarcity or water stress)" (2020). "That notwithstanding, many water-related conditions, such as water scarcity, pollution, poor governance, inadequate infrastructure, and climate change, create risk for many different sectors and organizations simultaneously" (Eslamian and Eslamian 2017) (Figure 5).
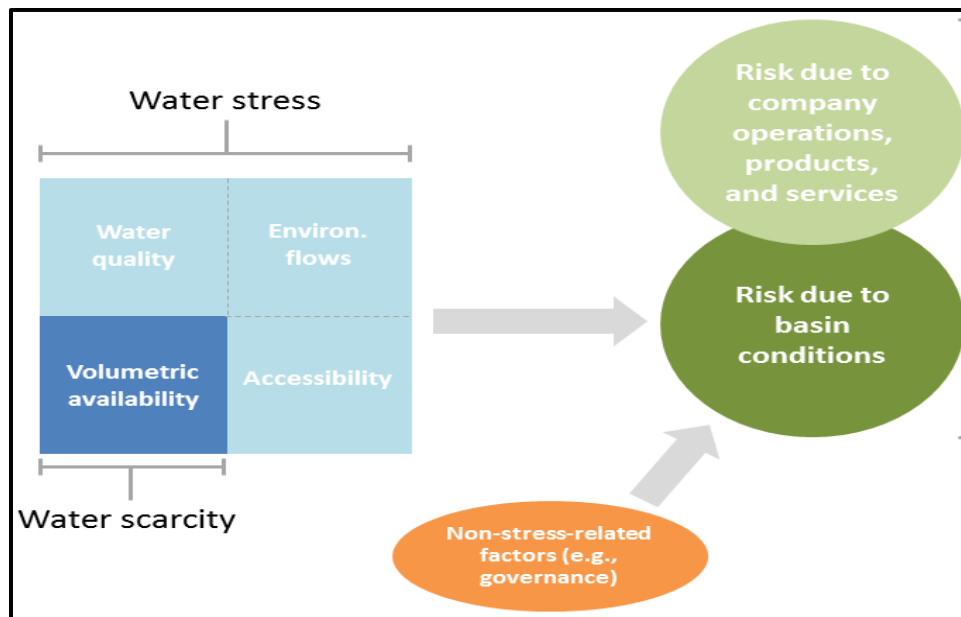
Figure 5. *The Conceptual Interaction between Water Stress, Water Scarcity, and Water Risk (Schulte 2014).*

It is explicitly essential to define the term "water security" as a class of international relations issues. According to the United Nations Water, water security can

comprehensively include various dimensions that range from climate change and water

scarcity to trans-boundary cooperation and sound governance. The main aim of water

security, i.e., the realization of a broader sense of ecological sustainability and human

security, is highlighted in this definition.

Water Conflicts and Risks

The Pacific institute's open-source database: The Water Conflict Chronology,

provides more than 500 entries of water conflicts for 5,000 years, drawn from every

region of the world. The database categorizes the water conflicts into three groups:

trigger, causality, and weapon. According to the database, there were 33 water conflicts

in the Middle East from 2011 through 2019. These include 14 causalities, 15 triggers, and

three weapons. The remaining recorded conflicts consisted of a combination of two or

three categories. During the same period, the database shows that Egypt and Tunisia were

amongst the countries that witnessed multiple water conflicts (Table 2).

Table 2

The Water Conflict Chronology – The Pacific Institute (2020)

Date	Headline	Conflict Type	Country	Description
2012	Disgruntled Egyptian irrigators kidnap tourists	Trigger	Egypt	Farmers from the Abu Simbel region in Egypt hold over 200 tourists' hostage to protest inadequate irrigation water. After visiting nearby monuments, the farmers capture the tourists but release them after officials agree to a temporary water release.
2012	Violent protests over water shortages in Egypt	Trigger	Egypt	Public protests over drinking and irrigation water shortages take place across Egypt. Several protests turn violent: in Beni Suef, one person is killed and many injured during a conflict over irrigation water; in Minya, villagers clash with officials over water shortages and water pollution; in Faiyum, hundreds of people protesting water shortages block a highway and set fires.
2012	Villagers protest contaminated water in Egypt	Trigger	Egypt	Villagers from the Nile Delta province of Menoufia north of Cairo briefly lock the Egyptian health minister and a provincial governor inside a hospital room in protest over contaminated water caused hundreds of residents to fall ill. Egypt's state-run news agency MENA says the number of sick people reached more than 400. The two are released with police intervention.
2012	Angry demonstrators protest over water supply in Tunisia.	Trigger	Tunisia	On June 18-19, demonstrators demanding a solution to a dried-up water supply block the main road near Tozeur, leading to clashes with police.
2013	Water station in Egypt is attacked	Trigger, Casualty	Egypt	A water station in Bir al-Abd town is attacked. No one is reported injured or killed. The attackers claim that the water station was built on their lands.

0 (continued).

2014	A bomb damaged a water pipeline in the city of Minva Al-Qamh	Casualty	Egypt	A person is injured when an explosive device placed under a water pipeline is detonated in the city of Minya Al-Qamh, Eygpt. The pipeline is not damaged. No one claims responsibility for the explosion.
2015	Water pipe attacked in Egypt	Casualty	Egypt	A bomb explodes under a water pipe in al-Rahmaniya village, Abu Kebir, Sharqia governorate, Egypt.
2016	Threats to cut off the supply of water in northwestern Tunisia	Trigger	Tunisia	In northwestern Tunisia, residents of Fernana threaten to cut off the supply of water delivered by a pumping station to the capital, Tunis. They are protesting economic conditions and repeated water cuts that have sparked anger and protests among the local population. At least one death is reported. Water shortages are experienced in Sousse, Nabeul, Sfax, Kef, Siliana, Beja, Sidi Bouzid, Ben Arous, Medenine, and Tataouine. Given the increasing number of protests, the Tunisian citizen's water observatory, Watch water, warns against a possible "thirst uprising."
2017	Bomb damages water truck in Egypt	Casualty	Egypt	Islamic State fighters claim responsibility for bombs placed in a road that denotes, damaging a water truck and a tank in Sheikh Zuweid, North Sinai, Egypt.
2017	Protests over water cuts turn violent in Tunisia.	Trigger	Tunisia	A long series of protests in July 2017 are reported associated with cuts in the distribution of drinking water. Residents reportedly damage buses; citizens blockade a road; security forces and protesters are injured in confrontations.

Based on the Pacific Institute's open-source database: The Water Conflict

Chronology and according to the World Bank (2018), there are three fundamental

questions to water security:

1. *Water resources management*: Are the region's water resources being managed

    sustainably and efficiently?

2. *Service delivery:* Are water services being delivered reliably and affordably?

3. *Mitigation of water-related risks*: Are water-related risks being appropriately

    recognized and mitigated?

These three fundamental areas of water security are originated in the United

Nations' Sixth Sustainable Development Goal (SDG), which aim "to ensure availability

and sustainable management of water and sanitation for all by the year 2030" (UN 2018).

Furthermore, despite the inclusion of the UN's of the above goal as well as a

mandate for accountable and inclusive institutions at all levels (SDG 16), the action is

needed so that pervasive and systemic corruption does not continue to leak resources

from the water sector" (Transparency International 2020). According to the Water

Integrity Network Outlook (WIGO) (2016), institutions and decision-makers can play a

vital role in building "integrity walls" of transparency, accountability, participation, and

anti-corruption measures." All this qualities can improve the water sector's securitization

on both the national and regional levels. Water shortages will aggravate tensions and

unrest within societies, but, as opposed to outright warfare, "internal civil disorder,

changes in regimes, political radicalization and instability" are the more likely

consequences (Homer-Dixon et al. 1993).

Water Security in the Middle East and North Africa Region

Water has been a dominant mixture of socio-political and religious concepts throughout the MENA region's history, starting with the ancient Egyptians' belief in Habi, the Nile River god that connects Upper and Lower Egypt. Then associated with the Code of Hammurabi (the sixth and most famous king of the first dynasty of Babylon, 1792-1750 BC), water was mentioned in 10 symbols of the 286-code system. In the New Testament, the Jordan River is referred to when Jesus crossed his ministry (Matthew 19: 1) and when he took refuge there as a refugee when his enemies sought to capture him (John 10: 39-40). In Islam, the word water (*alma*') appears 63 times in the Holy Quran. The social scientist and historian, Ibn Khaldon, born in Tunisia (1332 –1406), states Chapter 5 "World History" of his famous book "Kitāb al-ʿIbar" that water can be used as a defense barrier against enemies and a critical factor in building cities and the stabilization of states and states.

Water security is increasingly a global challenge in the general and fragile Middle East and North Africa (MENA) region. This dissertation focuses on the following MENA Countries: Jordan, Iraq, Egypt, and Tunisia. It is among the world's most water-scarce areas (FAO and The World Bank, 2018). More pointedly, the report notes that the scale of water challenge is "unprecedented and requires coordinated responses across institutions in many locations." (2018).

The MENA region has staggering statistical water data shortcomings. Two-thirds of the MENA population lacks sufficient renewable water resources for sustainable growth (World Bank 2018). Approximately 6% of the world's population lives in the MENA region (FAO-UN, 2011). Nevertheless, it has access only to "2% of the world's

renewable freshwater" and is home to "12 of the world's most water-scarce countries" (World Bank 2015). The MENA region "consists of a heterogeneous group of countries" (OECD/FAO 2018). It relies on different sources of water. For example, Iraq depends primarily on surface water, while Jordan and Tunisia depend more heavily on groundwater (UNDP 2013). Egypt depends heavily on both ground and surface water (2103). In addition to the scarcity of water resources, David Brooks argues that the origin of water stress stems from three compelling factors: "demand for fresh water in the region exceeds the naturally occurring, renewable supply; much of the region's limited water is being polluted from growing volumes of human, industrial, and agricultural wastes; and the same water is desired simultaneously by different sectors in some society or wherever it flows across (or under) an international border" (1996).

The MENA region suffers from inter- and intra-state conflict and resultant instability due to many geopolitical and socio-cultural factors. For example, it is the aridest region in the world, and the issue of freshwater scarcity tops the list of its "environmental concerns" (World Bank 2018). In most MENA countries, available freshwater is now below the international threshold of 1,700 cubic meters per capita per year that defines 'water-stressed' countries" (Damkjaer and Taylor 2017). There is a rapid increase in the Middle East population, thus increasing water demand. 60% of the region's water supply will come from outside by 2050 (EXACT, 1998; Falkenmark, 2001; Lancaster, 1999; Ohlsson, 1999).

The governments in the MENA region treat water issues as matters of national security. The MENA region hosts about five percent of the global population, yet it holds less than one percent of its renewable water supply (Swain and Jägerskog, 2016).

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According to the World Bank (2008c), the naturally available water supply is exceeded by the overall water demand by about 20 percent. According to Bar and Stang (2016), many experts presently agree that there is a correlation between political instability and water insecurity, one that can be worsened by climate change and ultimately heighten political instability.

Furthermore, it suffers from mismanagement and inefficient water usage, pollution, obsolete water networks, infrastructures, and a lack of economic, political, and legal frameworks for transboundary water resource management. Climate change has increased the region's pressure on water resources that naturally exist. Researchers argue that the best way to address climate change is to deal with it as an agent that multiplies threats by worsening the existing instability, tensions, and trends. This observation is accurate because the region is already conflict-prone and fragile (European Commission, 2008). According to the European Union (EU), climate change has humanitarian implications and political and security risks that directly affect European interests (2008).

Consequently, climate change responses should be multi-sectoral and multilateral. The North Atlantic Treaty Organization (NATO) published a report claiming that the scramble for resources has resulted in the region's increased tension (NATO 2007). The NATO report strongly recommends that social, environmental, and economic issues fuel and provoke conflicts even though traditional causes form significant triggers. Martens (2017) points out that an amalgamation of poor governance, war, climate change, and demographics exacerbated the situation. According to the Stockholm International Peace Research Institute (SIPRI), Security, water scarcity, and climate change constitutes a confluence of crises in the MEAN region (Schaar 2019). He also argues that

"Authoritarian and militarized governments in MENA countries repress public discourse and action related to water and climate crises, viewing critics as threats to national security. However, the elite's economic interests and role in the political economy make them vulnerable to the new risks and threats" (2019).

Serageldin (2001) argues that governance failure to respond to water crises and shortage catalyzed the 'Arab Spring' in Egypt, Yemen, and Syria. For instance, the Syrian government failed to act against the prolonged drought in the region adequately. Also, miscalculated national policies caused a dramatic water crisis that affected agricultural lands, thus increasing essential goods prices. The water crisis in the region went beyond its national borders to Europe through massive migratory influx (SIWI 2016).

According to Lowdermilk (1994), the existing acute sanitation and water crisis in Gaza may significantly affect Palestinian national and humanitarian security, with spillover effects in Egypt and Israel. This situation may thus trigger national and international dynamics, which could result in armed conflicts. Climate change has caused flooding in the Nile Delta and increased Mediterranean Sea levels (Waterbury, 1999). This flooding can hugely increase the number of climate refugees, resulting in severe Egypt's national security concerns that can affect the broader Mediterranean region (Lowi, 1994; Medzini, 2001; Ionides, 2003).

Hussein Amery warns that in his article titled "Water Wars in the Middle East: A Looming Threat," that many cooperative solutions to resource conflicts will emerge in the Middle East, violent confrontations over vital resources such as water are still highly probable in the next few decades" (2002). Israel and Jordan have come together to address the issue of water security. This action has made Israel adequately increase

Jordan's water supply to satisfy its population and the refugees from Syria (Kolars, 1990; Allan, 1996; Haddadin, 2002).

Water Security's Trichotomous Fundamentals

Water resources management: Are the region's water resources being managed sustainably and efficiently? There are two aspects that water resources management should adhere to sustainability and efficiency. It identified two categories of sources of water: Conventional such as groundwater and surface water (transboundary rivers); and non-conventional such as desalination, reuse of treated wastewater, and the reuse of agricultural drainage water. The selected MENA region countries primarily use conventional sources as their primary water (figure 6). Nevertheless, there have been recently more Egyptian efforts to utilize non-conventional methods to address the water insecurity and deficit resulted from the Grand Ethiopian Renaissance Dam (GERD) and its increasing population. The Egyptian government built more than 65 desalination plants in the country's coastal governorates producing more than 744,000 cubic meters of water daily, according to the Sayed Ismail, deputy minister of Egyptian Housing, Utilities and Urban Communities (Yahya, 2020).

The World Bank report (2018) confirmed that more than half of the current water withdrawals in some MENA region countries "exceed sustainable limits'. It continued to say that "failure to address excessive water use can lead to the depletion and degradation of both surface and groundwater resources, which compromises livelihoods and development opportunities for future generations.
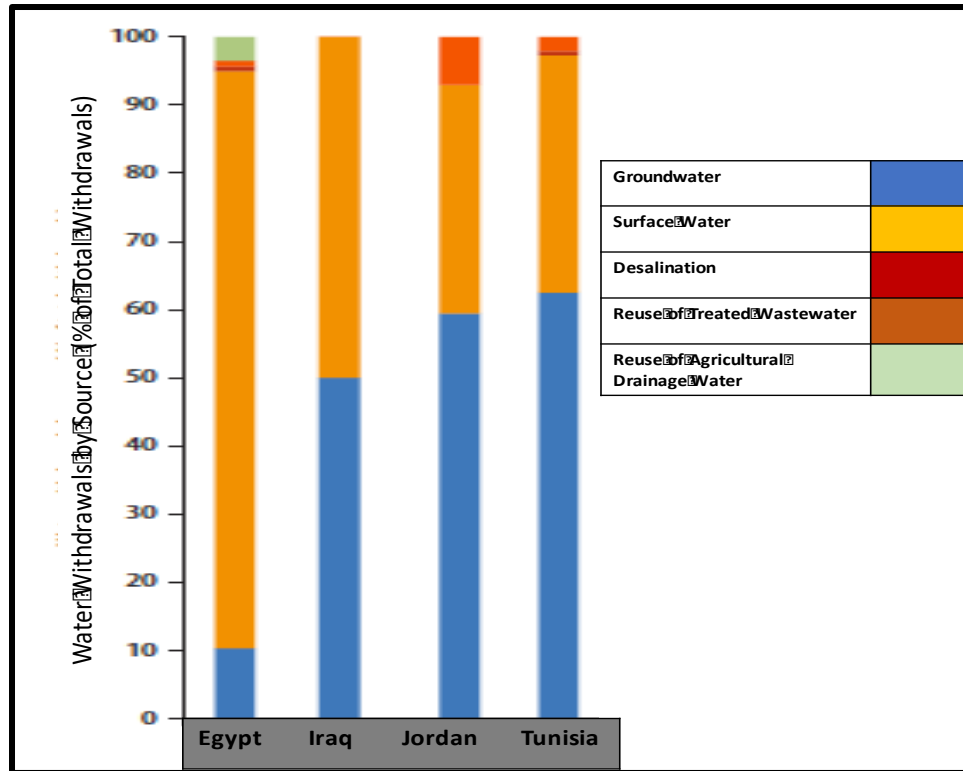
Figure 6. *Water Withdrawals, by Source, as a Percentage of Total Withdrawals, by Selected MENA Countries.*

Service delivery: Are water services being delivered reliably and affordably? There are two aspects that water delivery should adhere to reliability and affordability. Though the MENA region has made progress in terms of increasing access to improved water supply and sanitation since 1990, "still 13% of its population still lack access to handwashing facilities, and another 87 million people lack access to improved water sources in their homes" (Nonay and Advani, 2020). Concerning the current pandemic of COVID 19, the World Bank stated that 'refugees and internally displaced persons (IDPs) in the region are also particularly vulnerable to the virus; 26 million of them have no adequate WASH services" (2020).

It is estimated that the economic losses (high mortality rate, lowest water tariffs, and lack cost of recovery) from inadequate water supply and sanitation cost the region some $21 billion per year in economic losses, which is equal to 1% of its annual gross domestic product (World Bank 2018). For example, Iraq scored the highest amongst the selected MNEA countries and exceeded the regional average in the economic losses attributed to inadequate water supply and sanitation in 2010 (figure 7).
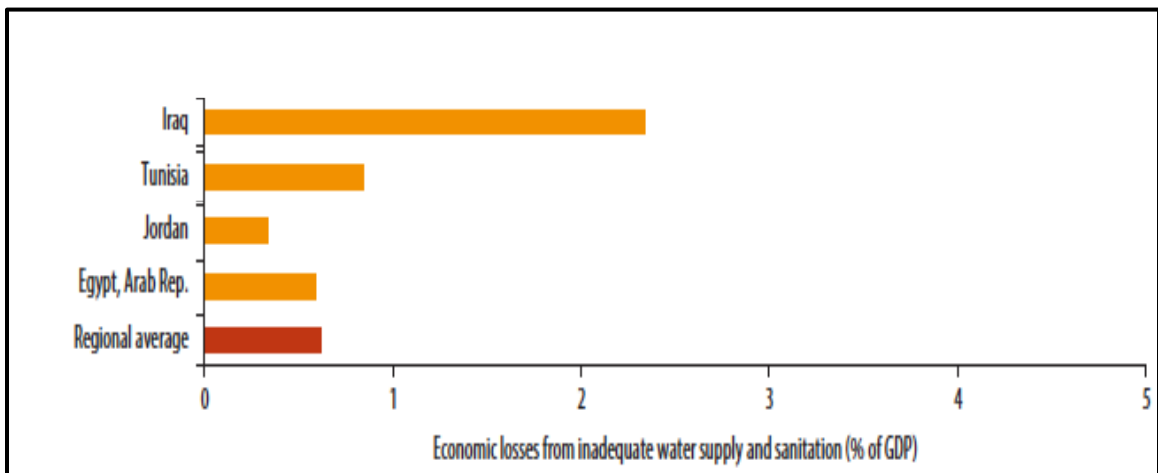
Figure 7. *Economic Losses from Inadequate Water Supply and Sanitation, by Country and Economy, 2010 (World Bank 2018).*

Mitigation of water-related risks: Are water-related risks being appropriately recognized and mitigated? Climate change is one of the significant challenges that severely threaten the MENA region's environmental, economic, political, and security aspects. It primarily affects both the scarcity and abundance of water resources.

There are many definitions of the term "climate change" For example, the United Nations Framework Convention on Climate Change (UNFCCC) attributes it to direct and indirect human activity that "alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods" (UNFCCC,

1992). The National Aeronautics and Space Administration - NASA (2011) defines it as "a change in the typical or average weather of a region or city. This could be a change in a region's average annual rainfall, for example. Alternatively, it could be a change in a city's average temperature for a given month or season." Ben Cook, a lead researcher and climate scientist at NASA's Goddard Institute for Space Studies (2016), stated that "recent drought that began in 1998 in the eastern Mediterranean Levant region, which comprises Cyprus, Israel, Jordan, Lebanon, Palestine, Syria, and Turkey, is likely the worst drought of the past nine centuries."

Floods are the most frequent natural disaster in the region (World Bank, 2018). According to a research paper titled "Mapping of Climate Change Threats and Human Development Impacts in the Arab Region," which is part of the Arab Development Report- 2010 sponsored by the United Nation Development, stated that "The Arab region started to witness some of these extreme events more frequently, particularly droughts, flash floods, and storm surge. The report predicts the climate change will significantly affect the MENA region by the end of the 21st century in many ways (Table 3).

Table 3

Summary of projected climate change effects in MENA

By the end of this century, this the region is projected to experience an increase of 3°C to 5°C in mean temperatures and a 20% decline in precipitation (IP CC, 2007). Due to lower precipitation, water run-off is projected to drop by 20% to 30% in most of MEN A by 2050 (Milly et al., 2005). Reduced streamflow and groundwater recharge might lead to a reduction in the water supply of 10% or greater by 2050.	Significant sea-level rise: The Mediterranean is predicted to rise between 30 cm and 1 meter by the end of the century—causing flooding to coastal areas along the Nile Delta (IP CC, 2007b). Mediterranean biomes are expected to shift 300-500 km northward if a 1.5ÅãC warming were to occur, which could mean that Mediterranean ecosystems (e.g. in Jordan) would become more desert-like.
Greater seasonal temperature variability. More severe weather events, such as droughts and floods.	An increase in vector-borne diseases and pests, as well as mortality

The World Bank Group's report titled "Beyond Scarcity Water Security in the Middle East and North Africa recommends that the MENA should benefit from the global experience in addressing its water security (2018). The report states that:

> *Global experience shows that countries and cities that have arguably overcome the limits of water scarcity have done so through integrated management of both water resources (conventional and non-conventional) and water services and mitigation of water-related risks (Figure 8). This has allowed them to surpass the constraints of their scant natural water endowments effectively. These cutting-edge water managers are effectively aligning water resource planning, management, institutions, information systems, infrastructure, risk management, and incentives to access and store more water, allocate it more efficiently, and deliver it more effectively to customers. Furthermore, they have done so while guarding the quality and sustainability of their water resources. Failure to seize these opportunities will have significant implications for the political, economic, and environmental stability in the region and beyond. As the current conflict and migration crisis unfolding in the Middle East and North Africa shows, failure to address water challenges can have severe impacts on people's well-being and political stability (World Bank 2018).*
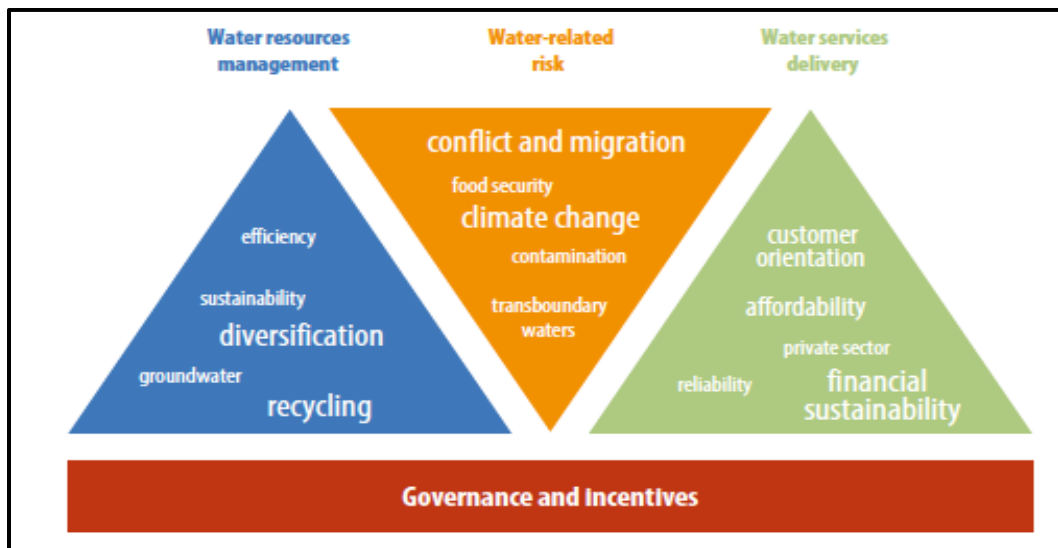
Figure 8. *Governance and Incentives to Seize Emerging Opportunities in Water Resources Management and Water Services Delivery and to Mitigate Water-Related Risks.*

MENA Region Water Organizations

Besides water government agencies, three critical regional organizations play essential roles in addressing regional water issues. Amongst them, the Arab Countries Water Utilities Association (ACWUA), the Arab Water Council, and the Arab Water Ministers Council.

ACWUA was established in Amman, Jordan, in 2009. It is a non-governmental organization (NGO) situated in Jordan. It is a center of excellence that partners with a water supply and wastewater utilities in the Arab Countries on building capacities within the institutions and instituting best practices for the utilities to achieve their objectives" (ACWUA 2019). It has more than 100 water utility members from 18 Arab countries, in addition to private sector companies, non-governmental Organizations (NGOs), academic institutions, and individual members (2019).

The Arab Water Council (AWC), another regional NGO, was established in 2004 and is headquartered in Cairo, Egypt. It has more than 450 members from 22 Arab countries representing various stakeholder groups from the water sector, such as government authorities, regional and international organizations, academic and research institutions, private sector, civil society and NGOs, and Individuals (AWC 2019).

In 2012, the Arab Summit endorsed the Arab Water Security Strategy 2010–2030, which identifies the joint Arab aspiration toward achieving sustainable development and represents a long-term guiding document for the region. The Arab Water Security Strategy-AWSS and its Action Plan (LAS, 2014) were launched and empowered by the establishment of the Arab Water Ministers Council (AWMC) within the institutional

framework of the League of Arab States (LAS). This strategy consists of the "following six pillars:

1. *Developing access to updated information on the state of water resources in Arab countries.*
2. *Improving the application of Integrated Water Resources Management (IWRM) principles.*
3. *Strengthening the scientific, technological, and industrial base.*
4. *Increased funding of water projects.*
5. *Enhanced vulnerability assessment and adaptation to climate change variables.*
6. *Working to establish a means to protect Arab water rights from shared international water."*

Elite Theory and Water Security

Elite Theory

The concept of "elites" has been one of the social sciences' mantras that are impose problematic and elusive. Elites are "small groups of persons who exercise disproportionate power and influence." (Britannica 2019).

The term dates back into the writings of the Italian philosopher Alfredo Pareto (1848-1932) in his masterpiece, "The Mind and Society" (1956). Elites are a group of individual leaders from business, government, and the armed forces who share common interests, social assets, and values within a sector they dominate (Mills, 1956). National elites occupy commanding positions within most salient institutions' set to widespread political influence and policy-making within a country. They are "representatives of governmental institutions (legislatures, presidencies, cabinets, political parties); the civilian public bureaucracy; the armed forces and police; large companies and business

organizations; large landowners' interest organizations; trade unions; the mass media; and prominent educational and professional organizations" (Reis and Moore 2005).

Historically, the concept of "elite" has been a systematic tool used to analyze social situations in their most essential manifestations, particularly concerning the movement of history and structural forms of human expeditions. Researchers have widely employed this concept in analyzing social depth with its problematic and interrelated nature.

Existing elite theory refers to the term "elites" as actors who control resources, occupy key positions, and communicate through networks of power and influence (Yamokoski and Dubrow, 2008).

The researcher provides the theorizing of elites via two relevant schools: Classical elite and Pluralist elite.

Classical Elite Theory

The classical elite theory opposes Marxism, which calls for a 'single-track doctrine' based on the societal class struggle between property owners and the Proletariats – working class (Bottomore, 1993). Furthermore, human society's study requires both a multicausal approach and minority domination, an "inescapable" feature of human society (Mosca 1939). For example, as a social group, governing elites can consist of "individuals who 'play directly or indirectly a noteworthy role at the highest levels of power" (Pareto, 1935). Both Pareto and Mosco contend that there are as many elites as different occupational groups, but his writings and Mosca's concentrate on the political and governing elite because of its historical and social importance.

Pluralist/ Strategic Elite Theory

This theory's focal point is the pluralistic elite structure, which can be associated with the economic, political, and environments involved. (Korom 2015). It also refers to functional and strategic elites. There are four processes for developing strategic elites: "the growth of population, the growth of the division of labor, the growth of formal organizations, and the growth of moral diversity" (Keller 1963).

These elites develop their unique positions and hierarchy associated with power resources (Khan 2012). For example, there are multiple elites in industrial societies in Western countries such as Germany and the United States. (Dahrendorf, 1962; Mannheim 1940). Dahrendorf claims that society consists of a plurality of interest groups, which generate many attitudes and conflicts; each group consists of a loose formation of individuals holding positions with the same interests (1962).

There are many critics to both classical and Pluralist elites' theorists led by C. Wright Mills and Pierre Bourdieu. Mills (1956) contends that the term "elites" means that significantly few upper-class members can control very different societal sectors. Bourdieu (1999) reiterates the same position, because he assumes that the dominant class can maintain its traditional demands for essential leadership functions in society. He is also critical of the societal division of power and government and education (1999). He believes that the subordinate groups contribute to their becoming objects of implementing power through what he calls "their habitus" or cultural capital (1999).

The researcher provides a chronological analytical summary of the relevant elite literature through three groups focusing on the period, major concepts and assumptions, and key advocates and scholars (Table 4).

Table 4

Chronological Summary of Contemporary Elite literature

Aspect	First Group	Second Group	Third Group
Period	Early 20th century	1950-1980	1990-2020
Concepts & Assumptions	Power is unequally distributed Society is divided into a small minority, with significant power – the elite – and most the population that do not have power elite are internally homogeneous', Elites are drawn from an exclusive segment of society Elites are essentially autonomous	Focused on the study of Western democracies Focused on emerging Elites in Post-Colonial Countries in the Middle East and North Africa. Argued that elites were a small and sustainable group Introduced the term 'intermediating elites,' which softened the boundaries between elites and non-elites. elites were analyzed through modernization theory Established causality between the social background of elites, and the interests and attitudes these backgrounds formed, and the behavior of elites	The entrepreneurial elite and professional groups emerged. Alliances between the newly- emerged elites and traditional state elite were established. Studied how Long-tenured leaders retained the services of trusted advisors, aides, and ministers rotating them in and out of government positions Introduced the concept of 'politically relevant elite,' consisting of three circles: core elites, the intermediate elite, and sub-elite.
Advocates & Scholars	Mosca (1939) Pareto (1963)	Weinbaum (1980) Lenczowski (1975) Quandt (1969)	Picard, 1990 Springborg, 1993 Perthes, 2004

Contributions to Existing Literature on MENA's Elites and Water Security

There is relatively little scholarly work on the roles of elites in comparative water security studies. Nevertheless, the concept of the elite has been addressed in a wide variety of issue areas, including political elites (Zuckerman 1977), business elites (Boschi and Diniz, 2004), military elites (Mills, 1956), media elites (Lopez, 2012), religious elites (Wald, 1992), elite athletes (Lorenz 2013) and scientific elites (Zuckerman 1995). They are all essential constituents to every community, government, occupation, religion, and other institutional spheres (Mills 1956; Pareto 1935).

The characteristics of "water elites" have been vague, as their identities might

vary over a continuum of validity. In September 2020, the researcher communicated with

Peter H. Gleick, President-Emeritus, Pacific Institute, and a Member, US National

Academy of Sciences, to participate in the dissertation survey in his capacity as a leading

researcher on water issues. He responded by email that "I do not know what water 'elites'

are, and I do not feel comfortable making assumptions about what they know or do not

know." Therefore, there needs to be a tightening of the use of this new terminology.

Water elites can belong to many professions, such as hydrologists, electro-mechanical

engineers, water management officials, researchers, and other education persons, power,

and water resources. That elite may or may not influence political leadership, especially

in totalitarian-regime run countries, or even the rest of the elites, regarding national or

regional water policy. The political leadership and decision-makers may also not think of

water in the same terms that the water elite does. An excellent classic case of a water elite

is represented by the leading role of the Egyptian-Greek Engineer, Adrian Daninos, in

proposing the build the High Dam on the Nile River (Collins 2000). Before the

revolution of 1952, Daninos presented an ambitious project to King Farouk's

government, but it was always refused (2000). Until the year 1953, when Daninos

decided to present his project to the new Egyptian government led by President Jamal

Abdul Alnaser. It was constructing a huge dam in Aswan to store the water of the Nile's

flood and produce electrical energy using this massive amount of water (2000). The

Egyptian government accepted the project (2000).

Consequently, this study identifies or proposes the following characteristics that

water elites should have: national experience in water-related issues; at least five years of

experience in the water field in high ranking professional positions; published conference papers to their credit; and active memberships and roles in relevant national, regional, and international organization related to water issues.

The MENA region is rich in culture, which is the touchstone in its human lives. Based on data generated by the GLOBE project, that studied how cultural values are related to organizational practices (Grove, 2005), cultural practices in this region are shaped in "higher in-group collectivism and power distance, while cultural values are represented by a common desire for higher performance and future orientation" (Kabasakal et al., 2012). Islam and Arabic as the dominant religion and language, act as unifying forces by creating a shared culture in the Middle East and North Africa region that spans from Morocco to Iran and Turkey (Kabasakal & Bodur, 2002; Encyclopedia Britannica 2020; Heritage, Andrew. 2004)

The MENA region elites proved to be capable of system maintenance. In his book titled "Arab Elites: Negotiating the Politics of Change," Volker Perthes argues that "Although in many cases the elite has been less successful at providing services to citizens, their ability to preserve their regimes, which includes maintaining domestic stability is a fact appreciated by many, including members of the business and intellectual elites" (2004, 306).

US-led intervention in Iraq in March 2003 and subsequent American engagement in nation- and state-building efforts afforded Washington an opportunity to exert multifactor influence on the formation of a new political elite, which consisted of its Kurdish and Shiites allies. The former Baathists leadership, mostly Sunni Arabs, lost their elite status with the toppling of former President Saddam Hussein's regime.

In the absence of strong organized groups or institutionalized political processes, elites in Egypt are vertically bound by patron and client relationships of various kinds. The closer one gets to a presidential patron, the more fragile the vertical communications are likely to be (Moore 1978). Horizontal ties between elite members are also fragile and consist of circles of friends, the so-called "shillas", which are in fact alliances between patron and client groups. This vulnerability, coupled with that afflicting the networks of clients and clients at higher levels, explains the relative importance of the elites in dealing with Egypt's pressing economic problems (1978).

The water stakeholders in the MENA region are progressing, albeit slowly, toward improving the water and sanitation situation in response to internal and external water-related challenges (Rached and Brooks 2010). Therefore, it is necessary to establish a multi-sectoral coordination approach that encompasses domestic, regional, and global resources and talents from "aid agencies, international financial institutions, diplomatic engagement, private sector innovation, and the military" (Risi, 2018).

The selected MENA countries' water sectors have witnessed wider public stakeholders' participation (Table 5).

Table 5

Sample of Water Sector Public Stakeholders in MENA's Selected Countries (ACWUA

2020)

Egypt	Iraq
- Ministry of Water Resources and Irrigation - Ministry of Housing, Utilities, and Urban - Inter-sectoral coordination Ministerial committee at the Cabinet-level - Egyptian Water and Wastewater Regulatory Agency (EWRA) - National Organization for Potable Water and Sanitary Drainage (NAPWASD) - Ministry of Health - The Holding Company for Water and Wastewater. - Alexandria Water Company - Assiut Water and Wastewater Company - Cairo Water Company - Dakahlia Potable Water and Sanitary Drainage Company - Fayoum Drinking Water and Sanitation Company - Giza Drinking Water & Wastewater Company - Greater Cairo Sanitary Drainage Company - Holding Company for Water and Wastewater - Luxor Water & Wastewater Company - Madinaty Electro-mechanic Power Company - Menya Water and Sanitation Company - Red Sea Water and Wastewater Company - Aswan Water & Wastewater Company - Benisuef Water and Sanitation Company - Beheira Water & Wastewater Company - Alexandria Sanitary Drainage Company - Damietta Water & Wastewater Company - Gharbia Water and Sanitation Company - Kafr ElShikh for Water & Wastewater Company - Matrouh Water & Wastewater Company - Menoufia Company for Water and Wastewater - North and South Sinai Company for Water and Wastewater - Qena Water & Wastewater Company - Sharkia Water & Wastewater Company - Sohag Water and Wastewater Company	- Central Ministry of Water Recourses - Central Ministry of Environment - Central Ministry of Agriculture - Central Ministry of Health 16 Provincial Directorates of Water - The Kurdistan Region Ministry of Water
	Jordan
	- Ministry of Water and Irrigation - Jordan Water Company, Miyahuna - Yarmouk Water Company - Aqaba Water Company - Ministry of Health
	Tunisia
	- Ministry of Agriculture, Water Resources and Fisheries - National Water Exploitation and Distribution Company (SONEDE) - National Office for Sanitation (ONAS) - Ministry of Health

CHAPTER III – METHODOLOGY

The chapter introduces and explains the research philosophies and methods employed in the dissertation, placing an emphasis on a mixed-methods case study approach and identifying and assessing the strengths and limitations of the research tools utilized. The purpose is to justify the choice of methodological approach and ensure it ensure that it meets the aims and objectives for this dissertation. Next, the chapter will then discuss the research design, which consists of a three-step data collection process (documentation, self-administered on-line survey, and in-depth semi-structured interview). Further, it presents and explains the data analysis approach employed will use to detail this research and its analysis. Last, it discusses the ethical consideration, research limitations, and reliability and validity.

Research Philosophy and Strategy

Methodologically, water security is best addressed, explained and analyzed by integrating the social and physical sciences. There are three basic categories of research philosophies that can be used within this study: ontology, axiology, and epistemology (Melnikovas, 2018). Ontology primarily deals with the reality and the related effects of the problem under investigation possesses on given societies. There are three subtypes: pragmatism, objectivism, and constructivism. Pragmatism utilizes existing theory to identify solutions to the problem at hand (Sahay, 2016). Similarly, objectivism highlights a social phenomenon and the diverse meanings that different stakeholders attach to it, while constructivism asserts that stakeholders involved in specific phenomena shape and influence its occurrence.

Conversely, epistemology utilizes a scientific approach in generating solutions to the problem under consideration. Three subtypes grow out of that philosophical approach: critical realism, interpretivism, and positivism. Critical realism and positivism assume a similar approach to using research questions that can be tested (Omotayo & Kulatunga, 2015). However, the only difference is that the former does not utilize scientific approaches in drawing a viable conclusion. On the other hand, interpretivism helps in understanding how individuals' behavior, as well as how they perceive and interpret those of others. Lastly, axiology helps understand how opinions impact the collection and analysis of data involved in the research.

Considering this study's nature and scope, the preferred philosophical category to deployed was ontology. Ontology is a branch of philosophy that allows researchers to establish the nature of reality involving a specific social phenomenon, which, in this case, is water security (Dougherty, Slevc and Grand, 2019). Ontology precedes epistemology as the former response to questions such as: what exists and how it exists? What could be existing in water security through the prism of specific ideas and perceptions? (Hay, 2006).

To be specific, this study positively utilized objectivism, allowing it to discern the different meanings attached to water security by different stakeholders, which, in this case, were water elites. Generally, the study was set to explore water elites' perceptions of water security in the Middle East and North Africa region. Adequate coverage of the problems identified within this topic required the use of an objectivist philosophical approach.

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This study was not interested in establishing changes in water security within the MENA region; hence there was no need to collect data over time. Consequently, the study assumed a cross-sectional time horizon. As a result, the data was collected within a specific period. The use of a cross-sectional time horizon enabled the study to compare the variables involved within a specific time (Moon et al., 2019). These variables are as follows: water resource management, water-related risk mitigation strategies, and water service delivery. There have been heated debates relating to the measurement of these variables among different states, including the case studies under consideration here. Assessing the relationships between those variables, with respect to individual cases, as well as across cases, was essential in generating viable solution that will ensure water security for the current and future generations.

Research Approach

This study assumed a deductive research approach. The deductive research approach will allow the study to develop its hypotheses from the existing theory and develop a viable methodology to test it. A deductive approach is central to this study, which uses classical elites' theory and the strategic elites' theory as the primary building blocks for the framework employed. More pointedly, this dissertation progresses from a generalized perception regarding the differences among the water elites to identifying and explaining the specific differences among them as pertains to water security in the Middle East and North Africa (MENA) region.

Several research strategies can be employed by researchers to help them achieve their goals. However, this dissertation relied on comparative case study analysis as its primary research strategy. A case study allows researchers to concentrate on a single area

to conduct research. This situation perfectly resonates with the study's framework considering that the research is to be conducted within the MENA region. Water security in this region is one of the primary concerns of the different governments involved. Some studies suggest that governments in the MENA region treat water issues as matters of national security. As a result, the region has become of significant interest in matters relating to water security.

Additionally, the growing interest in this region is coupled by the fact that it holds close to 5% of the world's population and controls less than one present of the world's renewable water supply. Similarly, the climatic change witnessed within the contemporary world has produced significant flooding within the region, a calamity that presents the opportunity for massive water harvesting to enhance water security. Further, a prolonged drought that results from the climatic change also deprives the region of adequate rainwater and increases groundwater depletion, which in turn increases water security challenges. All these plot the MENA region as a viable study area when it comes to exploring issues relating to water security, something that can be achieved using case study as the preferred research strategy.

This dissertation makes use of a critical national mixed-methods comparative case study approach. Simpsons (2016) defines a cross-national comparative method as "comparisons of political, economic structures, and social structures." He adds that one or more units in different societies, countries, or cultures are compared according to one specific concept to explain and analyze from various phenomena of these separate entities (Savenije 2002).Therefore, concerning this investigation, the researcher chose a mixed-method approach rather than using a distinctively qualitative or quantitative approach to

investigate how water elites perceive water security in four countries in the Middle East and North Africa – Iraq, Egypt, Jordan, and Tunisia (the involved cross nationals) concerning four perception areas: current knowledge of water security, water resource management, water service delivery, and water-related risk mitigation. The results were expected to explain whether the elites' perceptions of water security helped align this discipline with other MENA security studies.

Mixed Research Methods and Triangulation

This study adopted the mixed-method research approach using the triangulation system. In this process, the researcher employs empirical research involving collecting and analyzing quantitative and qualitative data. Berg and Lune (2012:3) state that qualitative research is "the what, how, when, where, and why " of things' essence and ambiance. It helps to elucidate the strengths of sensitivity to meaning and context. It also enables an in-depth study of smaller samples and allows great methodological flexibility to use follow-up interviews and supplementary sources such as documents, reports, and observations. It gives greater credibility and reliability than using either method alone.

Qualitative and quantitative methods are "not distinct" (Dabbs, 1982). Each of the research methods involves the concurrent but separate collection and analysis of two types of data, which are then converged and emerged at the interpretation-of-results stage (Jenkins et al. :2001).

This consistent approach allows addressing the diverging water security issues amongst these countries while maintaining common interest points, resulting in a contextual geographical and regional comparison for research.

The Case Study

A case study explores how a specific social phenomenon affects a specific area's population and can be useful in establishing how factors are different among diverse cases (Melnikovas, 2018). As a research method or tool, it is widely used in psychology, sociology, and political science, including the natural sciences (Yin 2009). It is an inquiry about a specific contemporary phenomenon that uses considerable evidence (Johnson & Johnson 1994). It is employed to examine the specific and complex social phenomenon (Hamel et al., 1993; Perry and Kraemer, 1986; George & Bennett, 2005: Yin, 2018). Yin argues that it allows "investigators to retain the holistic and meaningful characteristics of real-life events" such as small group behavior, international relations, and maturation of industries" (Yin 2009).

The best utilization of case study as a tool is in the following situations: when the researcher has limited access and control over events and the focus is within the realm of contemporary phenomena of some real-life context (Yin 2008). However, there are distinct advantages to using it in this dissertation. It provides an in-depth investigation which gathers the appropriate information from all the possible sources. This notion reiterates what Geertz's concept of "thick description" (1973). It opens the door to the processes created and used by individuals affiliated with the phenomena under study (1973).

Sartori (1991) has stated that entities to be compared should have both shared and non-shared attributes. They should be at the same time, "similar" and "incomparable." To increase the inferential power of few-country comparisons, Landman (2008) puts much emphasis on combining quantitative and qualitative methods. The former as a

representation of descriptive statistics can help the researcher to synthesize a huge amount of data into clear and straightforward summary to complement the other two qualitative methods that will be used in the dissertation (documentation and interviews) and as shown in table 6. For example, it can present quantitative descriptions in a manageable form by simply describing what is or what the data shows without any inferential conclusion as the study cannot be generalized to either the selected countries or the MENA region.

Table 6

Descriptive Statistics and Qualitative Method Case Study Integration

Dependent Variable	Mixed Research Methods Sequence		
	Qualitative	Quantitative / Descriptive Statistics	Qualitative
	1. Documentation	2. Self-administered Survey	3. Semi-structured Interview
Water Resource Management	Yes	Yes	Cross-cutting/General responses to 10 interview questions.
Water Delivery	Yes	Yes	
Water Risks Mitigation	Yes	Yes	

Furthermore, case study techniques provide a means to examine a multiplicity of perspectives to illustrate a social entity or pattern and test ideas and processes (Hakim, 2000; Ritchie and Lewis 2003). Yin (2009) argues that the multiple-case approach is preferred over single-case approaches as the former's analytic benefits can be substantial, whereas the latter will be vulnerable.

After the MENA countries were chosen, they were organized into two case studies: Iraq and Egypt; and Jordan and Tunisia. Each case study was divided into three sections: General comparative features between relevant two countries; online survey data (national and demographic analysis of the survey respondents, by the perceptions of water elites of three relevant water security areas: water resource management, water service delivery, and water-related risk mitigation); and the in-depth informant interview analysis. These will be covered in Chapters 4 and 5.

Study Area Locations

This study focused on four different countries in the MENA region: Iraq, Egypt, Jordan, and Tunisia. This selection allowed for the comparison of their elites' perception of water security. Some of these countries share similar attributes, such as transboundary river basins (riparian state), but each of them has different overall water-related risk levels (Dimsdale, and Mabey 2018). This study is country-centric rather than river basin centric. This stems from the fact that it would be easier to justify a state-centric focus, as elites have allegiances to their country. Thus, it was appropriate for this dissertation to have a state-centric case study method.

The four different countries in this research were selectively chosen, as the study focused on different variables co-relating to these four countries, such as their similarities and differences within their water security context.

One seeming anomaly is that the selected MENA countries— Egypt, Jordan, Tunisia, and Iraq - have shared and non-shared hydro-political attributes. This selection allowed for the comparison of their elites' perception of water security. These entities or units should be at the same time "similar" and "incomparable" (Sartori 1991:246). Some

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of them share similar attributes, such as the transboundary river basin (riparian country), but each has a different overall water-related risk level. Overall, water risk identifies areas with higher exposure to water-related risks and is an aggregated measure of all selected indicators from "the Physical Quantity, Quality, and Regulatory and Reputational Risk categories" (Gassert et al. 2013). Jordan and Tunisia scored "extremely high" and "high" on their water risk level. On the other hand, Iraq and Egypt scored less degree of water risk on the same scale, as shown in (Table 7) (WRI 2019).

Table 7

MENA Region Water Risk Level- Few- Country Comparison

| COUNTRY | Current Overall Water Stress (WRI, 2019) | | |
	Country Ranking (1-165)	Score	Label
Jordan	5	4.56	Extremely High
Tunisia	30	3.67	High
Iraq	42	3.13	High
Egypt	43	3.07	High
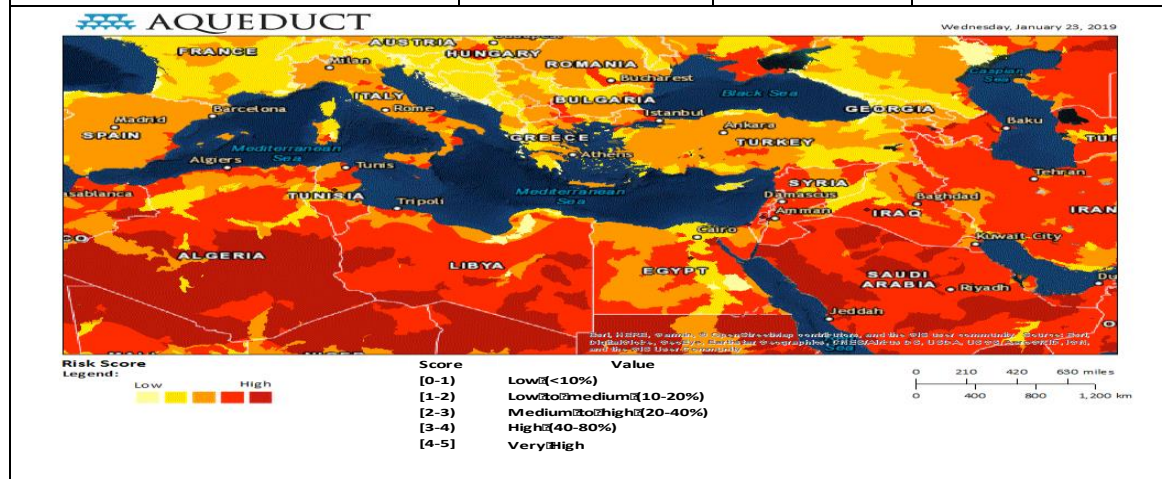
The two case studies presented various water security issues amongst these four countries as perceived by their water elite participants while maintaining common interest points, resulting in a contextual geographical and regional comparison for research.

Research Design

This dissertation addresses the following research question and corresponding hypothesis:

Research Question: To what extent, if any, are there significant similarities and differences between water elites' perceptions of the most critical factors affecting water security in the MENA region overall and in the countries within which they live therein specifically? (measured by the perceptions of water elites of three relevant water security areas: water resource management, water service delivery, and water-related risk mitigation).

Hypothesis: Demographics and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service delivery, and water-related risk mitigation, in the MENA region overall and in the countries where they live therein.

The dependent variables are water resource management, water service delivery, and water-related risk mitigation. The independent variables are the demographic and national factors. In the analysis chapters, the researcher will be measuring and assessing the three sets of relationships, one for each of these three dependent variables.

Case Study

The proposed research design was the logical framework to link the data to be collected to the research questions and hypotheses (Yin 2014). The merged quantitative and qualitative approaches can improve the understanding of the phenomena under study and provide credible answers to difficult items by using a single method (Greene et al., 1989; Tashakkori and Teddlie, 2003). The mixed-methods triangulation design research approach to collecting data for this study was a three-step sequential process. These steps are "highly complementary," and a good case study will use as many sources of evidence as possible (Yin 2009). The first step is documentation. It was followed by self-administered online survey used for quantitative measurement purposes. The third step was in-depth semi-structured interviews that collected qualitative data from a short list of key informants from the targeted water elites.

Step One: Documentation. According to Yin (2009), documentary information is likely to be relevant to every case study topic. Although surveys and interviews were envisioned as the primary means of data collection for this study, this document analysis supplementary research step was employed to introduce each of the two case studies in chapters four and five of the dissertation Yin (2008). Each case study will be introduced with dual general comparative characteristics and attributes between the two relevant countries. This part of the case study will be divided into four sub-sections, as follows:

- o Introduction
- o Water Resource Management
- o Water Service Delivery
- o Water-related risk mitigation

Step Two: Self-Administered Online Survey. The second step of data collection is the survey. It is a technique that involves examining processes and questioning a selected sample within a given population to generate data that relates to a specific social phenomenon. The data collected among the chosen sample always relates to knowledge, opinions, and behavior. A survey as a data collection method may take the form of on-line, mail, telephone, or personal. Some of the factors to be considered before settling on an appropriate survey method include cost-saving, speed of data collection, geographic flexibility, respondent cooperation, response rate, respondents' anonymity, follow-up, degree of interviewer influence, and item non-response rate Table 8.

Table 8

A comparison of different survey methods (Khasawneh, 2020)

Dimensions	Online	Mail	Telephone	Personal
Cost	Low	Moderate	Low to moderate	High
Speed of data collection	Very fast	Slow	Very fast	Moderate to fast
Geographic flexibility	High	High	High	Limited
Respondent cooperation	Varies depending on website	Low	Good	Excellent
Response rate	Fair	Fair	Low	High
Anonymity of respondent	High	High	Moderate	Low
Follow up	Difficult	Easy	Easy	Difficult
Degree of interviewer influence	None	None	Moderate	High
Item non-response rate	High	Low	Medium	Low

Comparing these methods by considering the above factors revealed that an on-line survey was the most effective and efficient survey method. Through this, the study settled for an on-line survey as given its relatively low administration cost, very fast speed of data collection. Similarly, it ensures a fair response rate and a high level of anonymity of respondents. Lastly, the respondents can easily navigate the provided platform; hence, no further training is required for respondents. Still, the respondents' cooperation varied depending on the website and social media channel where the researcher has a lesser degree of influence on subjects.

Surveys are used primarily "to answer questions that have been raised, to solve problems that have been posed or observed, and to describe what exists, in what amount, and in what context" (Isaac & Michael, 1997). The main advantages of this type of data collection research tool are their effective capability of obtaining information from large samples of the population at minimal investment in terms of time and money (Bell, 2005). They can be used to collect information about perceptions and attitudes towards specific research issues (McIntyre, 1999).

Survey Design and Administration

The survey was an on-line self-administered tool targeting water elites. They are members of regional or national organizations with active roles in the water sector in the selected countries. The collected data helped to describe, compare, or explain the target population's knowledge, attitude, and behavior relevant to water security. The information was collected directly by asking subjects to answer straightforward, purposeful, and concrete questions that can take two primary forms such open and closed. Closed-ended questions do not give the respondents room for non-anticipated or unique

answers and so come in the form of checkboxes, drop-down, multiple answers, and ranking questions. Consequently, the closed questions used within the survey consisted of pre-selected responses or answers. On the other hand, open-ended questions gave individual respondents the freedom to provide any form of response to the questions. Through this, the respondents were asked to use their own words to answer the questions.

Further, it is advisable to utilize expert review during the survey instrument's design and development. Their feedback helped to reveal problems with the survey questionnaire so that they can be addressed before rolling out the survey (Willis. 1999). Accordingly, the researcher had two-rounds of reviews by ten experts and potential respondents from the MENA region's water sector organizations, such as the Arab Countries Water Utilities Association (ACWUA). They provided feedback regarding the survey content in various areas such as suitability, applicability, and cohesion. This process was advantageous to discern issues that manifest data quality problems.

The researcher continued drafting the survey questions and refining them. Then a small group of water experts from the private, public, and international organizations such as the United States Agency for International Development (USAID), the former Chairman of the Palestinian Water Authority (PWA), and the former General Secretary of Jordan Water Authority (WAJ). They reviewed the survey for clarity and readability from March to July 2019. Furthermore, the researcher presented the survey and interview questions draft to a panel of water experts participating in the ACWUA's 5th Arab Water Week "Towards Sustainable Development in Water and Sanitation" held in Jordan on March 2-5, 2019. On the second day, the researcher presented in the 25th session titled "Water Security for All: Science Diplomacy for Sustainable Development of Water

Resources in the Arab Region and Neighboring Countries." UNESCO Regional Bureau organized this session for Sciences. The researcher collected feedback from participating water professionals during and upon the completion of the meeting and conference. The data collection instruments were modified based on the received feedback. This process was advantageous to discern issues that manifest data quality problems.

The researcher successfully defended the dissertation proposal, which included the data collection instruments on February 6, 2020, at 10:00 am, Central Standard Time. After the dissertation proposal defense, the committee recommended that the researcher:

- o Reduce the selected MENA countries from five to four (Iraq, Egypt, Jordan & Tunisia). Therefore, the Palestinian Territories were excluded to avoid any bias that impacts the research as the researcher is an American Citizen of Palestinian descent.
- o Define the independent variables as national and demographic.
- o Reduce the proposed dissertation chapters to seven as follows:

    Chapter I: Introduction

    Chapter II: Review of Related Literature

    Chapter III: Methodology

    Chapter IV: Presentation of Case Study on Iraq and Egypt

    Chapter V: Presentation of Case Study on Jordan and Tunisia

    Chapter VI: Comparative Analysis of Case Studies

    Chapter VII: Conclusions

The researcher incorporated the requested changes in the proposal. The document was re-submitted it to the dissertation committee members on February 18, 2020, and they approved the changes on February 19, 2020.

The researcher submitted the survey and interview forms to Institutional Review Board (IRB) via the Cayuse system on February 26, 2020. The IRB approved the study and both instruments on April 1, 2020 (Appendix A). The researcher posted the online survey on *the Survey Monkey platform*, a data collection management tool, on April 15, 2020. This tool allows for increased ease of use, faster, cost-effective, more accurate results, the production of more robust results, and is more environmentally conscious.

The survey consisted of 39 questions of varying degrees of uniqueness (Appendix B). They were categorized into five sections:

      I.   Participant Demographics Background (Questions 2-11)

      II.   General Water Security Knowledge and Perceptions (Questions 12-18)

      III.   Water Resource Management (Questions 19-28)

      IV.   Water Service Delivery (Questions 29-33)

      V.   Water-Related Risk Mitigation (34-39 Questions)

Snowball Sampling

The researcher did not apply probability sampling to this study since it could not ensure that the different population units had equal probabilities of being chosen. (Denscombe, 2007). Instead, the study used non-probability judgment sampling as it ensured that the survey reached respondents who had sufficient and relevant knowledge

about the questions. Subjects were recruited utilizing a technique of network and snowball sampling. This sampling technique helped to identify the appropriate participants as part of a convenience sample as the population listing is "unavailable and cannot be compiled (Fink 2003, 41, 164).

The snowball-sampling involves only a few people who furthermore become a multiplier and ask further people to join the sample in these selected countries. It relies on "previously identified members of a group to identify other target populations (2003,165). This sampling technique offers not only the advantage of quickness but also facilitates the spread of the survey because the multipliers will act as a reference for the researcher's credibility (Dencombe, 2007). To this end, the researcher initiated communication with the Arab Countries Water Unities Association (ACWUA) In Spring 2019. He aimed to explore the possibility of utilizing this organization database as part of identifying the Initial list of participants from the selected four countries. ACWUA management agreed to cooperate, but it will utilize its website (https://acwua.org) to upload and disseminate the survey, which will be introduced first by email to its members. The researcher will utilize other social channels such as Facebook, Facebook Messenger, WhatsApp, and email and recruit more members from his professional network in the selected countries.

Step Three: In-Depth Semi-Structured Interviews. Interviews are widely used in research studies as an additional tool in the social sciences due to their ability to allow a more in-depth, open and informal interaction between the interviewer and the person being interviewed (Potter, 2002; Winchester, 1999; Sarantakos, 2013).

In general, the qualitative interview is essential for data collection (Yin 2013d). The interviewer can pursue in-depth information around the topic. Interviews are a useful tool for follow-up with individual respondents to surveys to investigate their responses (McNamara,1999). There are three types of interviews: structured, semi-structured, and unstructured interviews. An unstructured interview involves a direct conversation between the researcher and the respondent with no questions and only a few. The researcher only used the study topic to probe the participants and obtained rich and in-depth information.

On the other hand, a structured interview involves strict adherence to interview protocols by the researcher, such that only the interview protocol questions are asked by the researcher (Al-Ababneh, 2020). The interview questions are specifically channeled to address the social phenomenon in question. It is highly regarded as the most accurate form of the interview though the respondents have no chance to raise concerns during the interview. Similarly, a semi-structured interview is also being controlled by interview protocols, only that it incorporates conversational aspects between the researcher and the respondent. Through this, it allows the respondent to raise any concern that they have during the interview. However, it can result in a power struggle between the interviewer and the researcher, which may affect the data's validity and reliability.

This dissertation will use semi-structured interviews, commonly used in qualitative research (Alshenqeeti, 2014). Interviewees should be related to the study question (Drew, 2014; DiCicco-Bloom & Crabtree, 2006). This type of interview is advantageous as it is flexible and allows the researcher to intervene when necessary and explore critical points. (Patton, 2015; Yin, 2013).

Following the survey phase, in-depth interviews with key informants were conducted to explore the findings and results generated from the survey responses in greater depth. As Yin (2014) emphasizes, interviews with key informants are often critical to a case study's success and can be one of the most important sources of evidence. Accordingly, the researcher contacted a sample of survey respondents who showed a willingness to participate in the interview.

Interview Design and Administration

A 10 - question interview instrument (Appendix C) was developed to gain more in-depth insight and build off the survey findings. These open-ended interview questions are designed to be primarily conversational to prompt discussion and allow the respondents to elaborate on their thoughts and to introduce new ideas to the debate (Creswell, 2014). Giving the respondents the freedom of speaking what they know on the topic under discussion not only ensures the establishment of good rapport between the respondent and the interviewer but also ensures new insights are generated, which can result in innovative ways of tackling the problem under study.

These questions act as verification for the information gathered and determine the degree to which the in-depth interview questions can apply across the four countries. The researcher was flexible regarding the venue for the interview in which the respondents were allowed to select their preferred channel and time. Due to the Coronavirus pandemic -COVID-19, the study had limited access to the interviewees. Therefore, the interview questions were sent via email and social media channels based on the provided preferred contact information they submitted in question 11 of their survey forms. The researcher consulted with other international experts in the water sector who have extensive water

experience in the MENA region to provide their water security perception. This dimension added more depth to the study.

Data Analysis

The study utilized content analysis to analyze the data obtained from both the survey and the interviews. Through this method, once the researcher completed the interviews, the transcripts were analyzed to look for common themes, keywords, and major categories in the respondents' comments. These were compared across the selected nations. The themes were arranged under the three variables involved in the study in the form of water resource management, water service delivery, and water-related risk mitigation.

Social sciences used content analysis a research method in the 1980s but it was utilized mainly by journalism and communication research then (Krippendorff 2004). Social scientist differed in their definitions of concept analysis. Content analysis can be defined as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (2004).

According to Stempel and Westley (1989), conducting content analysis by researchers need to address four issues: "selection of units of analysis, development of categories, sampling of appropriate content, and verification of cryptographic reliability." Content analysis usually include six steps: formulating the research question or its objectives; choosing to contact and sample content; development of content categories; completion of the units of analysis; preparing the coding schedule, pilot testing and checking the reliability of the internal programmer; and analyzing of the collected data.

There are two heterogeneous categories of content analysis in terms of their

definitions. The first category focuses on an accurate and objective description utilizing

quantitative categorization of a specific content and intellectual tools. Janis (1943/1965)

used content analysis as a method for classifying the characteristics of intellectual tools

into categories according to some rules that the analyst sees as a scientific researcher.

Janis offers three classifications: (1) pragmatical content analysis-procedures which

classify signs according to their probable causes or effects; (2) semantical content

analysis-procedures which classify signs according to their meanings such as

designations analysis, attribution analysis, and assertions analysis; and (3) sign-vehicle

analysis-procedures.

Berelson (1952) defines content analysis as one of the scientific research methods

that aims at objectively, structured and quantitative description of the apparent content of

communication materials. He listed a variety of uses for content analysis such as:

describing trends in communication content; identifying the intentions and other

characteristics of the communicators, determining the psychological state of persons or

groups; to secure political and military intelligence; reflecting attitudes, interests, and

values (cultural patterns) of population groups; and describing attitudinal and behavioral

responses to communications.

The second category consists of the ones who confused the concept of content

analysis with other concepts such as context analysis or the documentary approach.

Richard B. Budd et al. (1967) argue that content analysis is a structured method for

analyzing the content of a message, as a tool for observing and analyzing the apparent

behavior of communication between a selected group of individuals who are interacting and communicating. On the other hand,

Harold Lasswell (1960) who has significant contribution to the disciplines of political science, sociology and sociology, argues that content analysis aims at an accurate and objective description of what is said about a specific topic at a specific time. He contends that the center of gravity of the content analysis the "investigation of communication messages by categorizing message content in classifications to measure certain variables." Lasswell incorporated these components in his classical formulation: "WHO says WHAT to WHOM with WHAT EFFECT?" (1960). According to Lasswell content analysis answers the "says what" part of the question, audience research answers the "to whom" part, and effects research answers the "with what effects" part (Krippendorff 2004).

<p align="center">Ethical Considerations</p>

According to Berg and Lune (2012), social science researchers who typically conduct their research on human subjects "must consider whether ethical standards and safeguards for subjects' protections are adhered to." The study ensured that all ethical considerations were adhered to throughout the process (research approach, research design, data collection, and analysis). Some of these ethical considerations included informed consent, permission, respondents' autonomy, confidentiality, and anonymity. Under informed consent, the respondents were introduced to the research aims and objectives before engaging them in both the survey and semi-structured interviews. On the same note, the researcher also respected individual respondents' autonomy by accepting their decisions and perceptions. Lastly, the study ensured that all participants'

identities remain anonymous, and the confidentiality of comments were not specific to any interviewee to avoid any reprehension and stigmatization by society. The researcher completed the Southern Miss IRB approval process before conducting the survey and interviews.

Study Limitations

Utilizing the case study approach in this study presented certain limitations. First, there has been no universal consensus on defining the term "elite." Second, the terminology "water elite" is a new concept introduced to literature for the first time. Third, the study was limited to the sampled water elites' perceptions and experiences and to the countries they represent and thus cannot be generalized to the other remaining MENA countries. The case study has been faulted for its lack of representation, its lack of rigor linked to the problem of bias" (Hamel et al. 1993). It also provides little basis for scientific generalization. This study's findings cannot be generalized to the larger population of each of the selected countries since it uses snowball sampling. On the same note, a cross-sectional time horizon always fails to provide explicit information regarding cause-and-effect relationships considering that it only a snapshot of a single moment in time.

Reliability and Validity

Reliability and validity are significant criteria in assessing the quality and adequacy of measuring the research tools. Consequently, they are essential parts of this dissertation research. For increased reliability, the study will target a more varied group of subjects in the selected countries. Further, documentation of all collected data will be kept to provide a trail that can be audited (Creswell, 2014). As a matter of logic, a data

collection tool that is not reliable cannot be valid, but it can be reliable and still not be valid.

The researcher used two data collection methods (survey and interview) to increase this case study research's validity. As Hantrais (2009) suggests, "using different approaches with convergent lines of inquiry will help address all aspects of the research questions and allow for cross-checking of the findings." The research instruments have been reviewed by key informants in the four selected countries to provide an added validity measure.

CHAPTER IV – A PRESENTATION OF CASE STUDY ON IRAQ AND EGYPT

Water is called "the essence of all living things" (Westall, 2018). This quotation means that no living organism can survive without water, as it is based on all life functions in the organism. Once abundant on Earth, water has become an increasingly depleted resource in the modern world (Brauman, 2016). In 2018, the World Bank and United Nations claimed that approximately 36% of the world's population was living in areas experiencing a water crisis (Chen, 2018). This threat has escalated over the past few decades for several reasons, such as overuse of water, pollution of water resources, massive water use for agricultural purposes, misuse of water on a global scale, and others (Arfanuzzaman, 2017). Hence, securing water resources is an increasing global need at present. In this context, another important concept is "sustainable development." In 2015, at the United Nations' historic summit, member states adopted the 2030 Agenda for Sustainable Development. The Sustainable Development Goals (SDGs) are at the center of this agenda (Stafford, 2017).

Water security refers to creating a way of life through which the current generation of the world can fulfil the needs for resources without compromising future generations' capacity from meeting their needs (Freedman, 2018). 'Sustainable development' will thus remain a mere myth if the concept of water security is not turned into a reality (Allen, 2018). The term 'water security,' on the other hand, is referred to as the availability of water in a reliable quantity which meets the needs of health, livelihood, irrigation, and production together with the presence of water-related risks at an acceptable level (Hoekstra, 2018). Water security is the sixth goal among the seventeen enlisted in the Sustainable Development Goals (SDGs) (Varady, 2016).

Only a water-secure world can strike a balance between understanding the value of water and its usage in meeting the requirements of human life. The process of securing water leads to harnessing or nurturing the productive power of water while diminishing the negative effects of its absence (Kisakye, 2018). A water-secure world is expected to reduce poverty, depict advances in the various spheres of life like education, and subsequently increase living standards. The state of water security is achieved when the water resources in the area are adequate to meet the needs of the people living there, and there is little or no threat of the depletion of water supply (Kato, 2019).

The concept of water security is at times achieved by implementing water distillation methods, installing pipelines between water sources and its users, issuing water licenses with various security levels, and finally, war (Dadson, 2017). One of the most common threats to water security is water scarcity, which have multiple causes, including less or low rainfall, climate change, excessive use of available water, increased population in the specific area, and others. Environmental threats, including natural disasters, biohazards, and others, can also potentially damage water security. The areas of the world that are more likely to lack water security are places with low rainfall, a rapid increase in population, places with lesser freshwater sources, and international competition areas over water sources. The World Resources Institute recently published data in which it was stressed that 10 out of the 22 Middle East countries are at "high risk" of facing water scarcity due to over usage of the available water resources. Among the rest of the twelve countries, Iraq and Egypt suffer from the shortage of water supply because about 80% of the countries' available water is extracted and used in the irrigation process.

This comparative case study of Egypt and Iraq was introduced with dual general comparative characteristics and attributes between the two relevant countries. It consists of three sections:

1) Introduction.

2) Case Study Structure, Methodology, and Analysis (Documentation, On-Line Survey, and Semi-Structured Interview).

3) Conclusions.

Case Study Structure, Methodology, and Analysis

This case study focuses on a comparative analysis of the elite perceptions of water security in Egypt and Iraq, respectively. The researcher used a three-pronged methodology to develop a case study. The three sections are documentation, a self-administered online survey, and an in-depth semi-structured interview to collect qualitative data from a shortlist of key informants from the targeted water elites. The case study ends with a section summing up the main conclusions of the case study analysis.

Step 1: Documentation

According to Yin (2009), documentary evidence is likely to be relevant to every case study topic. Although surveys and interviews are envisioned as the primary means of data collection for this study, the preceding primary documentary and secondary source background research step was employed to introduce each of the two case studies presented in Chapters Four and Five. The documentation section consists of three sub-sections: Water Resource Management; Water Service Delivery; and Water-related risk mitigation

Water Resource Management.   The term 'water resource management' refers to the

process of planning, distributing, and managing the best possible use of water

(Hernández-Bedolla, 2017). This is a constant and ever-changing process as resource

management concerning water needs to adapt and change according to the potential

future problems. Concerning the idea of water resource management, the process will

include planning in terms of the water demand and subsequently providing water equally

to meet the demands and prevent the risk of water scarcity (Badham, 2019). Nevertheless,

in its application, this is hardly plausible in practice. The successful management of any

resource is possible through the proper knowledge of the resource available, the ways of

using it, the competition involved in its usage, evaluating the importance of the

competition in usage, and applying the developed policies for resource management on

the ground level. However, the steps mentioned earlier in managing resources are

incredibly challenging to implement with respect to water as a resource. This is because

the sources of water all over the world might, at times, be shared by countries or even

cross-national boundaries. Also, specific water uses may be difficult to manage in

traditional terms and might also be difficult to equate in financial terms. There are some

other problems involved in water resource management on a global basis. The three

principal challenges involved in this context are as follows:

- First, climate change majorly affects water availability in many areas due to the
  drying or warm climate.
- Second, the increasing vulnerability faced by populations globally due to natural
  disasters makes it more concerning to the governments to ensure population
  safety rather than ample water supply.

- Third, the growing urban demand for water makes it scarce in the villages; fourthly, unrestricted and misuse of water supply leads to the increasing scarcity of water, and finally, the alteration in the use of land has a significant impact on the supply and use of water (Huang, 2019)

As far as Iraq is concerned, decades-long armed conflicts, fights over transboundary water usage, and the increasing impact of climate change have resulted in the country's vast water crisis. In order to ensure sustainable development in post-conflict Iraq, it was found essential that access to necessary water infrastructure was required to be given and the climate-sensitive long term strategies to do away with the water crisis in the country. During the heatwave of summer 2018, the immediate need for water infrastructure was demonstrated drastically when almost 118,000 people were hospitalized due to symptoms of illnesses related to water quality (Causevic, 2020). At that time, the protests in the southern part of the nation in the city of Basra were also aimed at demanding better provisions of clean and hygienic drinking water and portable water. This protest clearly expressed that the citizens now expected the government to rebuild the water infrastructure and even provide proper sanitation. In this context, the Hague Declaration encourages investments in rebuilding the water infrastructure in Iraq and promises to promote humanitarian efforts like granting access to potable drinking water and sanitization (The Planetary Security Initiative 2017).. This declaration also stressed the need to formulate proper long term plans for water security by considering factors like climate change and others. However, for this purpose, water management's local and national level institutions must be strengthened. Also, increased oil production in Iraq will increase water consumption in various industrial sectors, currently about 34.8

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million m/year (Al-Furaiji, 2016). In modern times, even after the political standstill in Iraq, the government is seemingly active and committed to providing proper, safe, and potable water infrastructure and sanitation that would result in improved water security (Yousuf, Mahmood A, 2018).

On the other hand, water resource management in Egypt in the modern world is a complex process. It involves multiple stakeholders that use the water for several purposes, such as irrigation, generation of power, industrial usage, navigation, and others. Egypt depends majorly on the Nile River for its supply of water. About 97% of the country's water supply is provided by the great river (Stanley, 2017). This is because rainfall is minimum at about 18mm per year in the area that is occurring in both autumn and winter. There is no water-sharing pact between the 10 countries sharing the Nile, but they cooperate throughout the river valley. Egypt has both conventional and non-conventional sources of water. The conventional sources include four principal groundwater aquifers: the Nile Aquifer, the Nubian Sandstone Aquifer, the Moghra Aquifer, and the Coastal Aquifers. The non-conventional sources of water in the country include agricultural sewage, saltwater desalination, brackish water desalination, and municipal wastewater reuse. Also, Egypt has access to have substantial groundwater resources in the form of fossils in Western Desserts.

Nevertheless, even after all of this, one of the significant problems with Egypt's resource management is similar to other countries of the world: a striking imbalance between the increasing demand for water and its limited supply. For this purpose, proper discussion and coordination between the other nine countries sharing the Nile water is required. The Nile Basin Initiative provides a platform for such discussion and

cooperation. The water-saving in agriculture is an essential aspect of Egypt's water resource management strategy, which it intends to use to provide sufficient water supply to meet the demand for water in all spheres of life with limited sources at hand. However, the magnitude and process of water-saving through agriculture have been debated in the country. All the debates kept apart, the water-saving procedure applied in irrigation in Egypt is not based on modern water-saving technologies like sprinklers or drip irrigation. Rather it depends on the belief that the farmer needs to be educated on the timing and quantity of water in the fields to facilitate both the irrigation and ensure water savings. This is because of a lack of control over the timings and quantity of water used earlier and more water usage than required. Apart from all this, external cooperation from some of the different countries of the world has helped in shaping Egypt's current-day water resource management plans through both assistance and financing (Elshorbagy, 2017)

Water Service Delivery. Community water supply or service delivery may assume various meanings according to region or country-specific definitions. In general, it is identified by the people it serves, the purpose it fulfills, and the manner of its operation. There are public health, economic, and human rights-related benefits attached to the supply of safe and clean water to people worldwide. A United Nations General Assembly resolution in 2010 that designated sufficient and safe supply of water as a human right, the fulfilment of which leads to the creation of situations in which the other fundamental human rights can be realized. Generally, water service monitoring frameworks provide a network of indicators that can be used to track trends in water supply and measure its progress. Through these indicators, comparisons can be made worldwide between different companies providing drinking water services, and the efficiency of their

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technology can also be measured. The main objective of monitoring the efficiency of water services is to contribute to the development and subsequent expansion in the service delivery that will result in securing the public health, economic and human rights-related benefits that are expected to be achieved from the maintenance of a proper and adequate water supply (Penner, 2016).

The water service delivery in Iraq is characterized by insufficient quantity and quality of water supply. Decades of armed conflict, put together with limited or no environmental awareness, has led to the destruction of the country's water resource management system and, in turn, has vastly affected the supply of clean water to the people. Iraq currently faces difficulty meeting its target of supplying clean water to 91% of the country's households by 2015 (United Nation Country Team, UNCT, 2010). Almost 16% of the households' daily report problems regarding water supply, while about 20% of them use unsafe water sources for regular use (UNICEF/COSIT/ KRSO/MoH Multiple Indicator Cluster Survey 2006). Again, septic tanks and animal wastes pollute the drinking water network of the country. The water supply of Iraq is dependent on three primary resources, namely: the Tigris and the Euphrates rivers that provide about 98% of the water demand in the country (Barbooti, M.M., et al, 2010). Rainfall in the country are a seasonal affair and occur from December to February and generally cause flooding in the north-east and southern portions of the country which may lead to the further scarce supply of clean water; in some places like the northern part of Iraq (Global Security 2020), groundwater is the sole source that guarantees the supply of water sufficiently. According to the Human Rights Watch Report (2019) the quality of drinking water supplied in the country is often mixed and poor. Unhealthy drinking water

and below-level sanitation practices of Iraq have made diarrhea and other health-related hazards common in people's daily lives. Again, in some parts of the country, Basrah, the local water sources contain high salts. So, currently, the country's drinking water is bought from the water tankers or markets that receive water from the nearby water plants that use the reverse osmosis method to remove the excess salt (2019).

The groundwater quality of Iraq is high in pH value ranging from 7.03 to 7.91 and low in mineral content (Ghalib, 2017). These water sources are often contaminated because of the free seepage of sewage water from nearby households. In general, Iraq is a water-stressed country, and it usually suffers in maintaining a proper standard of water supply daily. In addition to these complicating factors, the water supply tariff is so low that the required revenue is not recovered to invest in the proper supply and sanitation of water. At the same time, people who obtain their water from tankers have to allegedly spend up to one-third of their income on attaining proper potable water, while others who can acquire water freely use up to 350 liters of water per capita a day (Ismaiel, 2018)

On the other hand, Egypt's drinking water supply service is characterized by both achievements and challenges. The achievements include increasing piped water supply between 1998 to 2006 from 89% to 100% in urban areas and 39% to 98% in rural areas despite rapid population growth. Apart from this, the open defecation in rural areas has been eliminated, and high amounts of investment have been made in water infrastructure. Access to a basic water supply is now valid to the extent of 98% (Roushdy, 2016). However, several challenges are yet to be undertaken to reach an optimum water service delivery level in the country. One of these challenges includes the fact that only one half of the population is connected to sewers and has access to sanitation. As a result, about

50,000 children die annually due to diarrhea. Another challenge faced in this sphere is the low tariff rate of the water supply, one of the lowest globally. This situation burdens the government to invest even in water infrastructure running and leaves no profit room to develop the water service facility. Sometimes the absence of water supply in several cities of the country for more than three to four hours a day leads to the people using water from the canals, which could be hazardous to health. Also, the quality of water supplied is inferior in Egypt's informal districts, where almost 20% of the population lives. Even though the essential supply of water is being maintained, the quality of drinking water made available to the population is very poor because of which a large percentage of people suffer from water-borne diseases every year. Wastewater treatment is one method of treating the wastewater acquired from various sources and turning it into use and potable drinking water after sterilization. Although this procedure is very prevalent in Egypt, the practical reality is way different from what it ought to be. Of the total amount of water released into the Nile after wastewater treatment per year, only 35% of it was correctly treated, according to the last information of 2004. Nevertheless, in recent times, attempts are being made to better the quality and quantity of water service. In this context, foreign aid from the United States, France, Germany, European Union, and the World Bank are essential both in terms of financial aid provided as well as the technical assistance lent (Luo, 2020).

Water-Related Risk Mitigation. The modern world is facing several challenges in the field of water resource management. The risk factors in this sector are multi-fold and can affect individuals, businesses, and governments alike. Among the risks related to water, the one posing the utmost concern is water scarcity; everything else is secondary

by comparison, for the absence of water will put out any other risk related to the water supply. In terms of water scarcity problems, some of its plausible effects are: firstly, the biggest inhibitor of modern daily life would be the absence of sufficient water. With the growing population and subsequent rise in water supply demands, water scarcity is dangerously near. Second, businesses in the modern world seek to establish long term profit standards, and the problem of water scarcity can be a significant hindrance in this context. Third, companies may come under tremendous pressure to reduce water usage and increasing efficiency. Fourth, climate change can be one of the most significant inducers of water scarcity and vice versa. The absence of water may lead to drastic climatic changes, and finally, the governments will eventually come under tremendous pressure to curb the problem of water scarcity. Certain risks arising from water management measures include the following: i) water storage infrastructure, which leads to the water scarcity problem being transferred from the human beings to the environment;ii) groundwater extraction done to supply sufficient quantity of water leads to the depletion of the groundwater content; iii) water transfers from the sources to its storage facility, although is beneficial for humanity but is detrimental to the environment and the soil because of its erosive effect; and iv) the process of desalination of the water can also pose unforeseen risks and damages (Schaefer et al, 2019).

   For almost the past three decades and more, Iraq's government has failed to manage the nation's water resources, resulting in the country being denied its fundamental right to clean and safe drinking water. Specifically, multiple governmental failures from 1980, including low maintenance of water sources, little or no implementation of water management policies, and mismanagement of existing water

infrastructure has led to the depreciation in the quality of water available to citizens. Linked to the water crisis in 2018 in Iraq, the United Nations stated that approximately 4,000 individuals had to leave their homes due to the scarcity of safe drinking water. On understanding the problem, the government's constant reassuring promises to improve water supply standards have failed miserably because of constant denial, mismanagement, and corruption. The authorities have even failed to provide adequate information to the citizens, which is required to avoid the inevitable future water crisis. The various government departments' combined failures have been continuously violating the residents' right to safe water, hygiene, information, environment, and property law guaranteed under both national and international law. The Iraq government has repeatedly flouted the aim of upholding the citizens' right to healthy and safe drinking water and living conditions.

Another significant gap in Iraq's water-related risk regulation is the absence of the public health advisory or directive system. The authorities should be able to ensure that the public is aware of the risks or hazards of water contamination and other water-related risks. The Iraqi government needs to immediately consider groundwater as an alternative water resource as 7 billion cubic meters were available to be extracted until 2010. This water can be extracted and subsequently treated to make it safe for use (Obeed A, 2017). As the state government has continuously and visibly failed to provide an adequate supply of hygienic water to the citizens, the private water sector has mostly benefitted from it. The government has even failed to ensure that a particular area's residents are connected to the water and sewage networks. In addition, the government of Iraq has failed to manage Iraq's water resources well. Consequently, the rivers and freshwater

canals of the country are not providing enough water to balance the demand and supply of water in the country. Corruption rackets in the local and national businesses and institutions also delay or prevents engineering solutions from being completed in time.

On the other hand, the water-related risks facing Egypt are linked both to marked population increases and climate change. Over the past 50 years, Egypt's population has more than tripled, while available renewable water resources have remained the same. As a result, the annual per capita availability of renewable water resources (which is largely provided by the Nile River) has decreased dramatically from more than 2,500 m3 in 1950 to less than 900 m3 in 2000, and is also expected to decline to around 500 m3/ m3 /cap / year by 2050, (Wagdy, 2008) (Figure 9). Egypt is particularly affected by climate change due to the rise of the low-lying Nile delta. This is manifested as low levels of precipitation, changing weather patterns and rising sea levels in the Nile delta are slowly but steadily exacerbating the difficult situation, especially in the field of food and water (Abouleish et al., 2020).
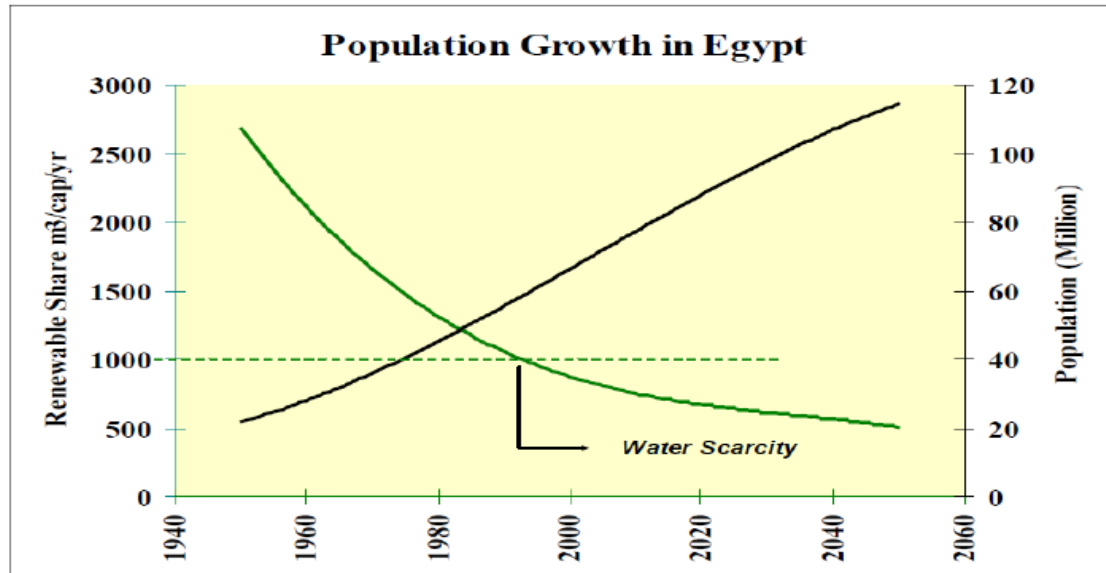
Figure 9. *Water Scarcity and Population Growth in Egypt*

In addition to this, the country fears an extreme situation of water scarcity might

emerge when Ethiopia begins to fill up the reservoir built by it behind the Great

Ethiopian Renaissance Dam upriver. The current water shortage in Egypt is 13.5 billion

cubic meters per year (BCM/year) and is expected to gradually increase up to 26

BCM/year in 2025 (Mohie El-Din, 2017). If Ethiopia fills the reservoir over the

Renaissance Dam without any discussion with Egypt, the latter will face a considerable

risk of water shortage in the near future. However, if Ethiopia sticks to its original time

frame of filling the reservoir in six years, the share of Egypt's water supply will be

affected by about 10-15 billion cubic meters (Siddig, Khalid, Jonas Luckmann, & et al.,

2019). This, in turn, would lead to about one million people losing their jobs and about a

loss of $1.8 billion in economic production. As a result, Egypt proposes to increase the

time of filling the reservoir to twelve to twenty-one years. In recent times, the conflict

over the Renaissance Dam continues to be a debatable issue between Ethiopia and Egypt,

which needs an immediate resolution to save Ethiopia from its power shortage and Egypt

from its water shortage. The dearth in the proper management of the existing water supply has also extended onto becoming or creating an existential crisis for the country. To manage the current situation of water-crisis, the government urges the farmers to use better irrigation methods to decrease water use for agriculture. Even fines are being imposed upon farmers to prevent them from planting water-intensive rice. Another critical risk faced by Egypt currently is the rise in the temperature. According to the current studies and surveys, the escalation in the environmental temperature may lead to the country losing up to 30% of its production by 2040. Heatwaves have already begun to reduce the production of crops in cities like Fayoum. The climate change in upstream nations is uncertain, and this clubbed with the scarcity of water that might occur due to the filling of Ethiopian reservoirs may cause water-related severe problems to the Egyptian population (Osman, 2019).

Step 2: Survey Analysis

The second step of data collection is the survey. It is a technique that involves examining processes and questioning a selected sample within a given population to generate data that relates to a specific social phenomenon. The data collected among the chosen sample always relates to knowledge, opinions, and behavior. A survey as a data collection method may take the form of online, mail, telephone, or personal questioning. Some of the factors to be considered before settling on an appropriate survey method include cost-saving, data collection speed, geographic flexibility, respondent cooperation, response rate, respondents' anonymity, follow-up, degree of interviewer influence, and item non-response rate.

The survey consisted of 39 questions of varying degrees of uniqueness (Appendix A). They were categorized into five sections:

1) Participant Demographics Background.

2) General Water Security Knowledge and Perceptions.

3) Water Resource Management.

4) Water Service Delivery.

5) Water-Related Risk Mitigation.

Participant Demographics Background. Section 1 surveyed 31 participants with the results shown below. The majority of the participants were male, Iraqi, between the ages of 35-44, obtained a bachelor's degree, and had 11-20 years of experience in the Water sector. This information is vital when trying to understand the results of the survey and what it fully entails.

Due to the low average of women who responded, the survey responses are primarily from a male perspective. The same goes for the nationality background. There is no evidence that this plays a vital role in the results, but it is considered that the results are analyzed.

Figure 10 identifies the age group of the participants ranging from 25-65+ years old. There is a more diverse age range in Egypt vs. Iraq, even though the number of participants in those age ranges is less than Iraq.
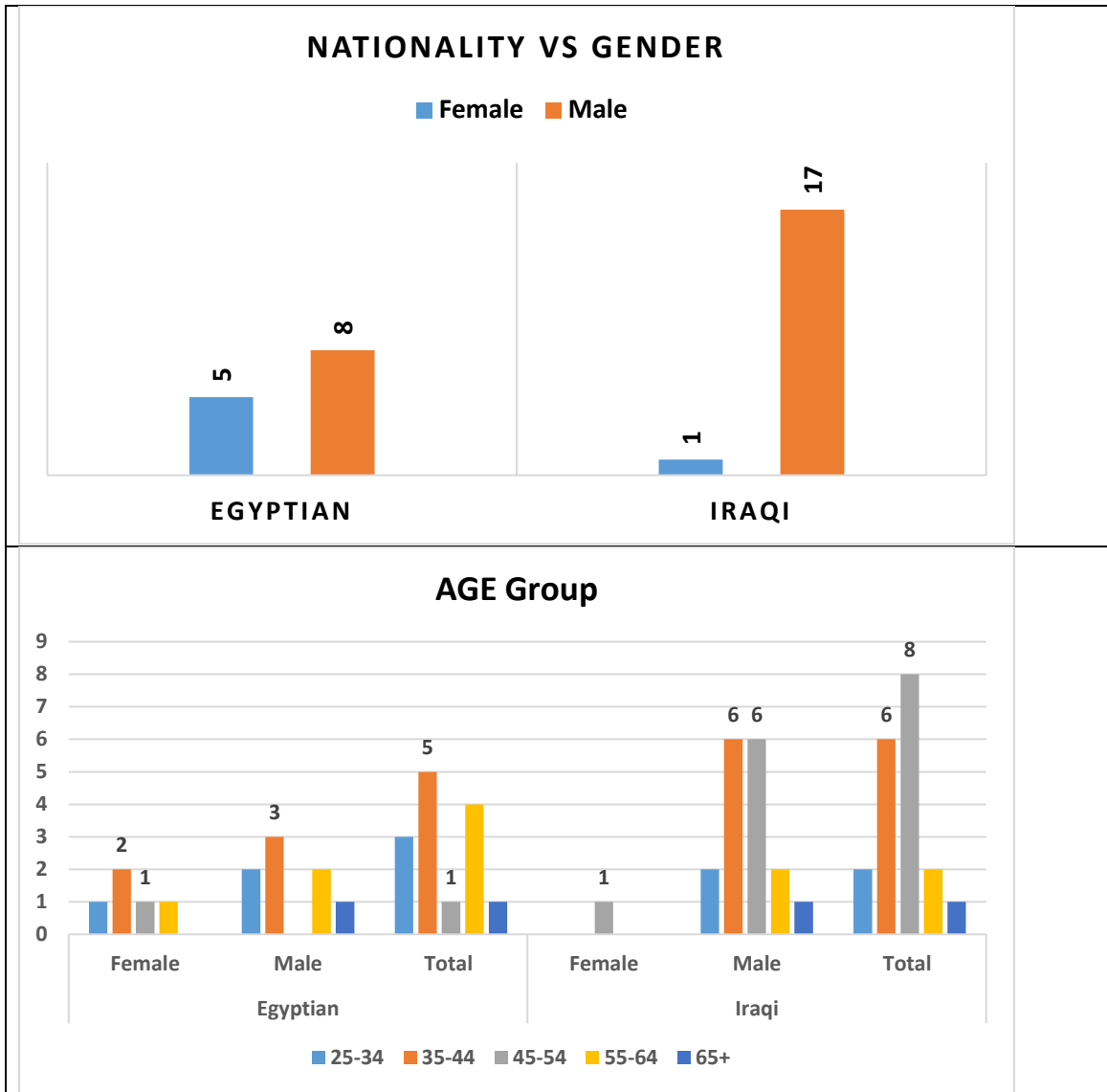
Figure 10. *Survey Participants' Nationality, Gender and Age Group.*

The educational background below shows participants at least have a bachelor's degree, while around 30 percent have a doctoral degree. This will show that the survey results encompassed a high education level from all participants with extremely viable water sector experience (Figure 11).
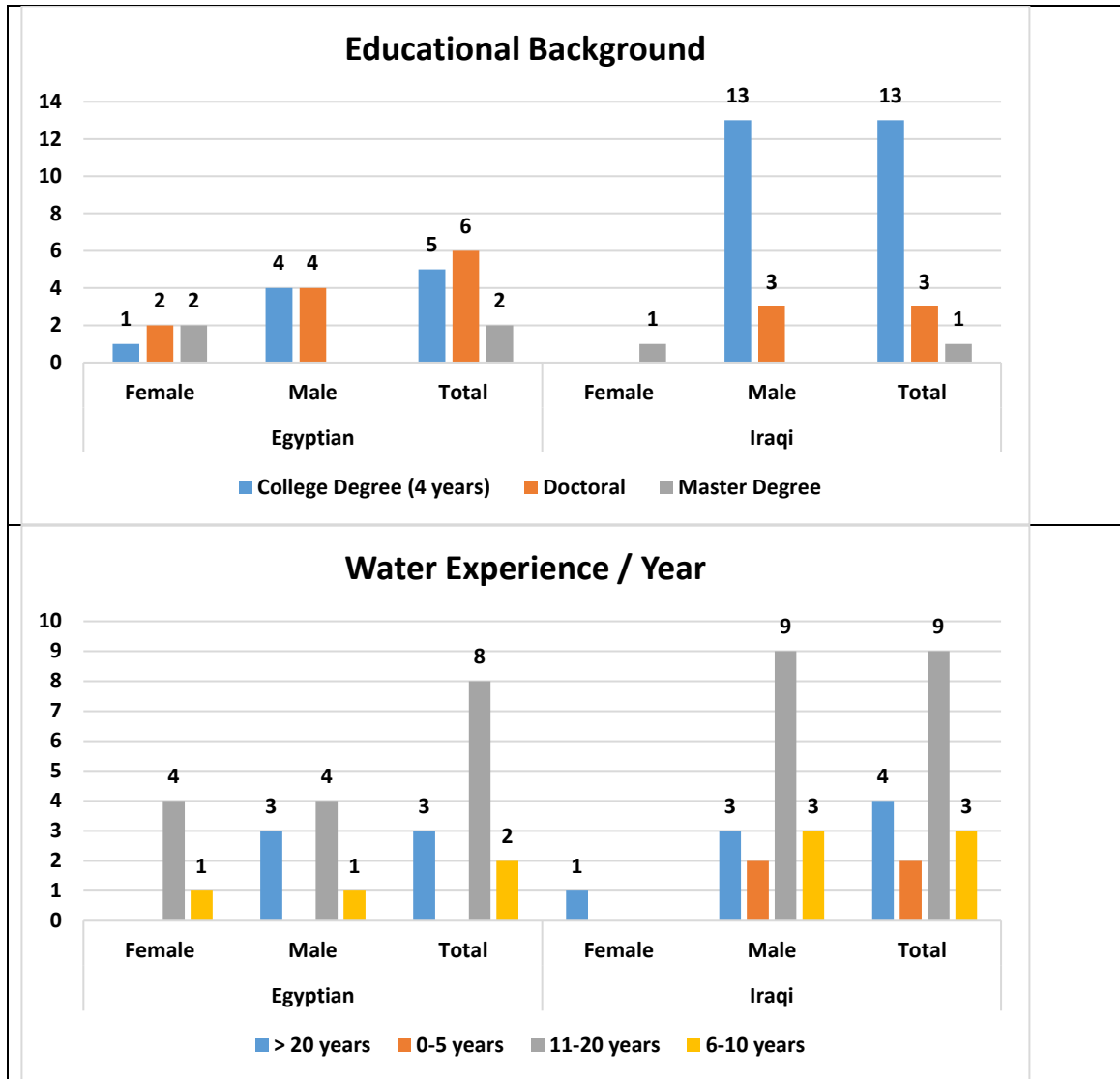
Figure 11. Participants' Educational Background and Water Experience.

Table 9 shows the current job and institution in which the survey participants currently serve. There is a wide range of positions from a chemist, general manager, chief engineer, and public financial management consultant. The institutions' participants' work includes the Ministry of Water Resources, Babylon Training/Development Center, and many more.

Table 9

Participants' Institutions and Job Categories

Level	Egypt	Iraq
Institutions:	• Ministry of Water Resources • Zagazig University • Alexandria University • Matrouh Water and Sanitation Company • Alexandria Sanitary Drainage Company • Aswan Water and Sanitation Company • Private Sector Water Business Consultancy	• Ministry of Water Resources • General Authority for the Operation of Irrigation and Drainage Projects, • Directorate of Water Resources in Baghdad • Irbil outskirts water department • Basra Water Directorate - Great Basra Water Project • Babylon Water Directorate • Babylon Training and Development Center
Job Category	• Human Resources Manager • Chief Engineer • Sanitary Drainage Director • University Professor • Chemist • Deputy Chairman of Water and Wastewater Company • Director of Hydraulic Analysis Manager • Water Treatment Plant Manager • Non-Revenue for Water Consultant • Organic Lab Manager • Professor of Sanitation Engineering • Project Manager	• Assistant Chief Engineer • Chief Engineer • Chemist • Environmental Consultant • Training Manager • Public Financial Management Consultant • Senior Engineer • General Manager

Figure 12 shows the three languages participants can professionally communicate their

experience in water-related research publications, and personal affiliations in

water/sanitation professional organizations.
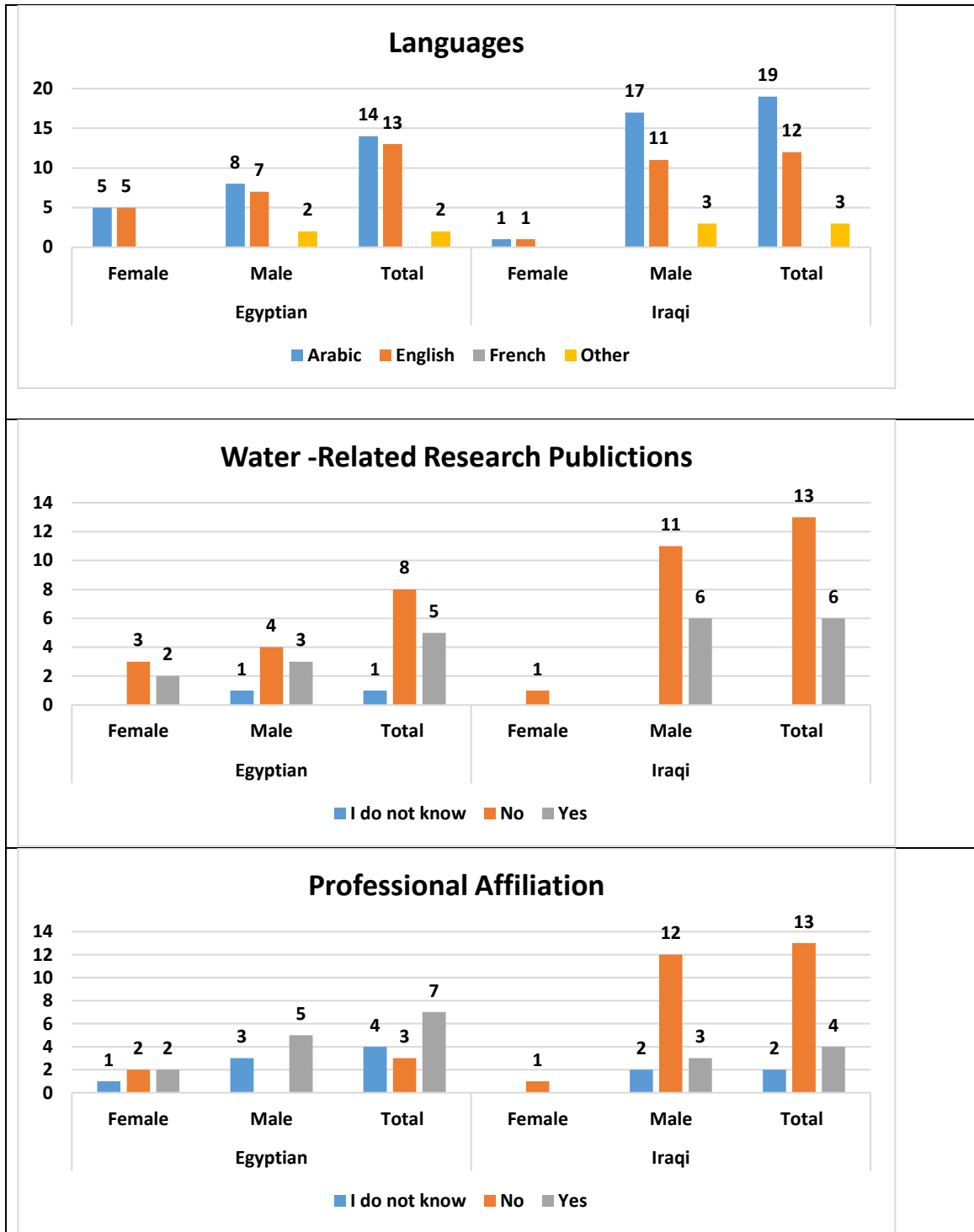
Figure 12. *Participants' Language Command, Water-Related Research Publications and Professional Affiliation.*

The majority of participants can communicate in English and Arabic, while no

participant has experience communicating in French. Five participants can communicate

in another language not listed in the survey. It is important to understand the

backgrounds of the participants when analyzing the survey results.

Almost 68 percent of participants do not have experience publishing water-related

research in the past five years. This was not detrimental to the research done in this

survey but might play a part in the knowledge criteria needed to answer some questions.

Participants also showed that only 50 percent have experience with national, regional, or

international professional groups/organizations in water/sanitation. This provides us with

a broad perspective on water issues due to the participants' low exposure in this field.

Overall, section 1 exemplifies the survey participants have a trustworthy

experience and will bring an unbiased perspective to the results. There are some

similarities and differences between Iraq and Egypt; more will be addressed in the

following sections. Most of the participants also expressed interest in a short follow-up

interview later in the research stage. This will be vital when implementing the next stages

(Figure 13).

**Respondents Showing Interest in Participating
in   Follow-up Interviews**

Iraqi	Yes 12 / No 7
Egyptian	Yes 12 / No 1

0   5   10   15

■ Yes ■ No
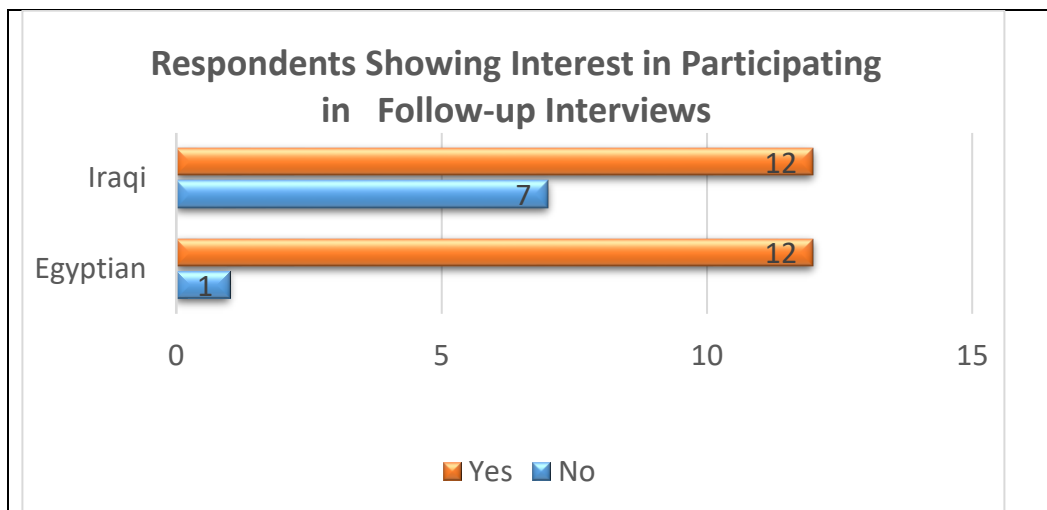
Figure 13. Respondents Rate Showing Interest in Participating in Follow-up Interviews.

GENERAL WATER SECURITY KNOWLEDGE AND PERCEPTIONS.

Section 2 includes various questions about water security; this includes
knowledge, importance, and awareness of Water Security in the Middle East and North
Africa region. Figure 14 amplifies that most participants have neutral to high knowledge
on water security in their country. The key difference here is the knowledge for Iraqi
participants is higher than that of Egyptians.
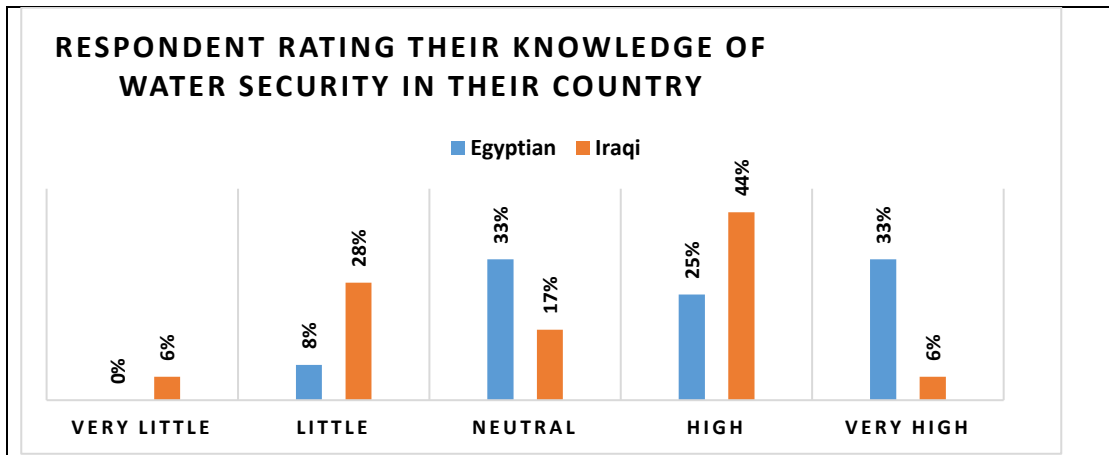
Figure 14. *Respondents' Rating Their Knowledge of Water Security in their Respective
Countries.*

Most participants did not have a working knowledge of water security issues
within the Middle East North Africa region (Figure 15). This was important as the
survey moved further, and more questions were asked outside of the respective countries
in which the participants live. Egyptians showed more working knowledge of the MENA
version vs. the Iraqi participants.
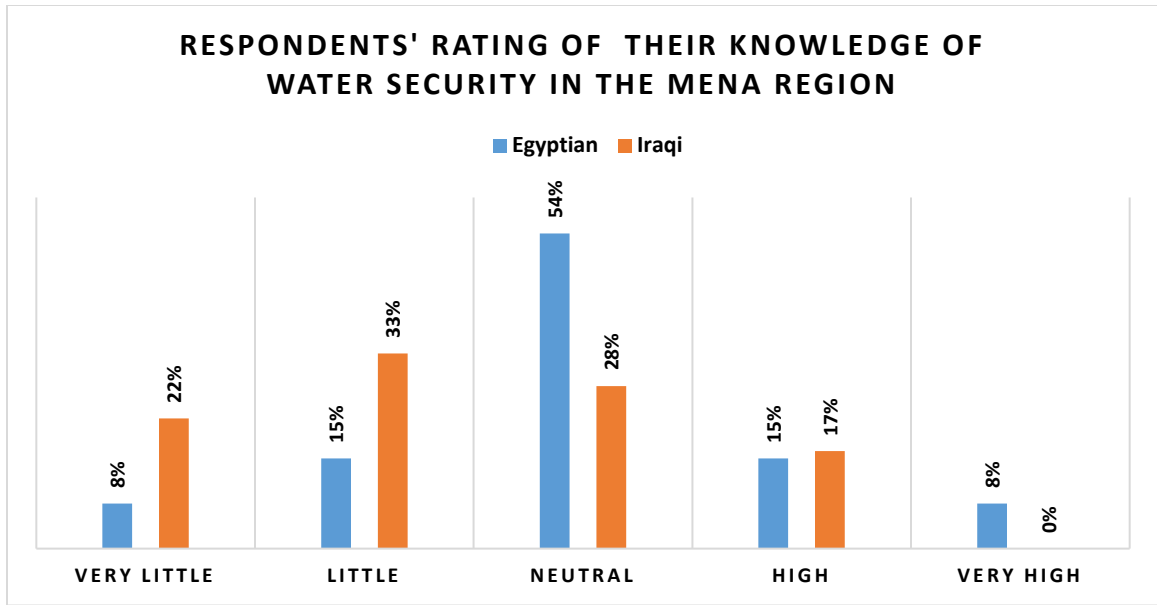
Figure 15. *Respondents Rating of their Knowledge of Water Security in the MENA Region.*

Furthermore, as the questions progressed in this survey, one question portrayed the importance of security as a whole. All 100% of Iraqi participants believed water is a national security issue in their country, while 77% of Egyptians believed the same (Figure 16).
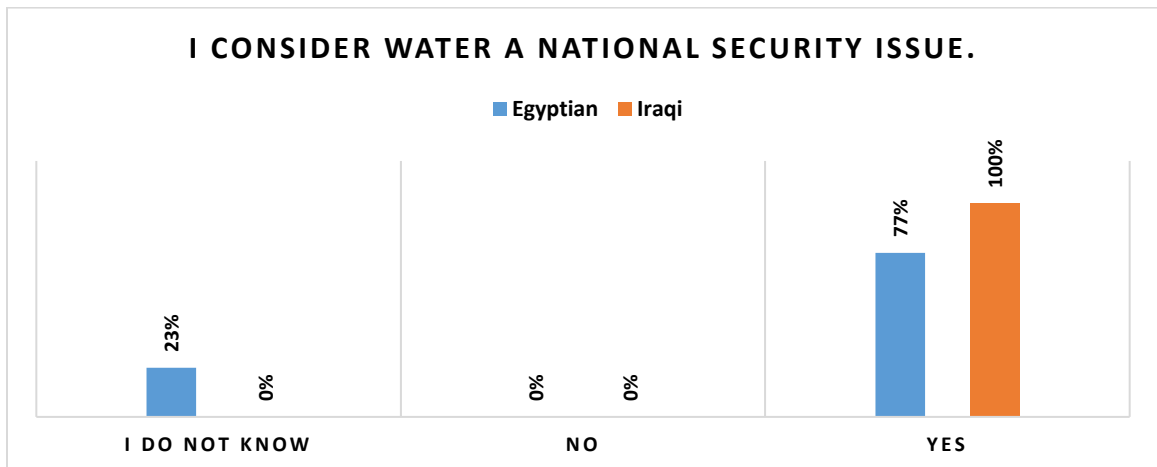
Figure 16. *Participants' Perception of Water as a National Security Issue.*

There are similarities between Egypt and Iraq; most participants from each country believe an overall assessment of water security in their country is critical (Figure 9). Egypt showed staggering numbers, with 100% of participants believing this is a critically important assessment. Iraq had about 12% of participants who believe this assessment is not essential. When the Survey dives deeper into the overall assessment of water security in the Middle East/ North Africa Region as a whole, over 80% of participants believe this is a vital assessment to take (Figure 17). These numbers slightly matched the assessment before, but most Iraq believes the MENA version is somewhat essential.
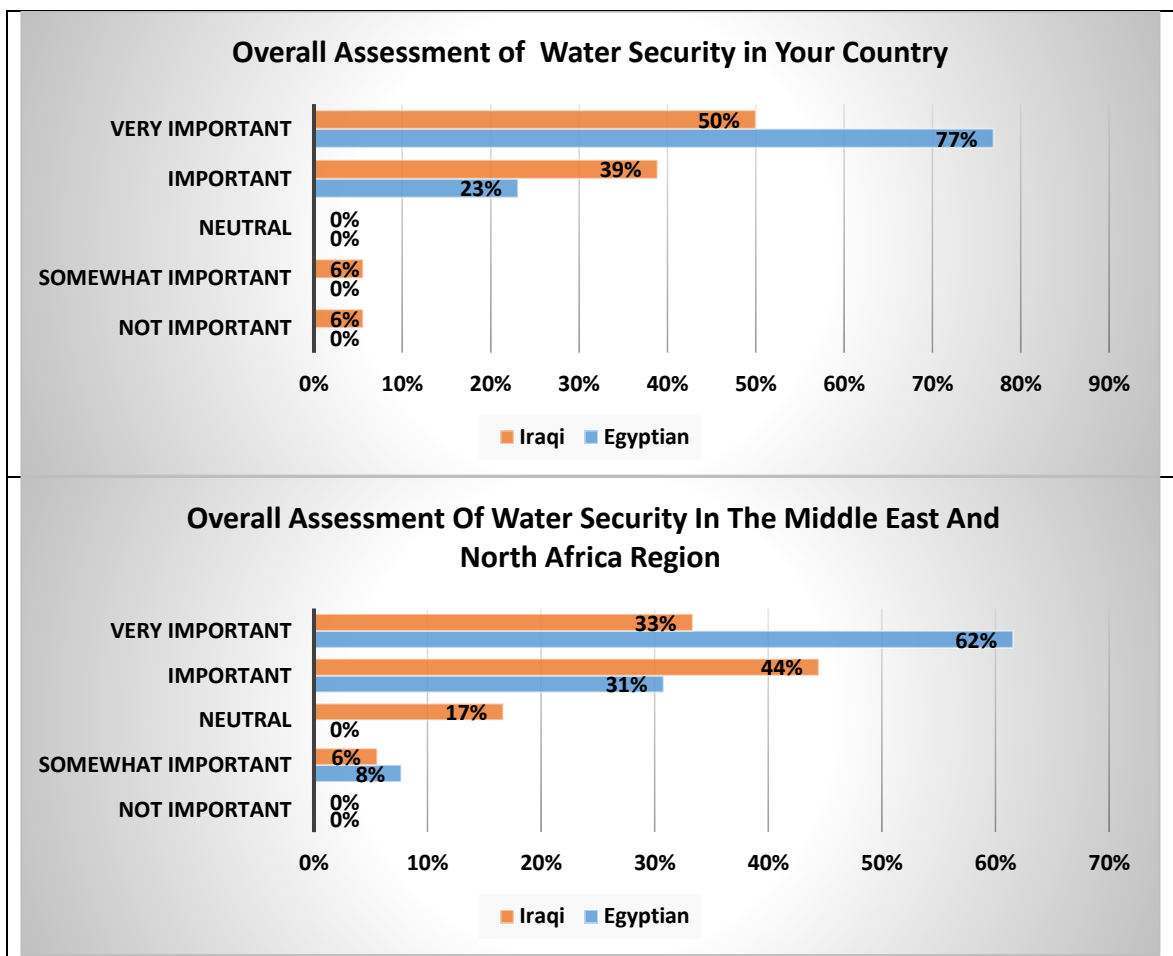
Figure 17. *Participants' Assessment of Water Security in their Respective Courtiers and the MENA Region.*

The survey addressed the participants' direct opinion on decision-making within any large-scale private/public water organizations and personal perception as pertains to their roles as water elites. Iraq and Egypt both had similar responses, with about half participating in private/public water organizations. Many participants, mostly from Egypt, did not fully understand the definition of water elite and if they were one, but almost half of the participants from each country believe that they were (Figure 18).
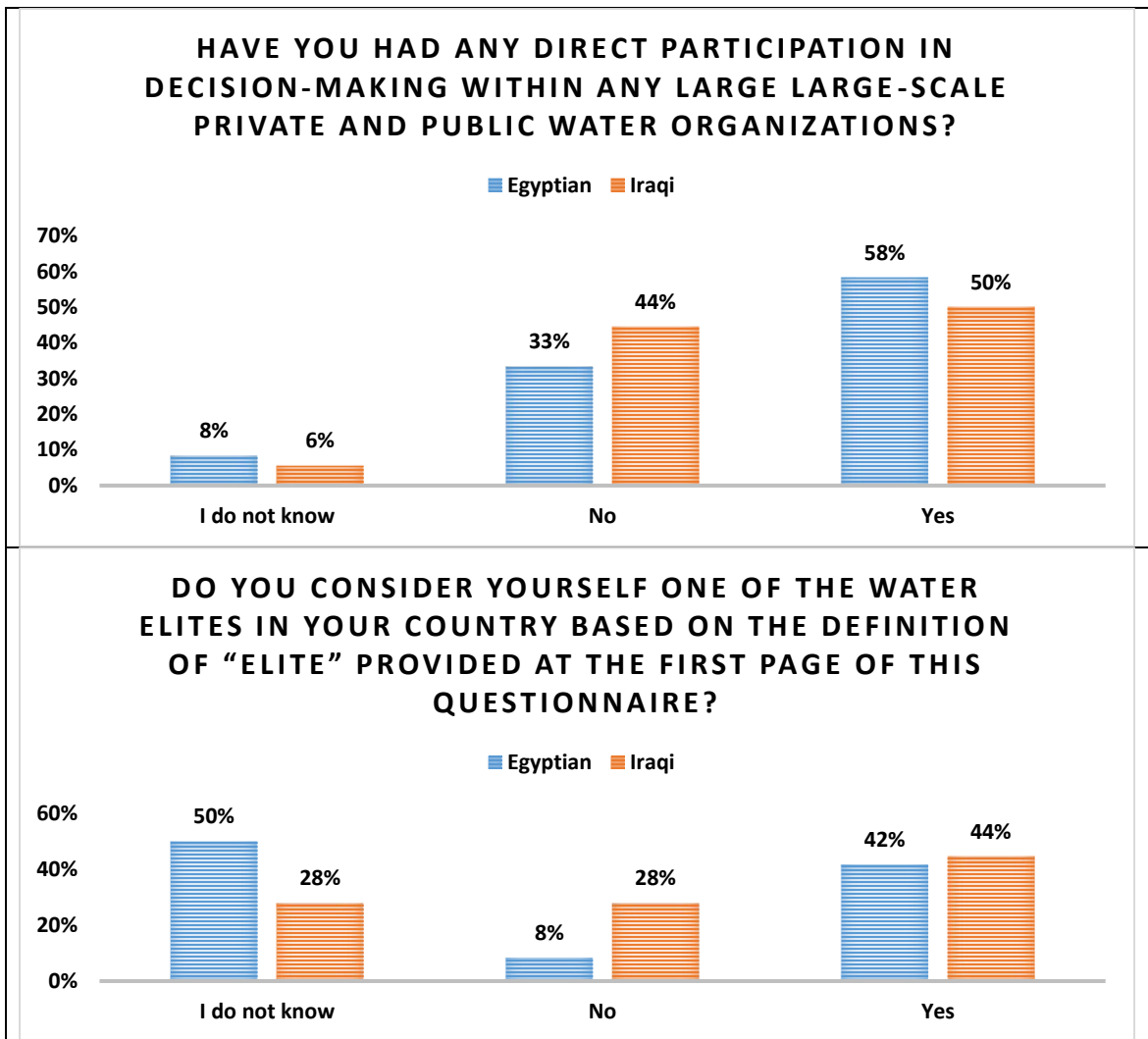
Figure 18. *Participants' Participation in Decision Making and Self-Perception of Water Elites.*

Water Resource Management. The third section of the survey encompasses the participants' perceptions of water elite, and water resource management in the Middle East /North Africa Region. There were strong similarities throughout this section of the survey between Iraq and Egypt. This includes both sides firmly believing that water service fees/pricing should reflect the extent of water scarcity and promote conversation (Figure 19). This was a critical similarity to make because it engulfs the main reason behind this survey.
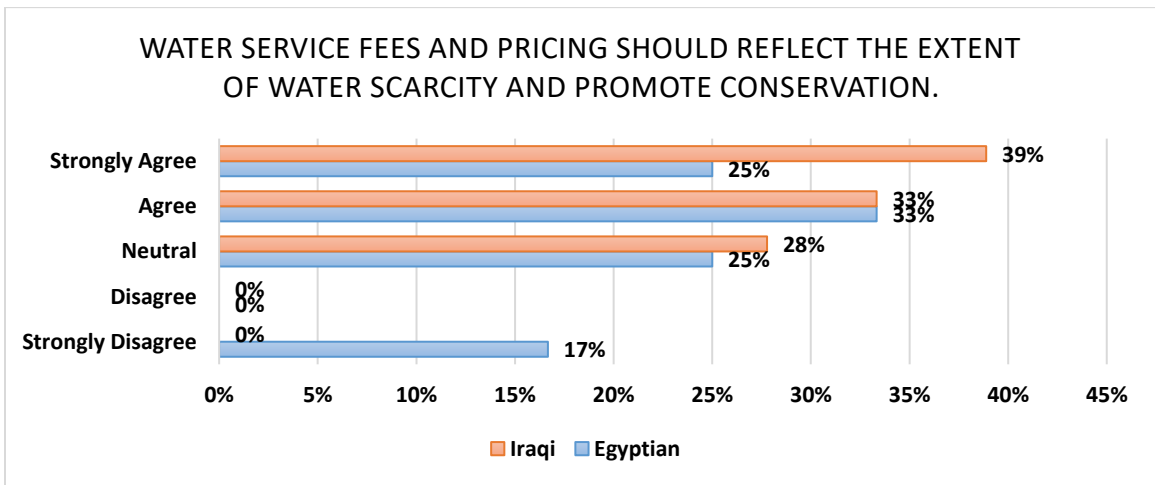
Figure 19: Participants' Perceptions of their Countries' Water Service Fees and Pricing Level.

Figure 20 proves water scarcity, as 100% of participants believe the incentives/technologies should enhance productivity/efficiency in the water sector.
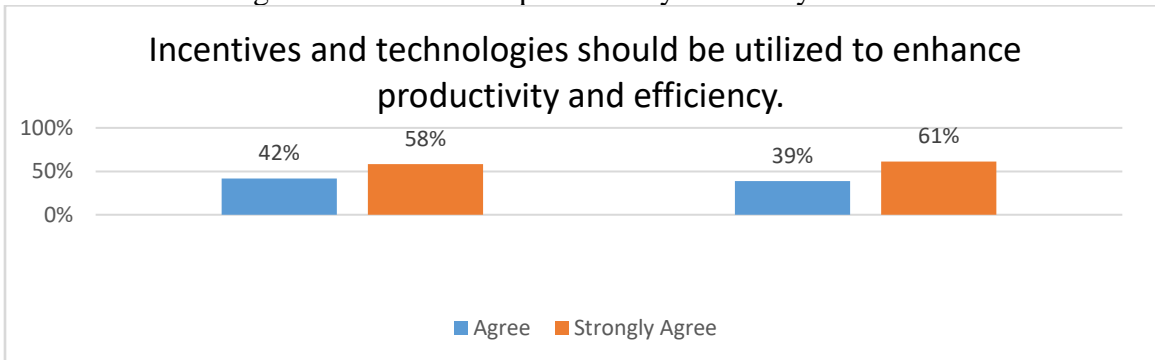
Figure 20. *Participants' Perceptions of the Role of Incentives and Technologies in Enhancing Water Productivity and Efficiency.*

Figure 21 portrays the continued similarities between Iraq and Egypt participants; most agreed with the idea that control of losses/leakage is essential, planning/prioritization of high -value water usages should be in balance with social equity/stability, water rights/subsidies/pricing policies are re-allocated fairly, and regulations/enforcement should be established to control unplanned overexploitation of water. Egyptian participants showed 25-17 percent disagreements from the majority to three out of the four of this question. This may have played a part in the participants' education and experience level, unlike the Iraqi participants.

PLANNING AND PRIORITIZATION OF HIGH- VALUE WATER USAGES SHOULD BE IN BALANCE WITH SAFEGUARDS FOR SOCIAL EQUITY AND STABILITY.

WATER RIGHTS, SUBSIDIES, AND PRICING POLICIES ARE RE-ALLOCATED FAIRLY.
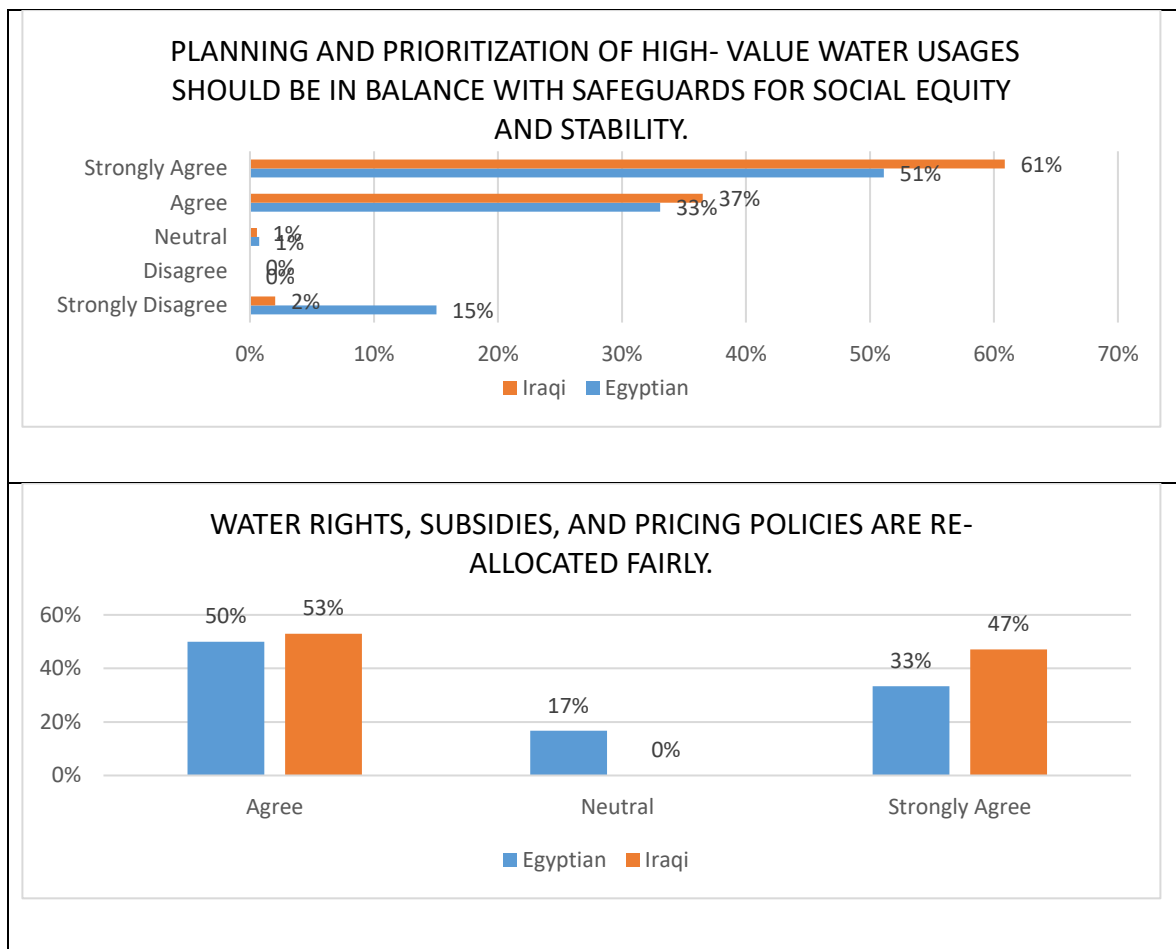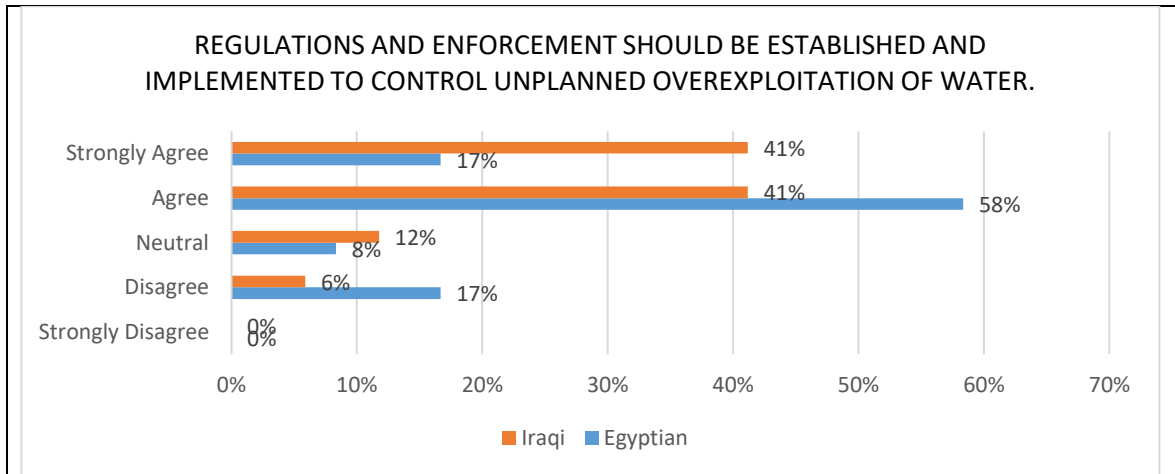
Figure 21. *Participants' Perceptions of Water Planning and Prioritizations, Rights and Regulations.*

Survey respondents continued to stress the importance of water security in the Middle East, with 80 percent of the participants believing the development of wastewater recycling/reuse and coordination use of surface/groundwater was important. Iraq participants had some differing opinions, with about 12% only believing it was somewhat important, while 100% of Egyptian participants believed it was necessary (Figure 22).

This difference was soon non-existent with the following question about increased institutional coordination among water, energy, and agricultural sector strengthen water management efforts. All 100% of participants believed this to be true in Egypt and Iraq (Figure 22).
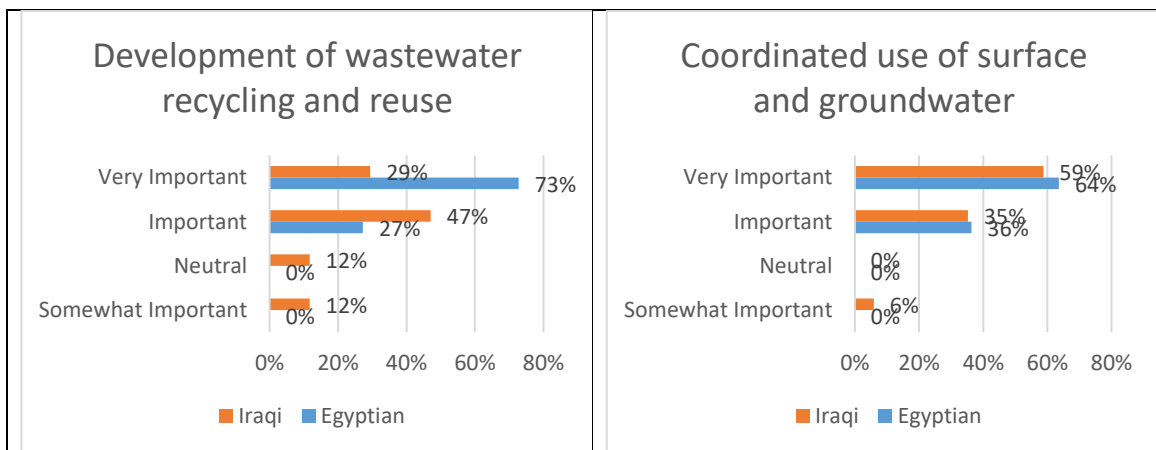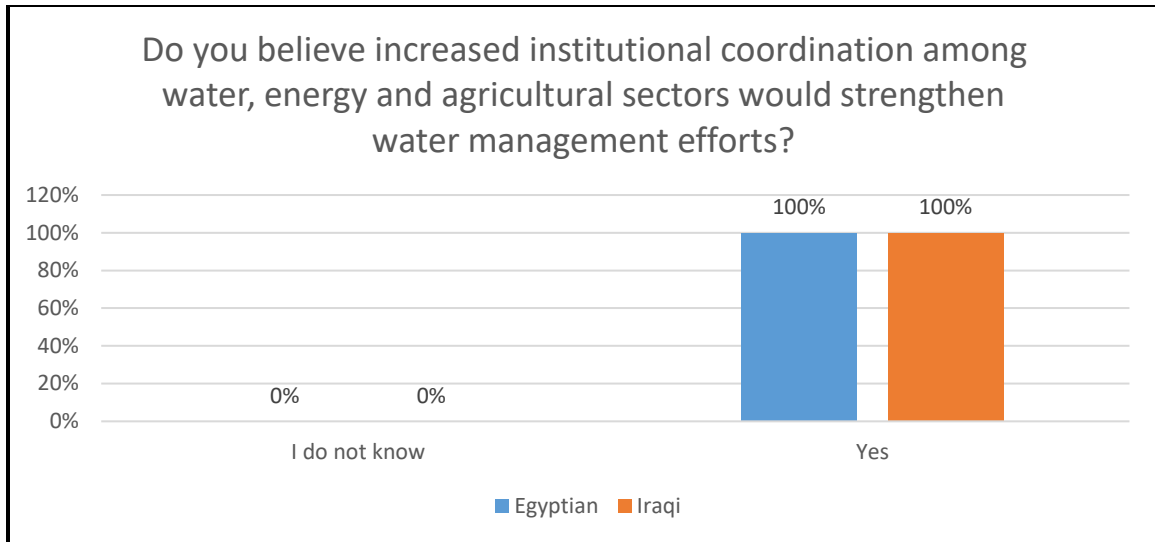
Figure 22. *Respondents' Perception of Development of Wastewater Recycling and Reuse and Institutional Coordination of Water Usage.*

The contrast between Iraq and Egypt water security begins to show when participants were split when asked if they believe their country's urban water service has improved in the past five years. Interestingly 76% of Iraqi participants disagreed with the phrase, while 100% of Egyptian participants agreed. This will be the crucial difference between these two countries (Figure 23).
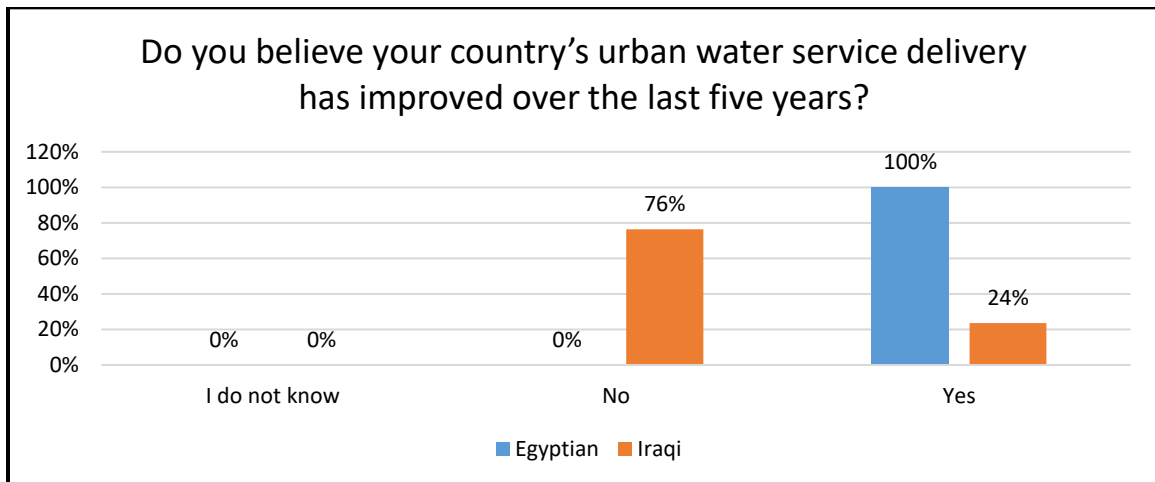
Figure 23. *Participants' Perceptions of their Country's Urban Water Service Delivery Improvement Level.*

The last question of section three asked the participants how they would rate the influence of social inclusion on water security in their respective countries. Fifty percent of Iraqi participants believed Women and Youth had a neutral influence on social inclusion, while 50% of Egyptians believed their impact was high (Figure 24). The state of each country's political and cultural climate is very different, which this question analyses.
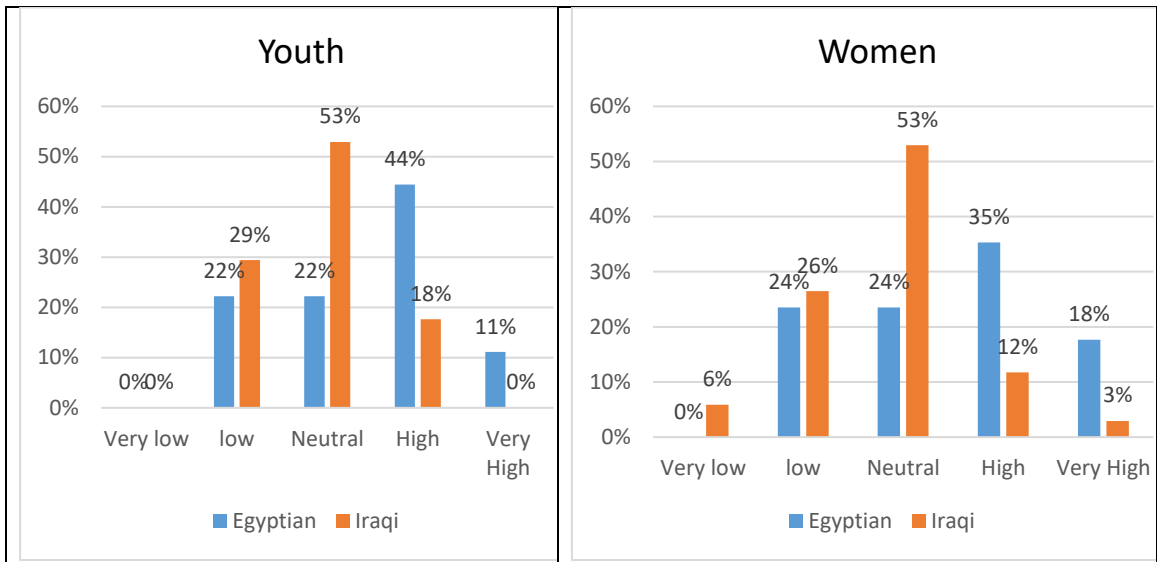
Figure 24. *The Participants' Perception of Social Inclusion (Youth and Women) on Water Security.*

Water Service Delivery. The water service delivery section indicated that the majority of Egyptians believe that their country's urban/rural water service delivery has improved in the last five years (Figure 25). Iraq showed the complete opposite, with most participants believing it has not improved in the urban/rural water service delivery sector (Figure 25). These differences continue to show from the last section as the survey dived deeper into the regulation of water security in the respective country.
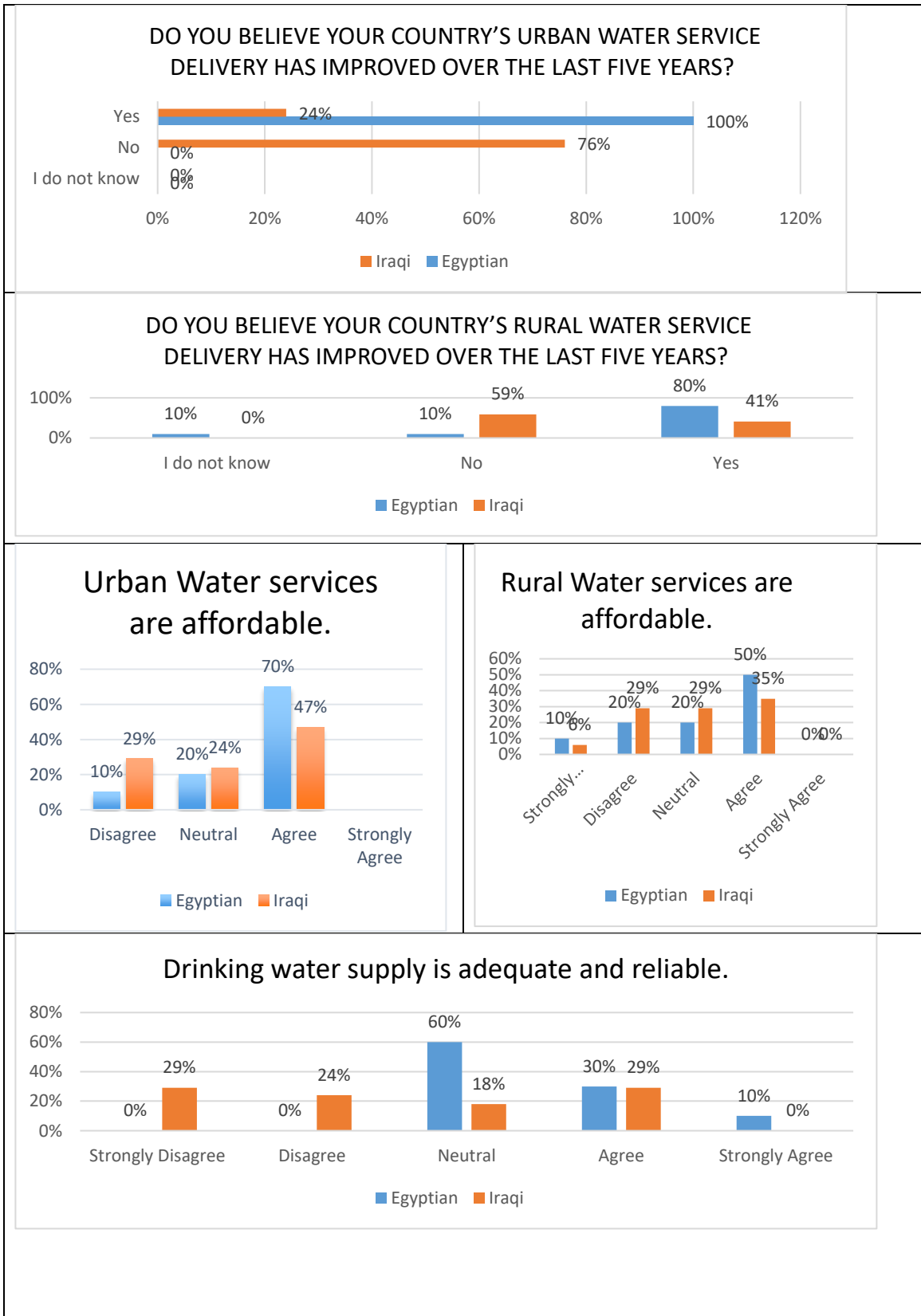
Figure 25. *Participants' Perceptions of Water Service Delivery.*

Figure 25 shed light on the differences mentioned in the past couple of questions, such that Iraq does not have adequate and reliable drinking water, and their urban/rural water services are not affordable. The analysis of the Egyptian participants was opposite to that of Iraq. All of Egyptian respondents believe the drinking water supply is adequate and reliable, while over half believe the urban/rural water services are affordable.

Figure 26 analyzes the participant's assessment of the importance of variety of factors that contribute to improving water service delivery: public participation and outreach in water-related issues; customer service level; economic losses from inadequate water supply; the effects of intrastate conflicts; water loss recovery level; strengthening the social compact between the government and its citizens; and corruption. There were many critical similarities between Iraq and Egypt, such as adopting anti-corruption measures in the water sector and understanding citizens' expectations concerning water services. The most significant difference was that Egypt believed the strengthening of social impact between government and citizen was high while the customer service level in Iraq was significant.
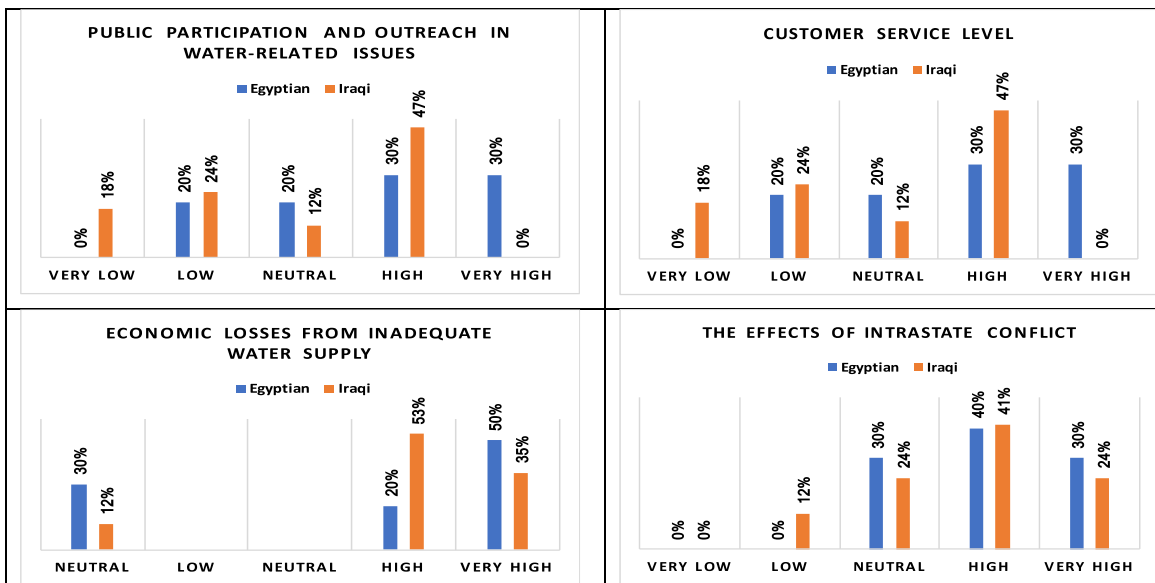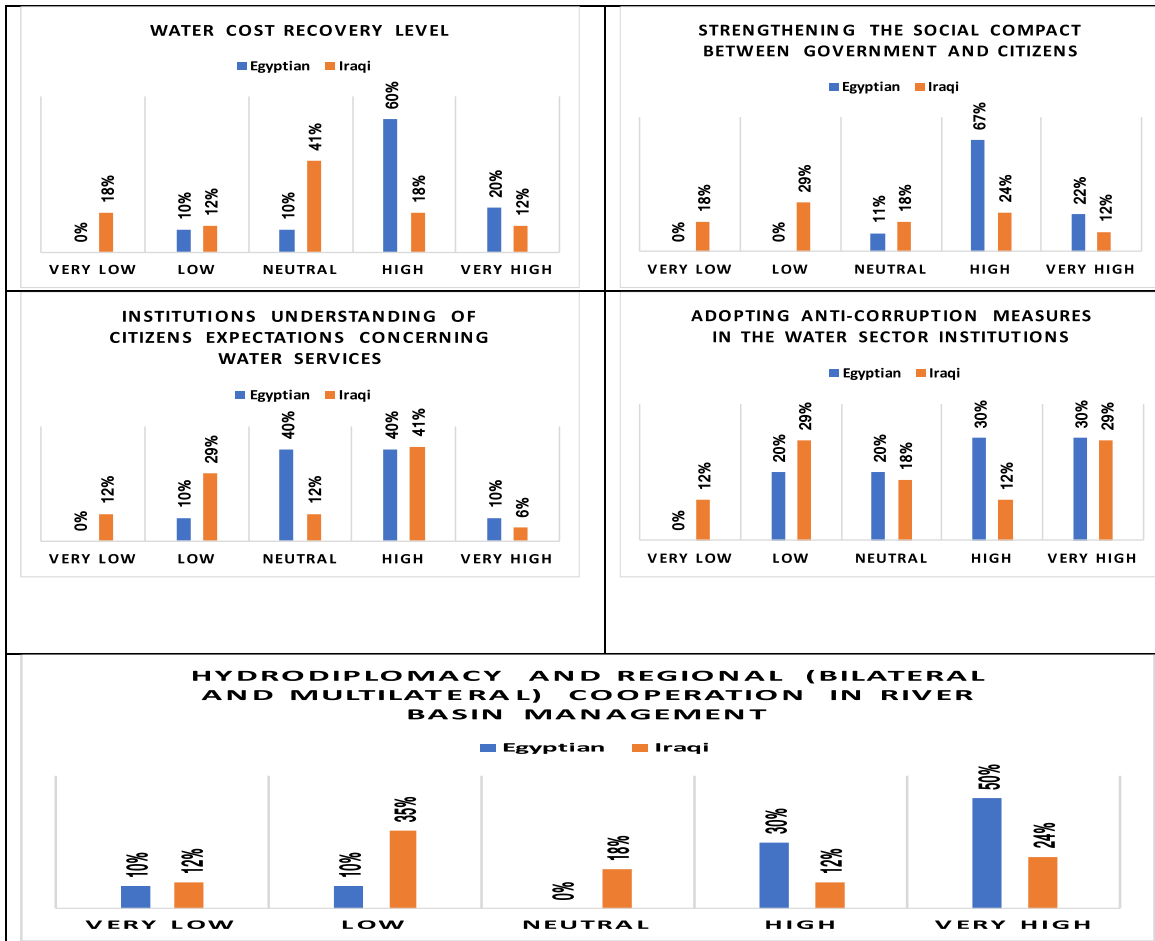
Figure 26. *Participant's assessment of the importance of variety of factors that contribute to improving water service delivery.*

Figure 27 indicates the participant's agreement with the statements/strategies to improve water services. Egypt and Iraq showed many similarities in that they firmly believed the integrated urban water management is recommended to improve the quality/reliability of urban/agricultural water services. Water insecurity has significant adverse effects on the political/economic/environmental stability in the MENA region. The differences between these two countries were minimal, with only an average of 20 percent of Egyptian or Iraqi participants thinking inversely on the selected topics.

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INTEGRATED URBAN WATER MANAGEMENT IS RECOMMENDED IMPROVE TO QUALITY IMPROVE QUALITY AND RELIABILITY OF URBAN AND AGRICULTURAL WATER SERVICES.
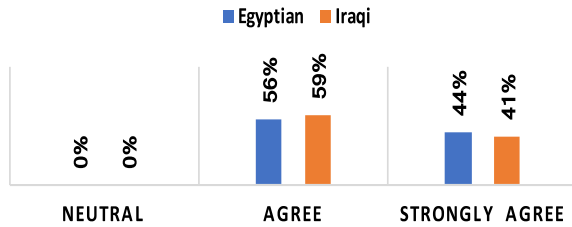
Egyptian Iraqi

NEUTRAL: 0% 0%
AGREE: 56% 59%
STRONGLY AGREE: 44% 41%

THE DEVELOPMENT OF NONCONVENTIONAL WATER RESOURCES IS RECOMMENDED TO IMPROVE QUALITY AND RELIABILITY OF URBAN AND AGRICULTURAL WATER SERVICES.

Egyptian Iraqi

DISAGREE: 0% 0%
NEUTRAL: 22% 6%
AGREE: 22% 71%
STRONGLY AGREE: 56% 24%
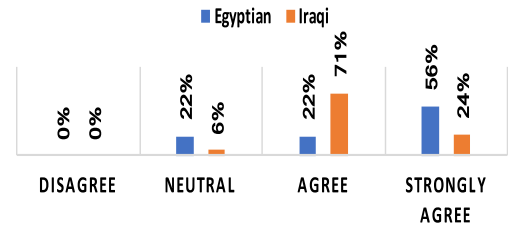
THE USE OF TREATED WASTEWATER FOR AGRICULTURAL USE OR MANAGED QUIFER RECHARGE IS RECOMMENDED TO IMPROVE QUALITY AND RELIABILITY OF URBAN AND AGRICULTURAL WATER SERVICES.

Egyptian Iraqi

NEUTRAL: 0% 24%
AGREE: 56% 41%
STRONGLY AGREE: 44% 35%

DESALINATION WATER TECHNOLOGIES PLAY AN ESSENTIAL ROLE IN ADDRESSING WATER SCARCITY.

Egyptian Iraqi

STRONGLY DISAGREE: 0% 0%
DISAGREE: 0% 0%
NEUTRAL: 10% 12%
AGREE: 50% 47%
STRONGLY AGREE: 40% 41%

IT IS ESSENTIAL TO IMPROVE DATA COLLECTION AND MONITORING TO HELP FOR EXAMPLE TOWARDS UNITED NATION'S SUSTAINABLE DEVELOPMENT GOAL 6 (SDG6).

Egyptian Iraqi

NEUTRAL: 20% 6%
AGREE: 20% 41%
STRONGLY AGREE: 60% 53%

TECHNOLOGY POLICY AND INSTITUTIONAL MANAGEMENT ARE NEEDED TO ACHIEVE WATER SECURITY.

Egyptian Iraqi

NEUTRAL: 10% 0%
AGREE: 30% 35%
STRONGLY AGREE: 60% 65%

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WATER INSECURITY HAS A SIGNIFICANT NEGATIVE EFFECTS ON THE POLITICAL. ECONOMIC AND ENVIRONMENTAL STABILITY OF THE MENA REGION.

■ Egyptian   ■ Iraqi

	NEUTRAL	AGREE	STRONGLY AGREE
Egyptian	10%	30%	60%
Iraqi	0%	35%	65%
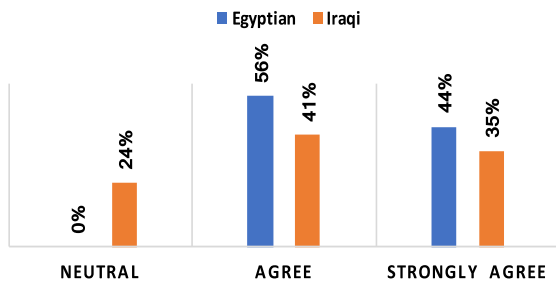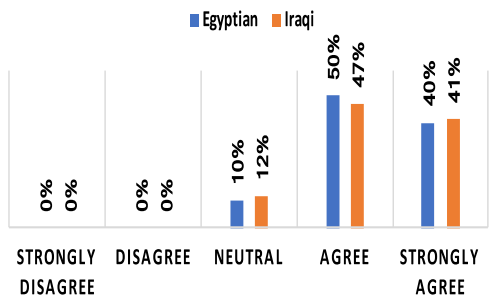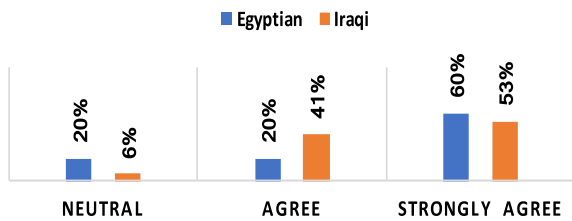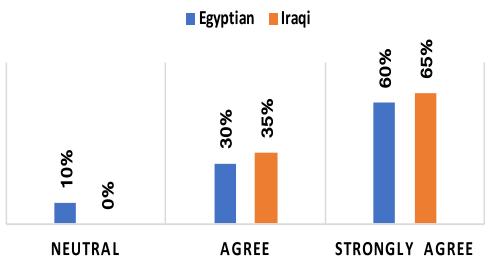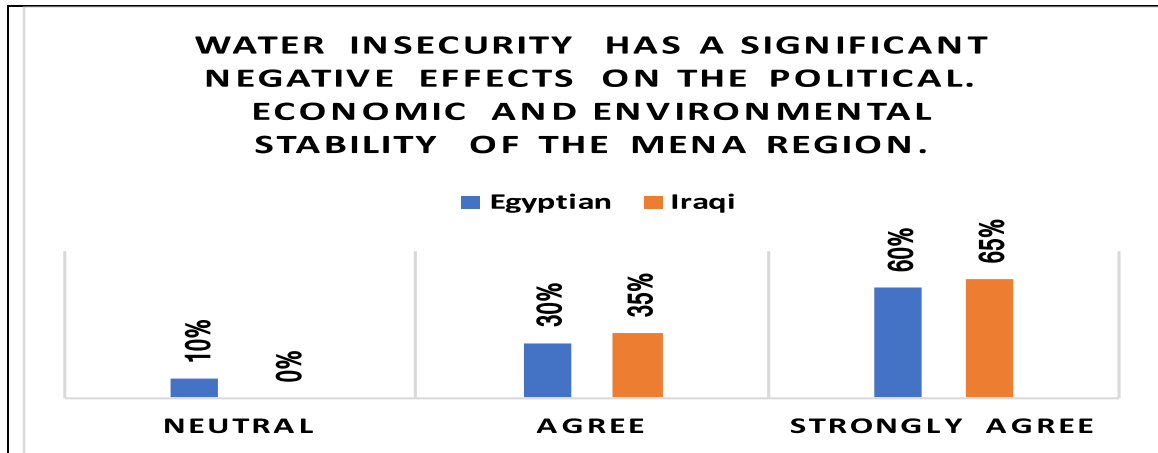
Figure 27. Participants' Perception of Strategies to Improve Water Service Delivery

Water-Related Risk Mitigation. The last section of this survey sheds light on the many similarities between Iraq and Egypt's water crisis. The participants were asked to indicate their agreements' level to a variety of statement on water services improvement (Table 10). Egypt and Iraq maintained the same average of agreeing to all the statements analyzed such that all agree climate change affects water security, lack of water supply causes domestic social unrest, and water is used as weapons in conflicts.

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Table 10

Participants' Perceptions of Water-Related Risks

Statement	Nationality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Climate change affects water security.	Egyptian	0%	0%	20%	50%	30%
	Iraqi	0%	6%	6%	65%	24%
Water stress resulted from surface water has a significant impact on water security.	Egyptian	0%	0%	11%	44%	44%
	Iraqi	0%	0%	12%	59%	29%
Water stress (lack of freshwater resources to meet demand) resulted from underground water has a significant impact on water security.	Egyptian	0%	11%	22%	44%	22%
	Iraqi	0%	0%	18%	59%	24%
Lack of water supply causes domestic social unrest.	Egyptian	0%	0%	10%	70%	20%
	Iraqi	0%	0%	6%	47%	47%
Water and water systems are used as weapons in a conflict.	Egyptian	0%	10%	10%	30%	50%
	Iraqi	0%	0%	12%	24%	65%
Regional cooperation on water issues strengthens trust and collaboration.	Egyptian	0%	0%	10%	60%	30%
	Iraqi	0%	0%	0%	35%	65%

Table 11 analyses the similarities of thought between participants from both countries with a small amount of differing opinions. Under 12 percent of Iraq participants disagree water-related NGO's play an important role in peace, the influx of refugees

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causes tensions/adverse effects on water security, and international organizations play a

constructive role in strengthening/improving the water sector in MENA.

Table 11

Participants' Opinions towards a Variety of Suggestions to Water-Risk Mitigation

Approaches

Statement	Nationality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Water-related NGOs play an important role in peace and stability in the MENA region.	Egyptian	0%	0%	30%	50%	20%
	Iraqi	6%	18%	24%	41%	12%
Virtual water (amount of water needed to produce different goods and services) strengthens water and food security simultaneously.	Egyptian	0%	22%	0%	67%	11%
	Iraqi	0%	0%	18%	65%	18%
Reliance on shared transboundary water (surface and underground) is essential.	Egyptian	0%	0%	11%	67%	22%
	Iraqi	0%	0%	18%	59%	24%
The effectiveness of bilateral and multi-lateral water transboundary agreements - water diplomacy) depends on the extent to which they are constructive, transparent, and equitable.	Egyptian	0%	11%	11%	33%	44%
	Iraqi	0%	0%	24%	29%	47%
The influx of refugees causes tension and has adverse effects on water security in the host countries involved.	Egyptian	0%	11%	22%	56%	11%
	Iraqi	6%	12%	18%	59%	6%
International donors exacerbate tensions over water security in the MENA region.	Egyptian	0%	20%	10%	70%	0%
	Iraqi	0%	0%	53%	35%	12%

Table 11 (continued).

International organizations play a constructive role in strengthening and improving the water sector in the MENA region.	Egyptian	0%	10%	30%	50%	10%
	Iraqi	12%	0%	12%	71%	6%
Anti-corruption and integrity measures improve the utilization of water resources.	Egyptian	0%	0%	11%	56%	33%
	Iraqi	6%	0%	12%	59%	24%

Iraq and Egypt show the most differences when asked their best solution is for improving water security (Figure 28). Almost 50% of Iraqi participants believe equal participation of all consumers in water management planning will be the best solution. Concurrently, Egyptian participants are split between reducing water pollution and improving access to water. This answer reflects the country's state and what they would need to bring attention to water security.
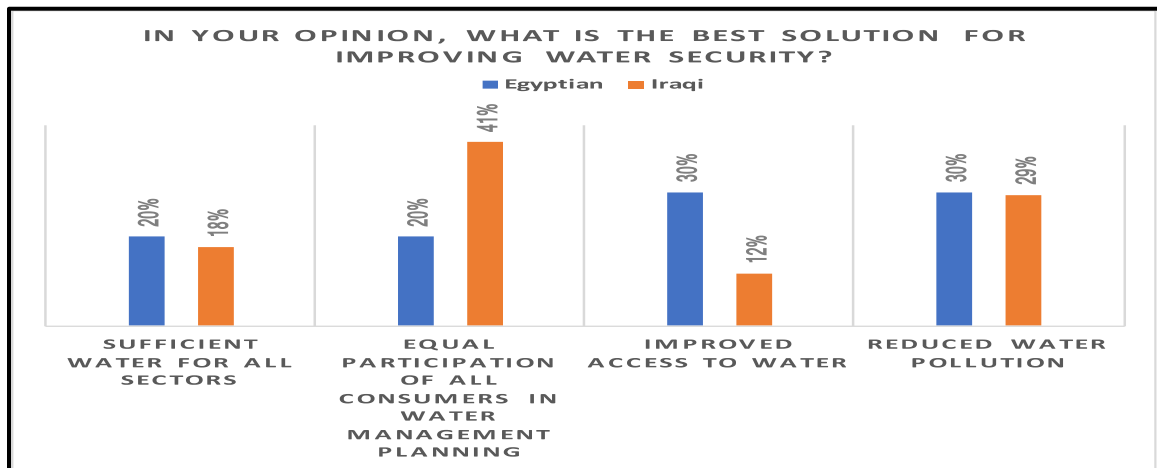
Figure 28. *Participants' Perceptions for the Best Solutions for Improving Water Security.*

Due to their differing solutions, a set of questions were utilized to solicit the difference in politics between Iraqi and Egyptian participants (Figure 29). These two

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countries showed the most differences when asked if their country uses more water than it needs, with 50 percent of Iraq is believing they do and 50% of Egyptians believing they do not. This difference continues to merge when participants were questioned if they believe their country has enough water to support agriculture now and in the future. An overwhelming 90% of Egyptians disagree, and 60% of Iraq agree or neutralize the statement.

MY COUNTRY USES MORE WATER THAN IT NEEDS.

THERE IS ENOUGH WATER TO MEET MY COUNTRY'S NEEDS.

DECLINING WATER LEVELS IS A CAUSE FOR CONCERN.

REDUCING THE AMOUNT OF CONSUMED DOMESTIC WATER WOULD BE DIFFICULT.

THERE IS ENOUGH WATER IN MY COUNTRY/REGION TO SUPPORT AGRICULTURE NOW AND IN THE FUTURE.

THERE IS ENOUGH WATER IN OUR RIVER BASIN TO SUPPORT OUR COMMUNITY NOW AND IN THE FUTURE.

Figure 29. *Participants' Perceptions of Water Supply Risk and Hydro-politics.*

Egypt and Iraq continued to show critical similarities and differences in public

perception of their nations' water security. Figure 30 shows the participants' opinions of

each of the following stakeholders' responsibility for protecting water quality/quantity in

their country. Egypt and Iraq are split on the role of Water utilities in their country, where

Egypt believes it has high responsibility, and Iraq believes it has a low. The two countries

share similarities with low responsibility level for the private sector and non-

governmental organizations.
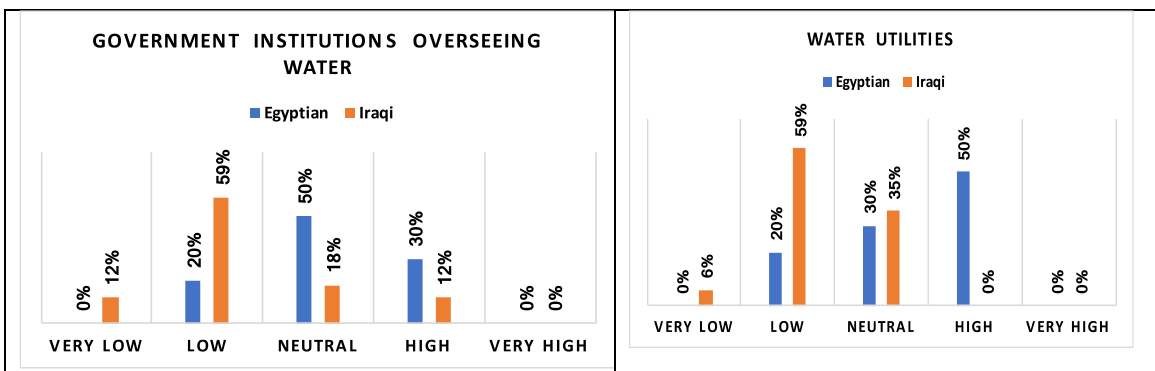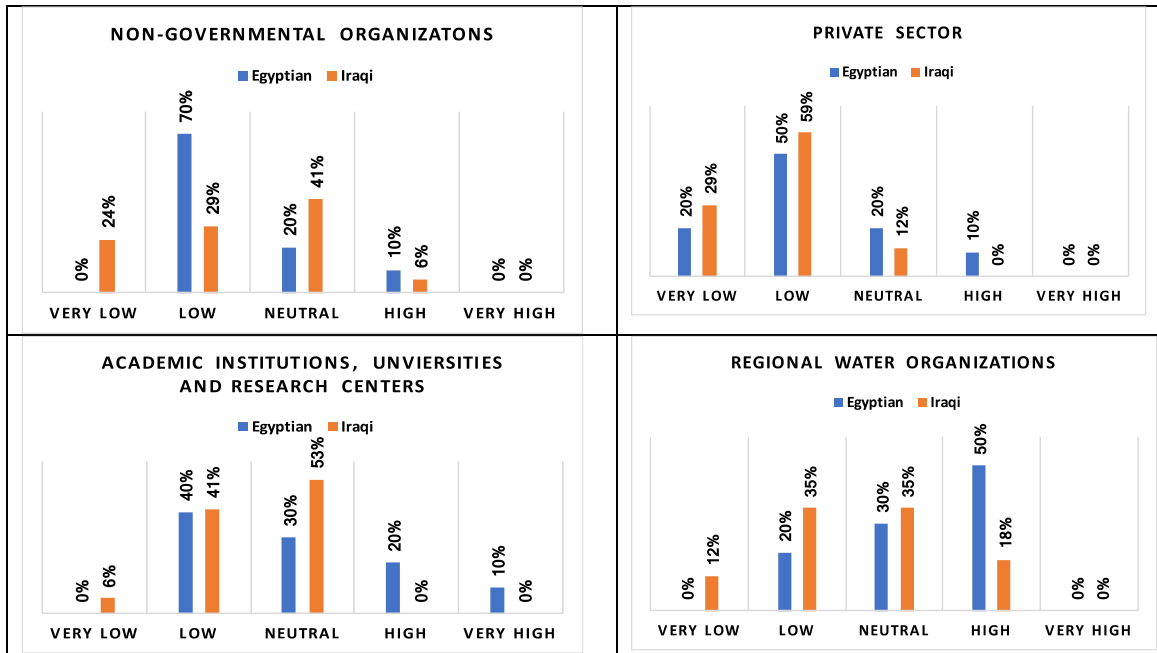
Figure 30. *Participants' Perceptions of Water Sector Stakeholders Performance*

The last two questions of survey sum the survey with the participants' predictions based on climate change and other water-related risks that were not covered in the survey (Figure 31). Egyptian and Iraq participants believe that there will be a more significant difference in water availability or less water availability due to climate change. Most of the participants also believed the survey covered a great variety of water-related risks.
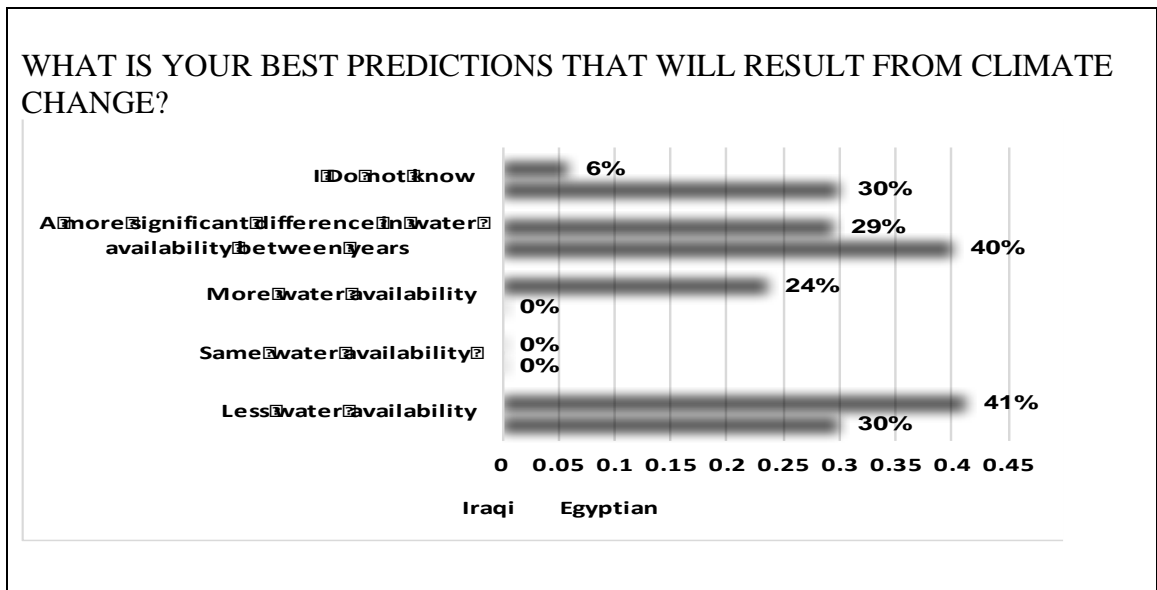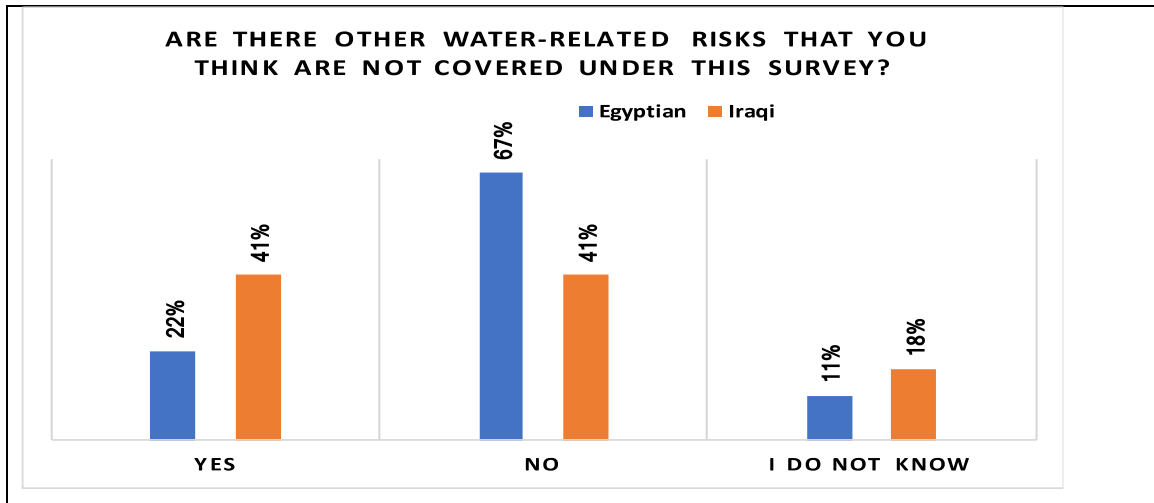
Figure 31. *Participants' Predictions of the Impact of Climate Change on Water Security.*

Some of the respondents provided the following other water-related risks:

- Building dams in Turkey and Ethiopia without considering the rights of others.

- The high level of salinity in the Shatt al-Arab's water and the change of water specifications from the river to marine and according to the season and water releases.

- Water Pollution.

- Ignoring any third party or organization trying to help solve the water shortage or problem could lead to a catastrophic problem since local governments pay less attention to water resources' vital topics. Also, these organizations' goals are helping people in these countries implement water, sanitation, and hygiene education projects, which is unfortunately missed by the MENA region governments.

- The water policies of neighbouring countries.

- The internal conflicts of the countries themselves.

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- The frequent abuse of irrigation projects and river basins.

- Lack of public awareness on the part of the society of the importance of water.

Step 3: Interview Analysis

Following the survey phase, in-depth interviews with key informants were conducted to explore the findings and results generated from the survey responses in greater depth. As Yin (2014) emphasizes, interviews with key informants are often critical to a case study's success and can be one of the most crucial evidence sources. Accordingly, the researcher contacted a sample of survey respondents who show a willingness to participate in the interview.

The interview instrument was developed to gain more in-depth insight and build on the survey findings through a small data analysis approach, thematic coding, sorting and synthesizing, and theorizing. It consisted of 10 open-ended questions that were primarily conversational to prompt discussion and allowed the respondents to elaborate on their thoughts and introduce new ideas to the debate (Creswell, 2014). Giving the respondents the freedom to speak what they know on the topic under discussion ensures the establishment of good rapport between the respondent and the interviewer and ensures new insights are generated, resulting in innovative ways of tackling the problem under study.

These questions acted as verification for the information gathered and determine the degree to which the in-depth interview questions can apply across the two countries (Iraq and Egypt). Due to the Coronavirus pandemic -COVID-19, the study envisioned that there will be limited access to the interviewees. Therefore, the interview questions

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were sent via email and social media channels based on the provided preferred contact information they submitted in question 11of their survey form. This unfortunate situation led the researcher to conduct only four interviews (two each from Iraq and Egypt) with the survey respondents who were willing to participate in the interview and provided their precise contact details.

Four interviews were conducted: two from Iraq and two from Egypt. These interviews aimed to spread nationality, age, gender, and position in the organization/program and experience in the respective countries' water sector. Of all interviewed, two women and two men had about 5-20 years' experience working with water government entities and private sector consultancies.

Q1: How would you describe water elites in general? Informants provided a variety of descriptions of water elites. They have any or very little knowledge of water elites. One of the Iraq informants stated that: "Water elites are being chosen unfairly. The current human resources (HR) applicable systems choose those elites based on just loyalty for the political and administrative ideology and passing some career path. Decision-makers do not pay attention to other fair integrated aspects, such as efficiency, effectiveness, contribution to the organization's mission statement, achievements, educational background, and supervision experience. I have been excluded from leadership positions only because I am not old enough, I belong to social groups that the leadership does not like, and I always take initiatives that lead to change. Everyone in the utility knows that I am a certified and qualified person by international entities like The German Society of International Development *(Deustche Gesellschaft fur Internationale Zusammenarbeit - GIZ)* and ACWUA. In general, they did not have a role in enforcement

for water standard design, especially in network and pressure (hydraulic design)." A female informant from the Kurdistan Regional Government described water elites as "Separated or not united. They did not predict the water crisis that took place in the region recently. She argued that their performance is average most of the time and periodically turn into good depending on political conditions."

The Egyptian informants provided more details responding to this question. One of them stated that "A powerful elite exists among this population with political/cultural influence *(wasta)* that expects to receive services essentially immediately on demand such as new connections for real estate development or industrial/agricultural purposes. Also, among these powerful elites are powerful political, military, commercial, and tribal/ethnic group leaders who can manipulate/negotiate their water payments and keep tariffs low is despite O&M costs. There was a vague understanding of this informant of the elite water term as he mixes it with other types of elites. Another informant describes the term as "those at upper reaches of government and business who have some responsibility for water supply and wastewater. Generally speaking, the water elites with whom I have worked have been good people who wanted to do good for their people who lived therein. They were hard workers with a great deal of intelligence and integrity. I have also known a few water elites, in high positions, who relished their stature and power more than perhaps they should – and they probably took advantage of others as a result. I have reason to believe that some were corrupt – using their positions for personal gain. When I was first a water company manager, I felt rather good about myself and the "power" I had. It was not long before I realized that my position was a serious

responsibility because our company served the public with a vital service. This was not an appropriate time to go on an ego trip or abuse that position."

Q2: How knowledgeable do you think your country's water elites about the following water security issues: water resource management, water delivery, and water-related risk mitigation? The interview provided various perceptions regarding the three areas related to these questions: water resources management, water delivery, and water-related risk mitigation.

Water resource management

The Iraqi interviewees stated that managing water resources is "very poor." They described the water leadership as "not professionally acquainted with the modern approached of integrated water resource management (IWRM)." They believe that the current projects are not sustainable and are not sufficient. These projects, according to them, are just for public relations consumption. They generally rated the IWRM "very low."

The Egyptian interviewees agree that water resource management practices are "limited, except how water availability impacts them and their constituents directly." One respondent indicated that no one could be sure, but it is an area "where more attention could be paid, and more knowledge will be accumulated."

Water service delivery

The Iraqi interviewees stated that "water service delivery does not meet our customers' expectations due to the unstable legal framework, the absence of quality management systems (QMS), billing mistakes, untrusted customers, monopoly of water

sector services." Others rated it as "good but without established standards" and "not bad."

The Egyptian interviewees agree that water service delivery practices are limited, and the water elites are very knowledgeable in this area.

Water-related risk mitigation

One of the Iraqi interviewees responded that there is no established well-planned crisis management in place "with predefined roles for all stakeholders." They perceived the management and institutional setup as "not proactive but rather reactive." They continue to say that leadership mainly "reacts with the crises by forming committees and provide the public opinion with a scapegoat in case of failure occurrence." There are no contingency plans to mitigate risks. One of the respondents assessed the performance of the leadership as "basic" in addressing water-related risks.

Egyptian interviewees did not elaborate on this area. They are just described as "not bad," and it needs more attention from the water stakeholders. One of them suggested that it is a topic that needs to be addressed by the MENA region water elites.

Q 3: What do you think are some of the water elites' perceptions of water security sustainability for each of the following: water allocation, water supply, and water demand management? The interviewees' perception of the three focused areas of water security showed that they were reluctant to provide details or clear answers.

Water Allocation

One Iraqi informant stated that water allocation is as reasonable as "Who pays well, they will get the service." Another mentioned that it is mediocre to "not bad."

One of the Egyptian informants that water allocation is limited at best. The other participants did not provide an answer to this question, as she stated, "I am not able to respond to this item."

Water Supply

When asking Iraqi informants' perceptions of water supply concerning water security, most of them mentioned that it is "good." One of them stated that it is essential to search for "funds to finance water-related networks and treatment infrastructures," which is crucial for a reliable water supply for citizens.

The Egyptian informants provide little details on water supply. One of them said it is "limited." Another stated that "I am not able to respond to this question."

Water Demand Management (WDM)

The purpose of WDM is "to increase water efficiency through both wise use and reduction, which will reduce or postpone the need to build more dams and drill more boreholes" (Macy, 1999). WDM is a management approach that "aims to conserve water by influencing demand. It involves the application of selective incentives to promote efficient and equitable use of water. According to the International Union for Conservation of Nature" (IUCN 2000), WDM can increase water availability through efficient allocation and use. This is guided by economic efficiency, equity, access; environmental protection and sustainable ecosystem functioning; governance based on maximum participation; responsibility and accountability, and political acceptability (2000)." In alignment with the two WDM definitions, the Iraq informants stated that WDM could be achieved by "expanding establishing water treatment plants and wastewater 3D treatment." Nevertheless, they stated that it is currently done not at a

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satisfactory level. The Egyptian interviewees indicated that it is limited to a mediocre level.

Q 4: What technologies do you think can improve your country's water balance and the MENA region? Regarding the technologies that can improve the water balance at the national and regional levels, the Iraq informants appear to be knowledgeable. For example, one of them suggested using solar energy in water treatment, seawater treatment plants, underground water, and cooperation between neighbourhood countries by joining water networks together. Another person suggested three ways to achieve water balance by working on non-revenue water, addressing the illegal connections, and using advanced water metering systems. Other innovative approaches can be made, such as Building dams and benefiting from surface water by constructing water treatment plants, recharging underground water, recycling sewerage water, reusing the treated wastewater, establishing high-tech stations, and using Reverse Osmosis (RO) desalination for the countries bordering the seas.

The Egyptian informants considered water as a fundamental human right. Accordingly, they perceived various ways to improve the water balance, such as conservation and public awareness, graduated tariff schemes with accountable billing and collection, accurate metering, and more efficient use of water by agricultural interests. One way to significantly improve the water balance in the MENA region would be to reduce non-revenue water – and some of the solutions in this area are not expensive to do but are effective. Sadly, many water elites are more interested in building more infrastructure that they are in reducing None-Revenue Water (NRW). One wonders why, since a much smaller investment to reduce NRW could yield significant results. In sum,

they agree on the notion that the following technologies would help in the water balance: identify leaks quickly so they can be fixed (reduce physical losses), customer record-keeping that accurately captures water usage (reduce apparent losses), and finally, accurate metering.

Q 5: What do you consider the most effective methods to deliver affordable water services? The Iraq informants believed that amongst the most effective methods to deliver affordable water services are adopting and applying tailored "serving the poor's programs in addition to using filter tanks.

On the other hand, the Egyptian informants stated that could be accomplished by encouraging public-private partnerships. They suggested using natural spring water, collecting it, and redistributing it by pipelines, as most of this water does not need treatment nor pumping stations (This is for mountain areas that contain springs). Concerning urban areas, the most straightforward ways are deep wells, which provide excellent and low-cost water. Another Egyptian informant added that the ideal case that we rarely find is a well-run water system with low NRW, good quality water, and effective services to charge fairly for its services and have affordable charges. She provides the following profound thoughts and reflective observations:

- *I have listened to people complain about the unaffordability of water service all around the world.*

- *These days, almost everyone has a cell phone, and the monthly charges for those cell phones likely exceed what people are paying for water. If you gave people a stark choice or giving up their cell phone or giving up water for a week, which would they choose? If they give up the water for a week, they likely die.*

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However, people are not willing to pay the cost of providing adequate water services, and they are willing to pay for that cell phone.

- *This is shameful on the one hand and unfortunate on the other – that people have not been educated to understand the importance of water and wastewater to their well-being. They have also been misled by politicians who enjoy using the water charges as a political issue that they will help solve by keeping rates low—shame on them.*

- *So, I am arguing for water charges that generate enough revenue that the water utility can cover its costs. Simultaneously, the water utility needs to provide adequate services so that people are more willing to pay – and they need to be cost-efficient.*

Q 6: What are the three highest risks that might negatively affect water security in your country and the MENA region? All informants considered dams built in the neighbouring countries as the most critical factors that affect water security in their countries, which might lead to water wars and affect hydro- political stability. For example, the Iraq informant believed that the Turkish water dams such as Atatürk Dam, commissioned in the upper Euphrates-Tigris river basin in 1992, reduced the amount of water received by Iraq. The Egyptian informants agreed with this threat as it pertained to their country. They perceive building the Ethiopian Grand Ethiopian Renaissance Dam (GERD), a significant threat once completed. They also considered climate as a critical factor impacting water security in their countries.

The Iraq informants listED a variety of factors affecting water security in their country. Among these are lack of sound water resource management, low public

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awareness, cheap water price, lack of enforcement of general water policy, and reliance heavily on traditional water resources underground and surface water.

The Egyptian informants provided more perspective on this question. They argued that unrest and potential ware in MENA could wreak havoc with water infrastructure. Concerning Climate Change and Population Growth: MENA is already water-stressed. Changes in the climate that result in less rainfall in the watersheds that feed MENA could be catastrophic. Increasing populations add to the stress.

Q 7: Do you think current water stress can cause domestic social unrest in your country? How? According to the Water Resource Institute, water stress poses severe threats to human lives, livelihoods, and business stability (2019). It has a horrendous effects on social stability. All informants agreed that the current water stress could cause domestic unrest in their countries.

One Iraq informant stated that it might increase the number of divorce cases in courts due to the challenging living conditions. Another responded that social unrest could be triggered by saying that the inequitable distribution of water. There is a 24/7 water supply in some areas, and the other is the interruption of water service (two to three hours per day twice a week). They believe that the water-food nexus is powerful. When the amount of water decreases, there will be some kind of conflict significantly when it affects food security in all its facets.

The Egyptian interviewees provided two perspectives on the "How" question. One mentioned that the "lack of water in already water insecure countries would lead to uprisings that could undermine stable, friendly governments. Strikes for Water as a Basic Human Right could disrupt economies and result in martial law and destruction. Ordinary

people will take their message to the streets if they are denied water while the elites continue to receive whatever they want." The other person stated the opposite thought. She noted that "I do think that water stress can cause unrest. The risks mentioned above all would result in less water for a growing population. At some point, the balance between water demand and water supply becomes untenable: there is not enough water for all, and there are no prospects to improve the situation. People must have water to live – so, in the situation where there is a severe lack of water, people will have to go to other places where they can find water – or they fight over what little they have."

Q 8: Do you think the current bilateral and multi-lateral transboundary water agreements improve water security in the MENA region? All informants agreed that the current transboundary agreements contribute to improving water security in the MENA region. How beneficial these agreements are conditioned by the extent to which they are fair for everyone to win, and if all selected countries respect them, the Iraq informants explained.

The Egyptian informants added that it is indispensable for the hydro-diplomacy to improve the current MENA water security via sharing resources and avoiding shortages and conflict.

Q 9: Do you think there is an impact of climate change on your country's water security and the MENA region? All Iraq and Egyptian informants unanimously agreed that climate change has a definite impact on water security at both the national and regional levels. This position stems from the fact that the MENA region depends mainly on raining water as a source of living as most of the region suffer from the scarcity of water, and the land is arid, the Iraqi informants commented.

The Egyptian interviewees confirmed that arid areas would expand as the planet warms, significantly impacting rural communities' water security. One of them was open when she stressed she was not a climate change expert, but she said that it would likely mean rising temperatures worldwide and more severe weather events. It may also mean less rainfall in MENA – so less rainfall and more people do not lead to a sustainable equation of water supply and water demand."

Q 10: What do you consider the most critical water stakeholder in water security? Informants agreed that water stakeholders should have an essential role in water security. However, they vary in their perspective of who the primary and most influential among those stakeholders are with respect to water security.

The Iraqi informants mentioned that local communities should participate transparently and fairly in strategic plan development, the government should apply governance principles seriously, and investors should invest in the establishment, operating, and maintenance projects by measuring Return on Investment (ROI) before deciding. They continue to say that water utility professionals should be enabled in their right positions.

The Egyptian interviewees mentioned the following stakeholders as critical to water security: citizens, political leadership, water providers or distributors, decision-makers, water, and wastewater companies. One stated that agricultural entities currently using the highest percentages of water for crops which require ever-increasing irrigation, local community leaders who can effectively represent their constituents to the elites in government.

Conclusions

When the water management processes of Iraq and Egypt are analyzed comparatively, it is found that both these countries, much like their other global counterparts, suffer from the same problem related to water security. A deeper look into the water crisis in Iraq and Egypt occurs within three main topics: water resource management, water service availability, and water risk management.

In terms of water resource management, Iraq and Egypt are in contrast. Iraq is way behind countries in the developed world because the government has failed to take the necessary steps for supplying safe water to the people. This is because decades-long armed conflicts over transboundary water usage, and climate change prolonged the country's vast water crisis. In order to ensure water security post-conflict Iraq, it is essential that Iraq increases monetary supplies for sustainable water Infrastructure.

Egypt, by disparity, is a bit better off because water availability to people has been met, although other challenges are still yet to be dealt with. One of the significant problems with Egypt's resource management is similar to other countries of the world: a striking imbalance between the increasing demand for water and its limited supply. For this purpose, proper discussion and coordination between the other nine countries sharing the Nile water is required. Furthermore, the four major points of water resource management; climate change, vulnerability to natural disasters, urban demand for water, and misuse of water, can be seen and compared within Egypt and Iraq.

Water service availability is also witnessed thoroughly in similar contexts with Iraq and Egypt. Iraq lacks in providing essential water supply, let alone giving its citizens access to healthy and safe drinking water. It is characterized by insufficient quantity and

quality of water supply. Due to the decades of armed conflict and destruction of the water resource management system, the country's drinking water is bought from the water tankers/markets that receive water from nearby plants. Iraq is water-stressed country and there is no end in sight due to the very low water supply tariff.

Egypt's water service availability differs from Iraq in the sense that it has a wide range of water supply due to the Nile. The rapid population growth has linearly increased the water service availability which is unlike many other third world countries. The con of this is that it is not quality water, due to the large percentage of people suffering from water-borne diseases every year. Only one half of the population is connected to sewers and has access to sanitation. The main similarity between the two countries is the quality of water is very poor. This is made to be a major problem which foreign aid from United States and European Union will be able to solve and is essential both in terms of financial aid and technical assistance. One essential solution to poor water quality is wastewater treatment that treats and sterilizes the wastewater acquired from various sources.

Water Risk Management, last of three main topics of water security, is one that both Iraq and Egypt share a commonality. Water Management is a global requirement in recent times, and it is evident that both of these countries lack implementing policies to meet global standards of safe water. Iraq, again due to its widespread corruption networks, deficits in implementing basic water risk management principles. The Iraqi government has failed to manage the nation's water resources, there is no public health advisory or directive system in Iraq which accompanies corruption rackets in the local/national businesses/institutions.

Throughout the different sectors of Egyptian water authority, Egypt shows both signs of progress and failure especially due to climate change. Over the past 50 years, Egypt's population has tripled while available renewable water resources have remained the same. However, with the assistance of other developed countries and international organizations, these two countries must attempt to provide safe drinking water to its citizens because receiving hygienic drinking water is the birthright of every human being.

CHAPTER V – PRESENTATION OF CASE STUDY ON JORDAN AND TUNISIA

Introduction

Jordan and Tunisia have been characterized by a scarcity of water resources with a noticeable irregularity. It was important for the two countries to acquire an integrated strategy to use water, one based on credible technical and scientific studies.

This case study focuses on a comparative analysis of the elite perceptions of water security in the selected two countries. The researcher used a three-pronged methodology to develop a case study. The three sections that follow are documentation, a self-administered online survey, and an in-depth semi-structured interview to collect qualitative data from a shortlist of key informants from the targeted water elites. The case study ends with a section summing up the main conclusions of the cross-case analysis between Jordan and Tunisia.

Water Resources Management

Even though Jordan's water utilities serve 98% of the population, scarcity remains a significant concern. There was a rapid growth in the population that increased the water demand, creating additional pressure on the limited availability (Antonelli, Laio, and Tamea2017). The current annual water consumption is 1,007 million cubic meters in Jordan, 50% of which is utilized in irrigation (Odeh 2019). Most of the water accessed by the people is from the groundwater, which constitutes 60% of the usage, while 27.1% is surface water, and 13.2% constitutes the treated wastewater (Assets.mcc.gov. 2020).

However, in the last few years, water use in Jordan has increased drastically, leading to a reduction in domestic consumption annually per capita from renewable

resources. Available water resources have dropped from 3600m3 since the year 1946 to 123m3 by the year 2013. The water level of 123m3 has categorized Jordan as a water poverty country. According to the World Health Organisation, by 2025, the renewable resource for water will reduce at the level of 90m^3(Assets.mcc.gov. 2020). The current water resources include 15 surface basins at different times of the year. Further, there are surface sources from the Zarqa and Yarmouk Rivers, although there are reductions in quantity at different times of the year.

By contrast, Tunisia has been classified under the category of countries having the least accessibility of water resources within the Mediterranean basin. Tunisia's history highlights the scarcity of water resources has resulted in the unequal distribution of the country's population (de Marsily 2019). The water resource challenges can be illustrated in different levels in Tunisia. The surface water had always been a problem in Tunisia due to the semi-arid climate with consistent episodic droughts and water quality deterioration. This situation has resulted in occasional droughts from the degradation in the quality of water. It is worth mentioning that Tunisia gets an average rainfall of 230 mm every year, although the quantity varies each year (de Marsily 2019). The surface water is estimated between 2,700 million cubic meters. It is distributed in three main sections of the country, based on the hydrological and climatic conditions with the geological and geomorphologic conditions.

The groundwater resource constitutes 2,000 Mcm with 55% of the shallow groundwater and 18% of deep groundwater. Tunisia has been strategizing various water resource management initiatives so that they can mobilize resources. The main idea was to increase water production with adequate demand management through water pricing,

new techniques, institutional mechanisms, and legal mechanisms (Frija 2017). Some of the national strategies adopted by Tunisia in water management include managing demand within the population, integrating resource management, and protecting environmental resources. In demand management, the government must ensure resources are preserved through economic efficiency. Further, social equity can be preserved through the proper distribution of good quality water.

The water integration management process is designed to preserve resources through recharging groundwater so that it is not over-drafted or degraded during droughts. Further, the wastewater treatment and treatment of the brackish water were also implemented (de Marsily 2019). Additionally, the government has implemented the water's quantitative conservation through reinforcement and improvement of the water capture process. This improvement is also included in the qualitative preservation of the ecosystem and water resources, which are complemented by cost evaluation and monitoring of the environmental resources.

However, in Jordan's case, it was observed that there was a high cost involved in treatment, transportation, distribution, and acquisition of drinking water. To avoid these high water services expenditure and improve financial sustainability with improved water management performance, the government had taken up specific measures and policies (Femia 2020). One set of government policies in Jordan focuses on agricultural production. One such policy involved the pricing of the irrigation water with the price of the pumping of water. Some of the additional costs involved included marketing and production cost were implemented on the municipal markets.

Moreover, the government provided certain agricultural credits to farmers involved in purchasing machinery for farming, building greenhouses, drip irrigation systems, and deep wells. The land-use policy was adopted to control the increased number of urban activities related to agriculture. This led to the dangers of the agricultural lands getting converted to non-agricultural uses. The legislation ensured that the agricultural lands were protected, and fragmentation of these lands was prevented.

Water Service Delivery

Tunisia's government undertook several initiatives to involve many small-scale operators in rural and urban areas, which would assist in the pilot projects as a part of water service delivery (Frija2017). Multiple private partners were involved in pilot projects assisting in supporting the public authorities, resulting in the reorganization of the aforementioned microsystems. These private sector actors contributed to Tunisia's strategy in developing technical efficiency with enhanced service quality. They played an essential role in water delivery service by reorienting the culture of services.

This was achieved by enhancing the projects' commercial and technical efficiency based on the demands of users. With the purpose of wastewater treatment requirement in mind, Tunisia will develop a BOT approach (Build-Operate-Transfer). The purpose of this approach was to build water plants that can be both conventional and non-conventional so that multiple water treatment approaches can be employed as appropriate (Frija 2017).

To achieve this project's success, the government carried out several assessments related to the investments and financial deficits to improve service quality (Souissi et al., 2019). The BOT approach required long -term financial support with the fiscal

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monitoring of guaranteed. As a part of the public service, the Tunisian government

organized two of the most well-known national operators, National Water Distribution

Utility (Société Nationale d'Exploitation et de Distribution des Eaux -SONEDE) and The

National Office for Sanitation (Office National de l'Assainissement - ONAS), who

played an essential role in the service quality and its coverage throughout the country.

On one hand, the SONEDE operator created by Law 68-22 in 1968, while ONAS, created

by Law 73-74 in 1974, and was responsible for managing water and sanitation in Tunisia.

Tunisia is divided in into 7 regions, 24 governorates and 264 municipalities

(Figure 32) (EU 2016).). SONEDE operators were involved in the treatment, production,

and distribution of the drinking water in all those governorates and regions (Fallah-

Mehdipour, Bozorg-Haddadand Loáiciga 2020). However, the activities of SONEDE

were limited in rural areas. They also ensured that the water treatments and transportation

networks were functioning smoothly, helping to smooth water distribution to Tunisia.

Concurrently, ONAS operators were responsible for the collection and treatment of

wastewater. Further, they were also involved in the installation and operating sanitation

network.

Figure 32. *National Water Distribution Utility (Société Nationale d'Exploitation et de Distribution des Eaux -SONEDE) Coverage Map.*

In Jordan's case, there were specific policy and legislative measures taken up by the water and the sanitation departments so that the water service quality could be enhanced. The Water Authority in Jordan (WAJ) decided to review the financial and economic challenges so that a financial policy can be developed in controlling the current

spending capital reduction (Femia 2020). This was accomplished through the development of technical programs to manage scarce water resources. The programs were also involved in reducing water wastage and water loss with the sustainable development of water sanitation services. The service programs addressed aspects, including water demand, institutional reform, irrigation water, wastewater, alternative sources of water, and water supply.

Moreover, the WAJ undertook several initiatives to reform the water sectors and improve resource management within the country. The measures included managing water, finances, legislative reforms, and institutional restructuring (Sadoff, Borgomeo, and Waal. 2017). The Jordan Compact, one of the service delivery programs for water, was a $273 million project that included three pilot projects.

The pilot projects comprised Waste Water Networking, Water Network, and the As-Samra Expansion Project (AEP) (Femia 2020). The primary purpose of this project was to increase the water supply in every household in Tunisia. Moreover, they thrived on improving the water delivery efficiency with the expansion in wastewater treatments.

With these projects in hand, the Jordan government aimed to stimulate the country's economic growth and relax constraints on water scarcity. Some of the measures that had been a part of these projects to improve service delivery included preventing the leakage and the quantity of treated water received by each of the households more per week (Lelieveld et al. 2016).

It also included the implementation of billing of water utility so that consumption did not increase in households in an unsustainable manner (Byrne, Gupta, Kringand Papi, 2017). Reports from the Jordan Compact projects reveals that investigations and measure

of the leakage were carried out so that the infrastructure of water delivery can be enhanced. This would also help reduce the physical loss of water and keep the freshwater safe from getting lost from the utility water pipelines.

Tunisia is among the North African countries most likely to suffer from an exacerbation of water stress due to climate change. Moreover, this situation has consequences for social and economic development, food security, and health. The Tunisian water sector leaders, such as Mrs. Aqsa Al-Bahri, the Minister of Agriculture, Water Resources and Fishing, recognize that water security is of critical challenge. She stated in the Tunisia Water Sector Report Press Release (December 11, 2020), that the "water problem has turned into a challenge, the main one in our country". The Minister continued, suggesting that "this problem requires close coordination between all efforts and forces in order to properly manage the risks of water scarcity that threaten human development and could jeopardize the rights of future generations to water." According to the Ministry of Agriculture, Water and Resources and Fishing press released (December 11, 2020), the limited water resources are subject to intensive and increasing consumption due to the population's high demographic growth and that it is witnessing a decline in quality. The press release continues to note that Tunisia, "is in a delicate stage that requires the development and controlled management of its resources, by redefining the strategic framework for planning and resource use. From this standpoint, strategic and forward-looking studies have been drawn up, such as the 'Water Sector Strategy 2050,' the study of diverting the North's surplus water to the center, the National Plan for Reuse of Treated Wastewater, 'Water Reuse,' and the Strategy for Environmental Protection after the year 2020."

Water-Related Risk

As highlighted by Hamrita et al. (2017), Jordan's water crisis and the climate

crisis contributed to threatening the country's fragile peace. Relatively recent years, the

Jordanian security services have monopolized the economy of the rural communities

(Schwartzstein 2019*).*

This has resulted in the slow collapse of the settled agriculture and herding.

Besides, in the urban areas, there had been a severe dearth in the availability of jobs. As a

result, most of the territory is populated by tribal, especially in Salt and Ajloun in Jordan

(Femia 2020).

The community depends primarily on the military as the adjoining areas suffer

from severe water insufficiency, or the water is too expensive to carry out agricultural

production. "Roughly 45% of the water used in Jordan goes to agriculture and one of the

key points on Jordan's 2008–22 National Water Strategy has been efforts to stop over-

pumping groundwater through reducing the amount of water that is given for free to

farmers as well as water theft" (Jaffery, 2019).

Climate change has produced   rainfall decreases and surface water level

reductions. Jordan is one of the regions that suffer from the most water shortage countries

of the world, with levels of water availability well below the standard water poverty

threshold 500 cubic meters per capita per year. Water levels per capita was 3,600 m3 /

year in 1946, but decreased to 145 m3 / year by 2008 due to population growth and

climate change (Jobbins, 2012). These aspects will continue to drop to just 90 m3 / year

by 2020 if no substantial conservation action is taken to the existing resources and

generating additional sources of drinking water (2017). This resulted in the tumbling of

the yielded crops, followed by severe drought. In addition, there has been a tremendous increase in the population.

With the growing water scarcity, some of the Jordan's semi-arid section, "marginal-quality water has become a major source of irrigation water" (Al-Karaki 2011). In the book titled "Water Scarcity, Security and Democracy: a Mediterranean Mosaic", the authors indicated that Treated effluent is another important source of water for agriculture which accounts for about 25 percent of the country's water resources (Chatel et al., 2014). It offers many advantages as it lacks the uncertainties of surface water resources and can meet a proportional share of the rising water demand from urbanization and population growth (UNDP 2013). Chatlel et al. indicated that "Farmers here have resorted to low water-intensive – less profitable – crops, such as potatoes, cabbage, beans, cauliflower, okra, and zucchini" (Chatel et al., 2014). Another factor that affect the water insecurity of Jordan is the Israeli National water Carrier Project which continues to severely affect the water supply in this country "where the lower reaches of the Jordan River have been reduced to a saline trickle, leaving Jordanian farms along its east bank desperately short of water" (McCaffrey 2007). Moreover, the water quality was reduced in these areas (Cook et al., 2016

Moreover, it is not just agriculture and herders who suffer from water scarcity; there are also those who were unemployed and out of business due to the increased electricity and water rates. The surge in the population, the surface water resource, and the rainfall resulted in the state's inability to deliver water to households (Global Water Intelligence. 2016). As a result, a more significant number of households were dependent

on water tankers, which became expensive as time passed. Another aspect that developed with water scarcity was corruption within the water sectors.

The bore wells in different Jordan parts are well illegally possessed by the well-connected businessmen or the tribal sheiks. They sold water at high prices to the civilians. This also resulted in potential chaos and water-related unrest that proliferated in the different parts of the country.

Unlike Jordan, Tunisia had equipped itself and created a strategic vision against water scarcity. The strategy that was planned until 2030 emphasized the effective management of the water resources. Despite the necessary action taken, there were gaps in sanitation and water services (Global Water Tariff Survey 2016).

Even though the government had planned several projects to negotiate contracts with the relocation of the capacities and functions, several settle disputes cropped up related to the fiscal and financial obligations.

The government employed the national operators SONEDE and ONAS to manage water resources even though its water projects continued performing, and there was a deterioration in the sanitation and water systems (World Bank. 2020). This was further accelerated with the dip in the performance indicators of SONEDE.

It resulted in a physical loss of water, with an accompanying increase in the water output, creating challenges in terms of the operators' performance and efficiency that contributed to shortcomings in the organizational and financial model (Global Water Tariff Survey 2016). Despite the water management projects, Tunisia depends on rainfed agriculture that significantly depends on the water resources since these crops and their resulting food security depended on rain-fed agriculture.

Due to water scarcity, cereal production became insufficient and failed to meet the national demand (Sadok et al., 2019). However, despite the risks, the government has been taking a consistent initiative to enhance the irrigation of the land and promote various new farming methods expected to enhance crop growth. Hence, water scarcity in Tunisia resulted in environmental restrictions, variability in resources, loss of water quality, and the overexploitation of the underground resources.

<center>Step 2: Survey Analysis</center>

The second step of data collection is an online survey. It is a technique that involves examining processes and questioning a selected sample within a given population to generate data that relates to a specific social phenomenon. The data collected among the chosen sample always relates to knowledge, opinions, and behavior. A survey as a data collection method may take online, by mail, telephone, or direct personal communication. Some of the factors to be considered before settling on an appropriate survey method include cost-saving, data collection speed, geographic flexibility, respondent cooperation, response rate, respondents' anonymity, follow-up, degree of interviewer influence, and item non-response rate.

The survey consists of 39 questions of varying degrees of uniqueness (Appendix B). They were categorized into five sections:

1) Participant Demographics Background

2) General Water Security Knowledge and Perceptions

3) Water Resource Management

4) Water Service Delivery

5) Water-Related Risk Mitigation

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Participant Demographics Background

    The researcher surveyed 29 participants from Jordan and Tunisia, with the results shown in Figure 33. The gender of the Jordanian participants consists of males (16) and females (8), and the majority of them are between the ages of 35-64, hold university education degrees, and with more than 20 years of experience in the Water sector. The Tunisian participants consist of three males and two females. Most of them are within the age group of 25-34, holding master's degrees with 5-20 years of experience. This information is vital when trying to understand the results of the survey and what it fully entails.
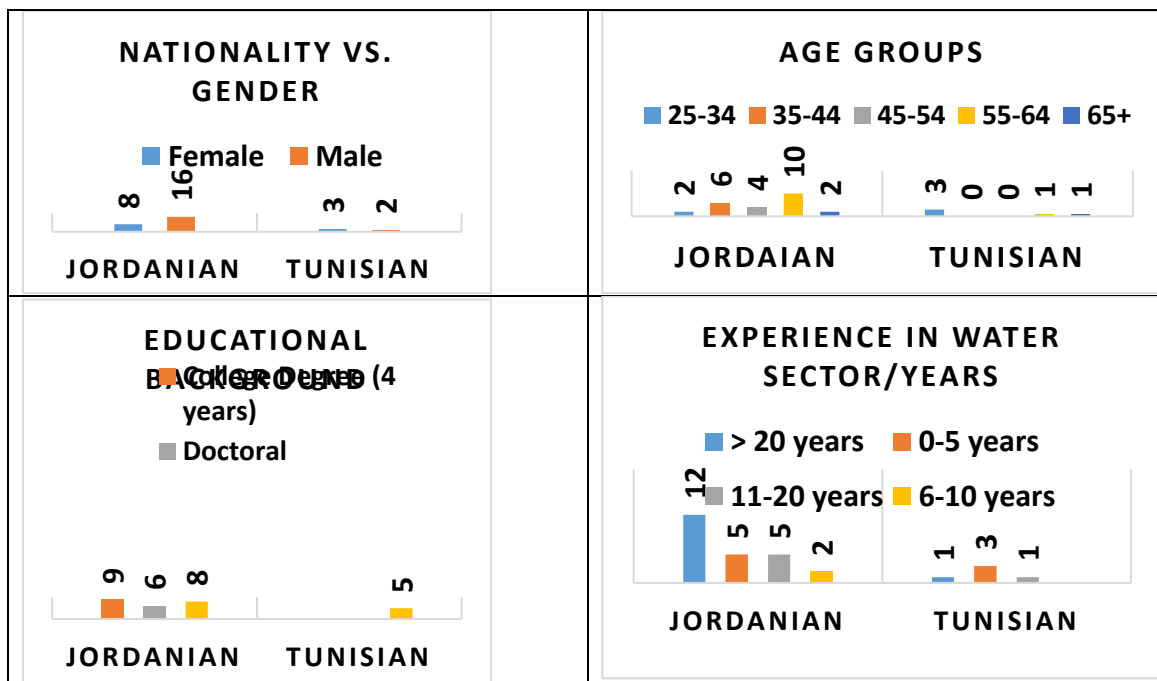
Figure 33. *Participants Demographic Data Summary (Jordan and Tunisia).*

    Due to the low average of women, the survey represents a predominantly male perspective. The same goes for the nationality background. There is no evidence that this plays a vital role in the results, but it is considered that the results are analyzed.

Figure 33 identifies the age group of the participants ranging from 25-65+ years old. There is a more diverse age range in Jordan vs. Tunisia due to larger interviewees count from Jordan. The educational background shows participants have earned a bachelor's degree, while around 30 percent have a doctoral degree. This will show that the survey results encompassed a high education level from all participants with extremely viable water sector experience.

Table 12 shows the current job and institution in which the survey participants are currently in. There is a wide range of positions from a chemist, general manager, chief engineer, and public financial management consultant. The institutions' participants' work includes the Ministry of Water Resources, Babylon Training/Development Center, and many more.

Table 12

Participants' Institutions and Job Categories

Level	Jordan	Tunisia
Institutions:	Middle East Water Forum (MEWF) Water Authority of Jordan United National Food and Agriculture Manager- Jordan Office Arab Countries Water Utilities Association. (ACWUA) Ministry of Water and Irrigation (MWI) German Jordan University	National Water Distribution Utility (SONEDE). CERTE - Water Researches and Technologies Center of Borj Cedria (WRTC) Water Consultancy Company
Job Category	Water NGO Chairman and Former Water Minister Water System lecturer Director of workshops & maintenance water sector Consultant General Secretary of ACWUA Head of Process and Services improvement and development Institutional Irrigation Specialist Information Technology Water Manager Professor Project Manager Project officer Purchasing Manager Researcher Retired government water manager Senior Advisor, Capacity Development Team leader- water communication and behavior change University President water consultant Water Demand Management Specialist Water Treatment Engineer	water treatment engineer Water Manager senior expert consultant Manager Water Technology Academician

Figure 34 includes up to three languages participants can communicate professionally in different degrees, their experience in water-related research publications, and personal affiliations in water/sanitation professional organizations.
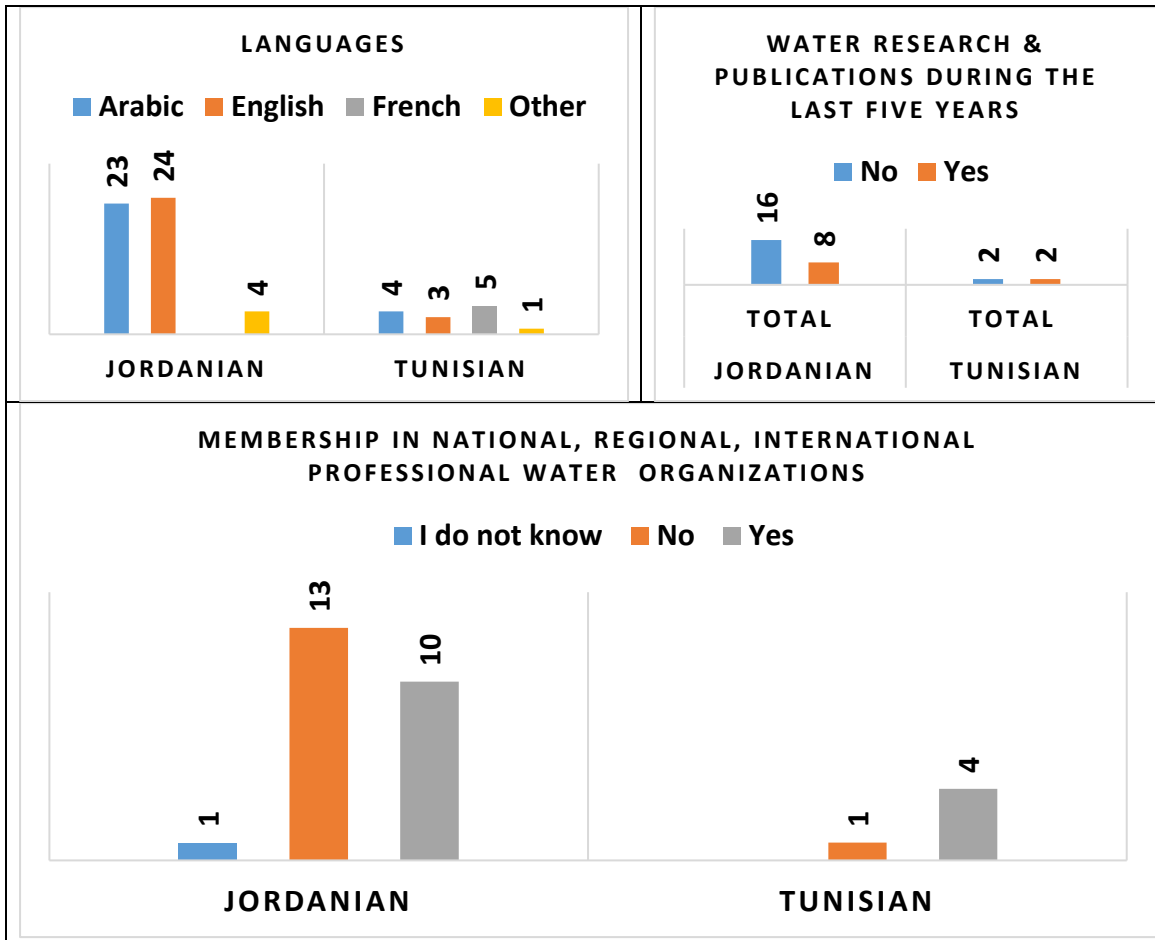
Figure 34. *Participants' Language Skills, Research Experience, and Professional Affiliations.*

The majority of participants can communicate in English and Arabic, while only five have French language experience. Five participants can communicate in another language not listed in the survey. This is important when analyzing the survey and understanding the background of the participants.

Almost 68 percent of participants do not have experience publishing water-related research in the past five years. This is not detrimental to the research done in this survey

but might play a part in the knowledge criteria needed to answer some questions. Participants also showed that only 50 percent have experience with national, regional, or international professional groups/organizations in water/sanitation (table 13). This will provide a broad perspective on water issues due to the participants' low exposure in this field

Table 13

Participants' national, regional, and International Professional Affiliations

Jordanian	Tunisian
Jordan Engineering Association	Natural Water Treatment Laboratory (*Laboratoire De Traitement Des Eaux Naturelles*)
Jordan Environmental Association	
Arab Countries Water Utilities Association (ACWUA)	Mediterranean Water Institute
Middle East Water Forum (MEWF)	World Water Council
Global Water Partnership (GWP)	Arab Water Council
Blue Peace Middle East	Maghreb Water Forum (*Forum Maghreben de l Eau*)
West Asia-North Africa Institute -Royal Scientific Society	National Office of Sanitation of Tunisia (ONAS)
International Water Association (IWA)	Agricultural Development Group (GDA) - Sidi Amor (*Groupement De Développement Agricole (GDA) - Sidi Amor*

Overall, section 1 exemplifies the survey participants have a trustworthy experience and will bring an unbiased perspective to the results. There are numerous similarities and differences between Jordan and Tunisia, which are addressed in the following sections.

Most participants also expressed interest in a short follow-up interview later in the research stage. This will be vital when implementing the next stages (Figure 35).

RESPONDENTS SHOWING INTEREST IN PARTICIPATING IN A SHORT FOLLOW-UP INTERVIEW

	Jordanian	Tunisian
No	42%	0%
Yes	58%	100%
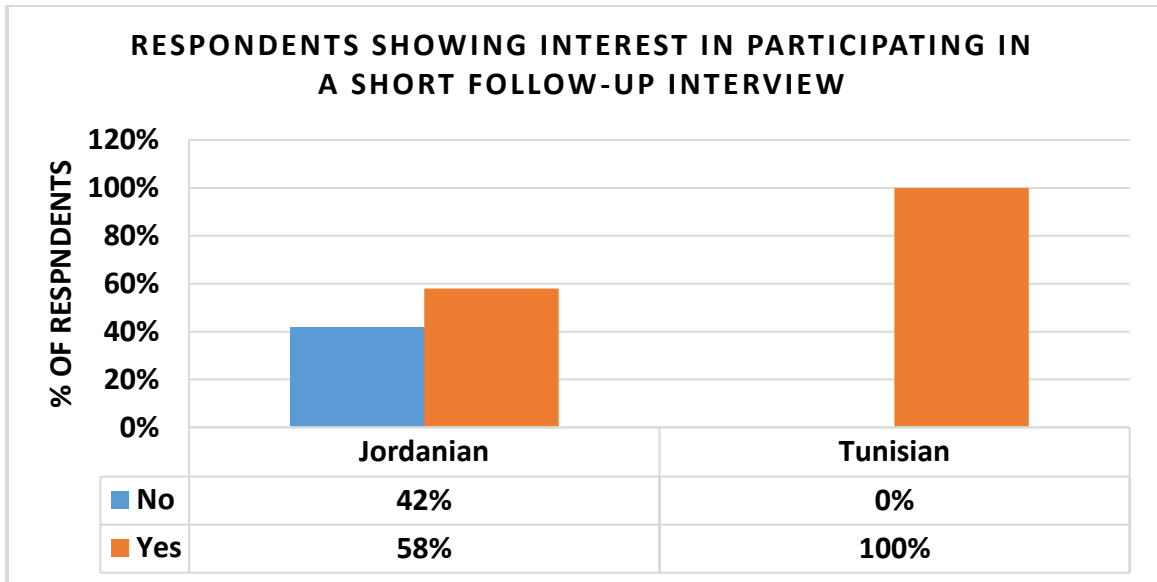
Figure 35. *Respondents Showing Interest in Participating in a Short Follow-up interview. General Water Security Knowledge and Perceptions*

Section 2 includes various questions about water security, most notably knowledge,

importance, and awareness of Water Security in the Middle East and North Africa region.

Figure 36 amplifies that most participants have neutral to high knowledge on water

security in their country. The key difference here is the knowledge for Tunisian

participants is higher than that of Jordanians.
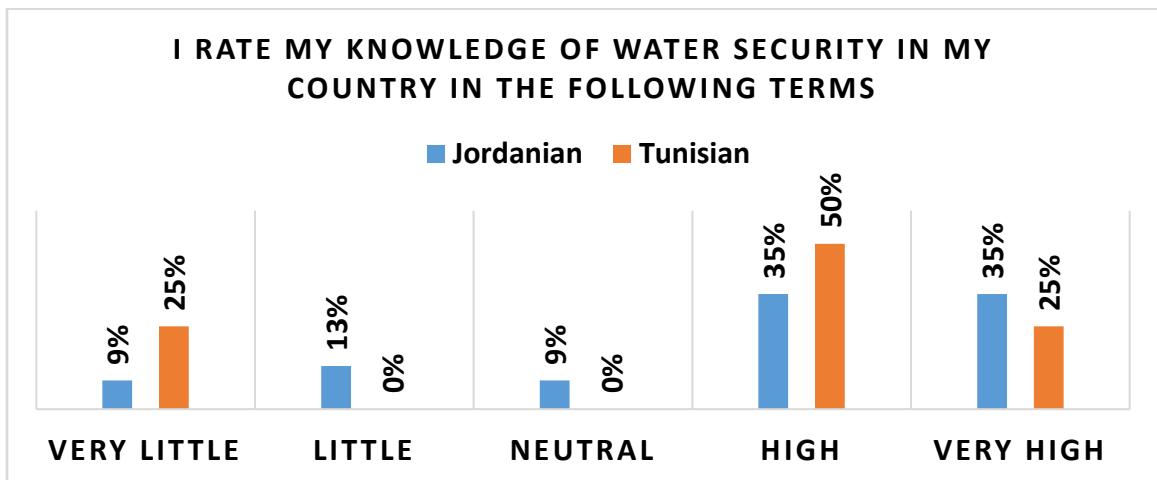
Figure 36. *Participants' Perception of Water Security in their Country.*

Figure 37 reads that most participants do not have a working knowledge of the Middle East North Africa region's water security. This will be important as the survey moves further, and more questions are asked outside of the respective countries in which the participants live. Jordanians showed more working knowledge of the MENA version vs. the Tunisian participants.

RESPONDENTS' RATING THEIR KNOWLEDGE OF WATER SECURITY IN THE MENA REGION

Jordanian **Tunisian**

	VERY LITTLE	LITTLE	NEUTRAL	HIGH	VERY HIGH
Jordanian	9%	17%	26%	30%	17%
Tunisian	0%	25%	50%	0%	25%
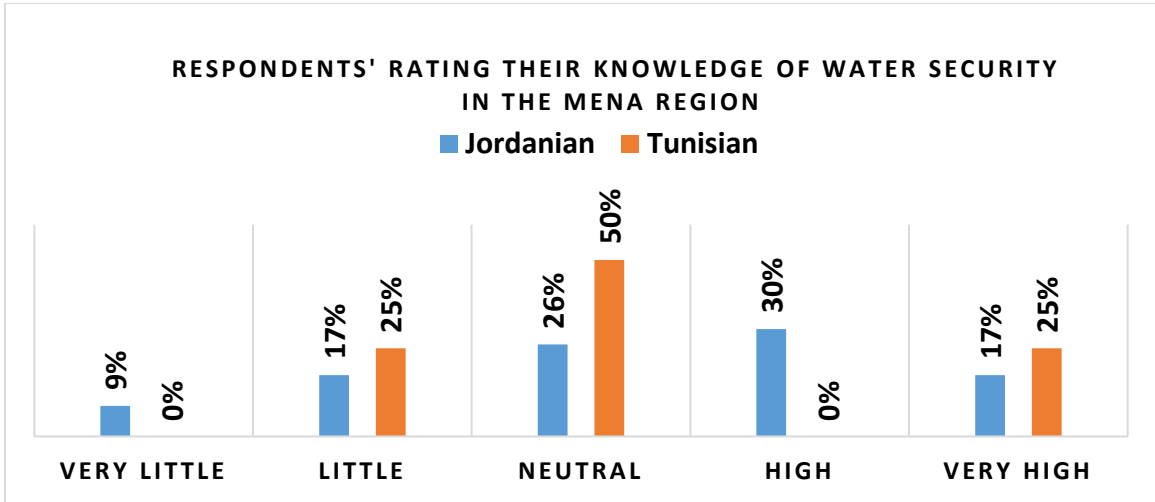
Figure 37. *Participants' Perception of Water Security in the MENA Region.*

Furthermore, as the questions progress in this survey, one question portrayed the importance of this survey. 100% of Jordanian participants believe water is a national security issue in their country. 100% of Tunisians believe the same (Figure 38).

I CONSIDER WATER A NATIONAL SECURITY ISSUE.

Jordanian **Tunisian**

	I DO NOT KNOW	NO	YES
Jordanian	0%	0%	100%
Tunisian	0%	0%	100%
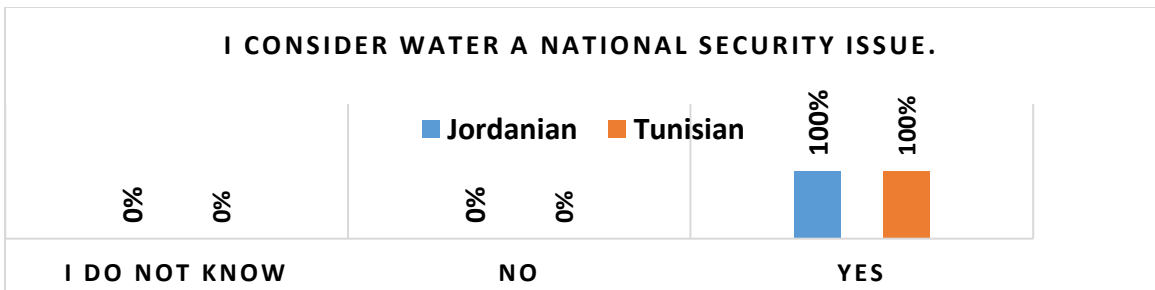
Figure 38. *Perceptions of Water as a National Security Issue.*

Figure 39 shows the similarities between Jordan and Tunisia; most participants from each country believe an overall assessment of water security in their country is

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critical. Tunisia showed staggering numbers, with 100% of participants believing this is a critical assessment. Jordan had about 4% of participants believe this assessment is not essential. When the survey dives deeper into the overall assessment of water security in the Middle East North African region as a whole, over 80% of participants believe this is a vital assessment to take. These numbers slightly matched the assessment before, but about 20% of the remaining participants believe water security in the MENA region is somewhat essential.
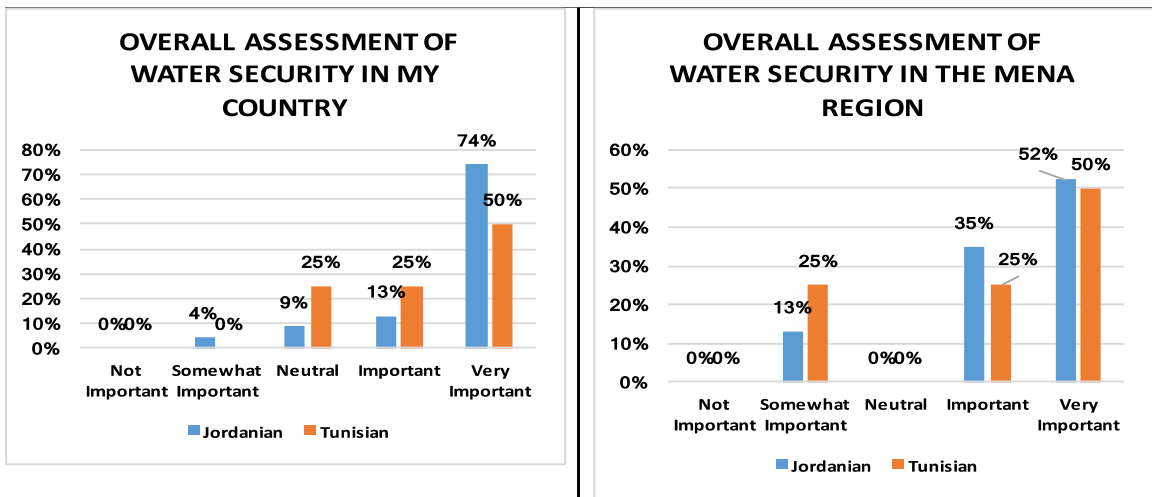
Figure 39. Participants' Overall Assessment of Water Security in their Respective Countries and the MENA Region

Figure 40 relays the participants' direct opinion on decision-making within any large-scale private/public water organizations and personal perception within their role as water elites. Jordanian and Tunisian participants had similar responses, with about half participating in private/public water organizations. Many participants, mostly from Jordan, did not fully understand the definition of water elite as stated in the survey and if they were one, but almost half of the participants from each country believe that they

were. The participants' self-identification as "water elites" confirms to an extent the researcher's proposed qualifications for what entails such type of elites.
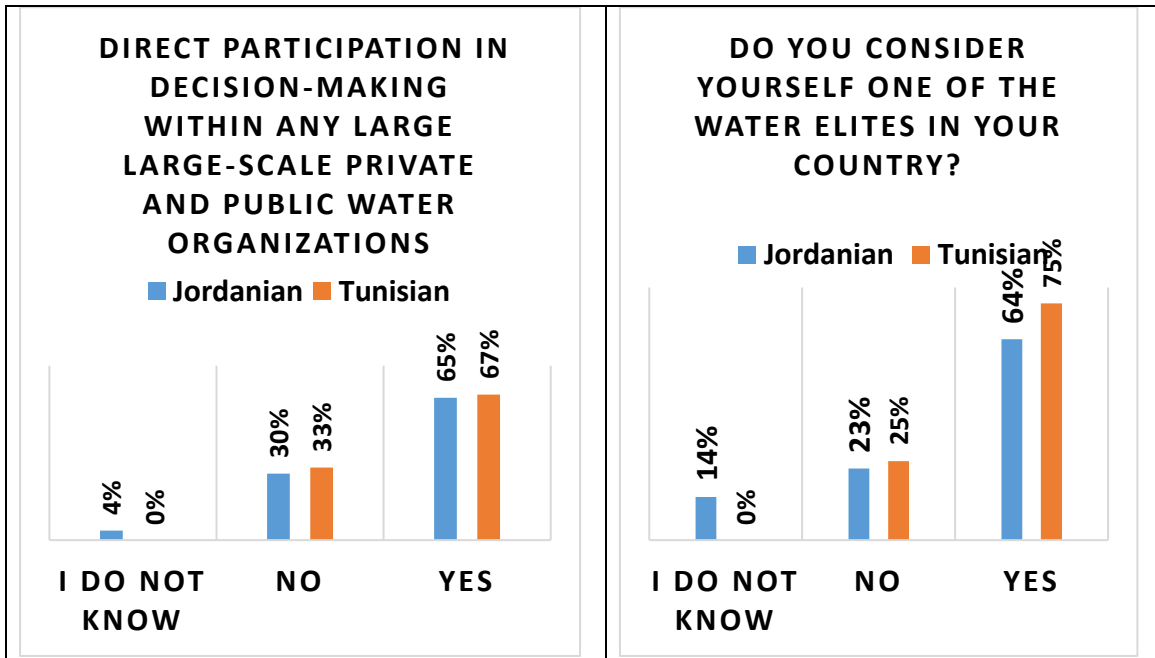
Figure 40. *Respondents' Participation in Decision Making and Identification themselves as Water Elites*

Water Resource Management

Section 3 encompasses the participants, water elite, and water security perceptions in the Middle East North Africa Region. There were strong similarities throughout this section of the survey between Jordan and Tunisia. This includes both sides firmly believing that water service fees/pricing should reflect the extent of water scarcity and promote conversation (Figures 10). This was a critical similarity to make because it engulfs the primary rationale behind this survey.

WATER SERVICE FEES AND PRICING SHOULD REFLECT THE EXTENT OF WATER SCARCITY AND PROMOTE CONSERVATION
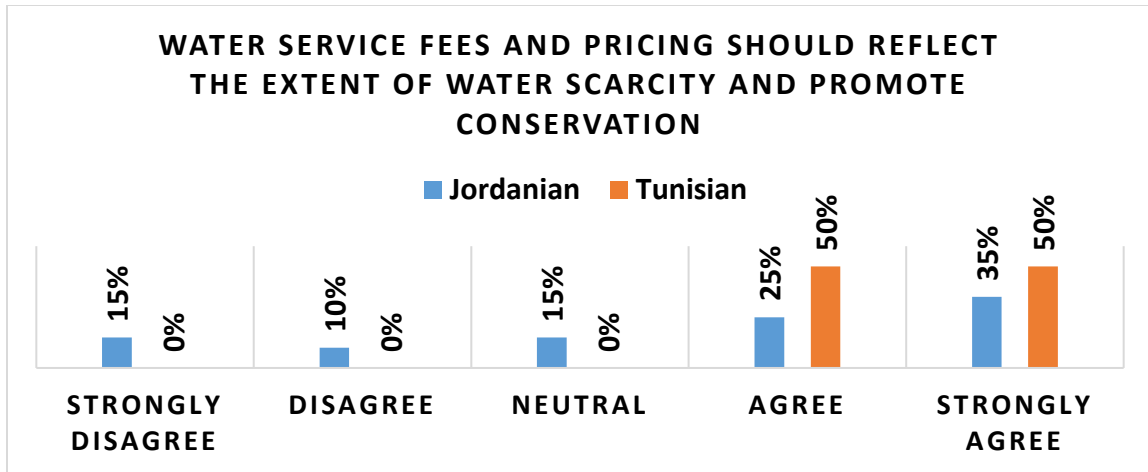
Figure 41. *Participants' Perceptions of Water Service Fees and Pricing.*

Figure 42 proves water scarcity, as 100% of participants (a combination of "Agree" and "Strongly Agree" rating) believe the incentives/technologies should enhance productivity/ efficiency in the water sector.

INCENTIVES AND TECHNOLOGIES SHOULD BE UTILIZED TO ENHANCE PRODUCTIVITY AND EFFICIENCY.
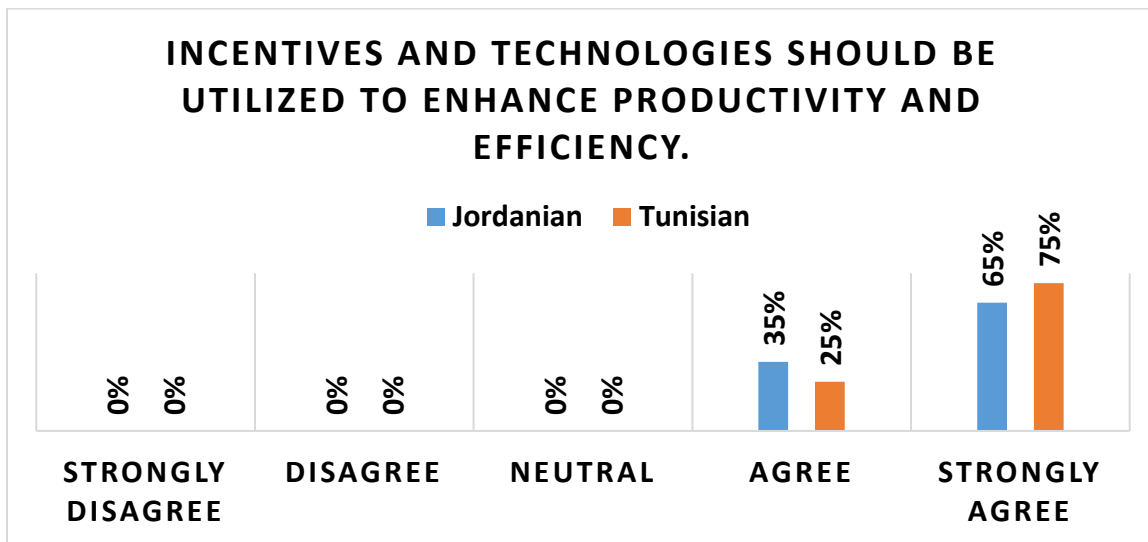
Figure 42. Participants' Perception of Incentives and Technologies

Figure 43 portrays the continued similarities between Jordanian and Tunisian participants; such as most agree with the idea that control of losses/leakage is essential, planning/ prioritization of high -value water usages should be in balance with social equity/stability, water rights/subsidies/pricing policies are re-allocated fairly.

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Regulations/enforcement should be established to control unplanned overexploitation of water. Jordanian participants showed 10 percent disagreements from the majority to three out of the four of this question while 50 percent of Tunisian participants disagreed only one out of the four. This could play a part in the participants' education and experience level of what is happening around them and their respective resources.
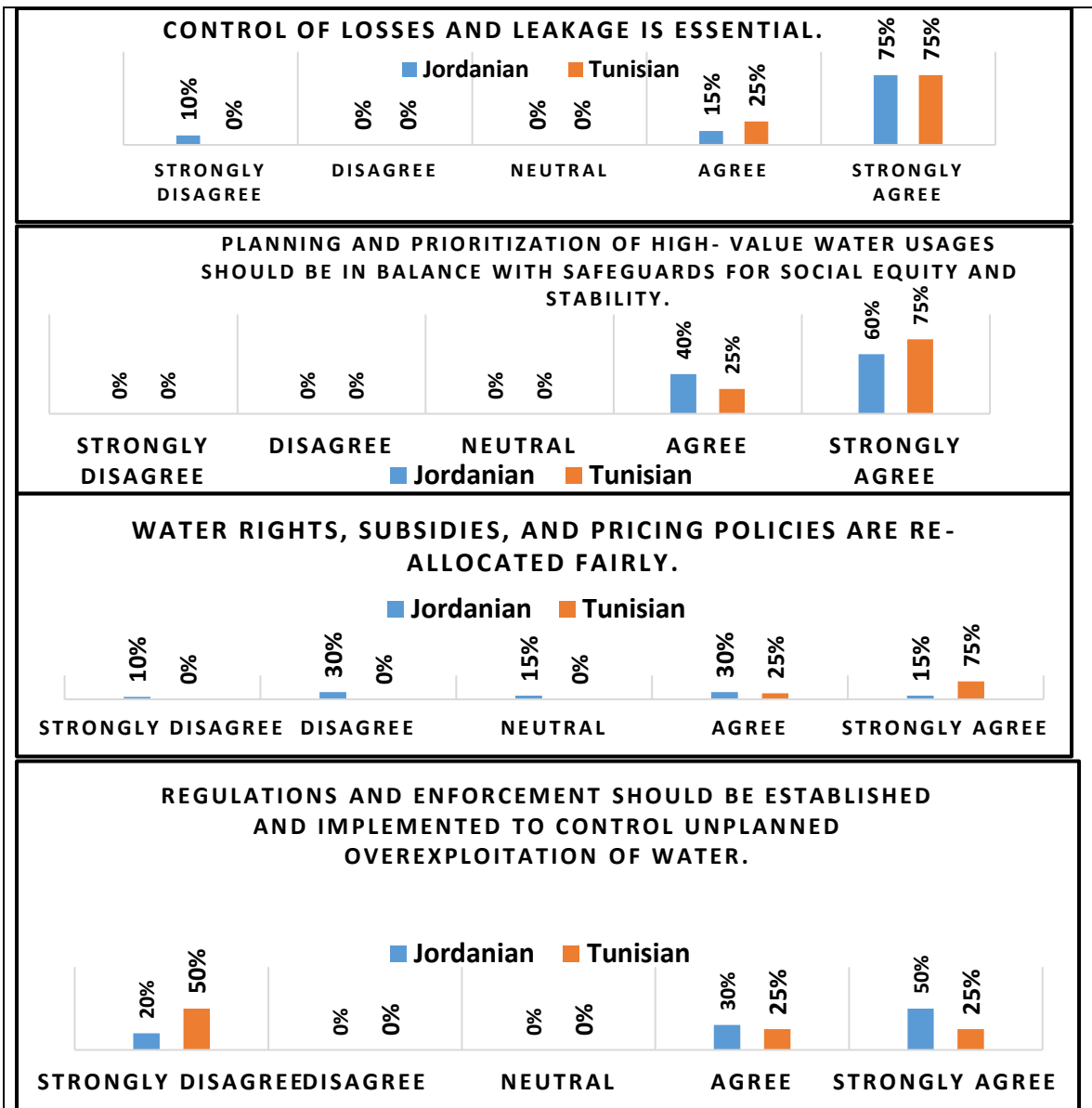
Figure 43. *Participants' Perceptions of Water Demand Management (WDM) Practices.*

Figure 44 continues to stress the importance of water security in the Middle East, with 80 percent of the participants believing the development of wastewater recycling/reuse and coordination use of surface/groundwater was important. Tunisian participants had differing opinions, with about 25% only believing it was somewhat important, while 100% of Jordanian participants believed it was necessary.

This difference was soon non-existent with the following question about increased institutional coordination among water, energy, and agricultural sector strengthen water management efforts. 75% of participants believed this to be true in Jordan and Tunisia, and 100% believed the development of wastewater recycling and reuse was significant.
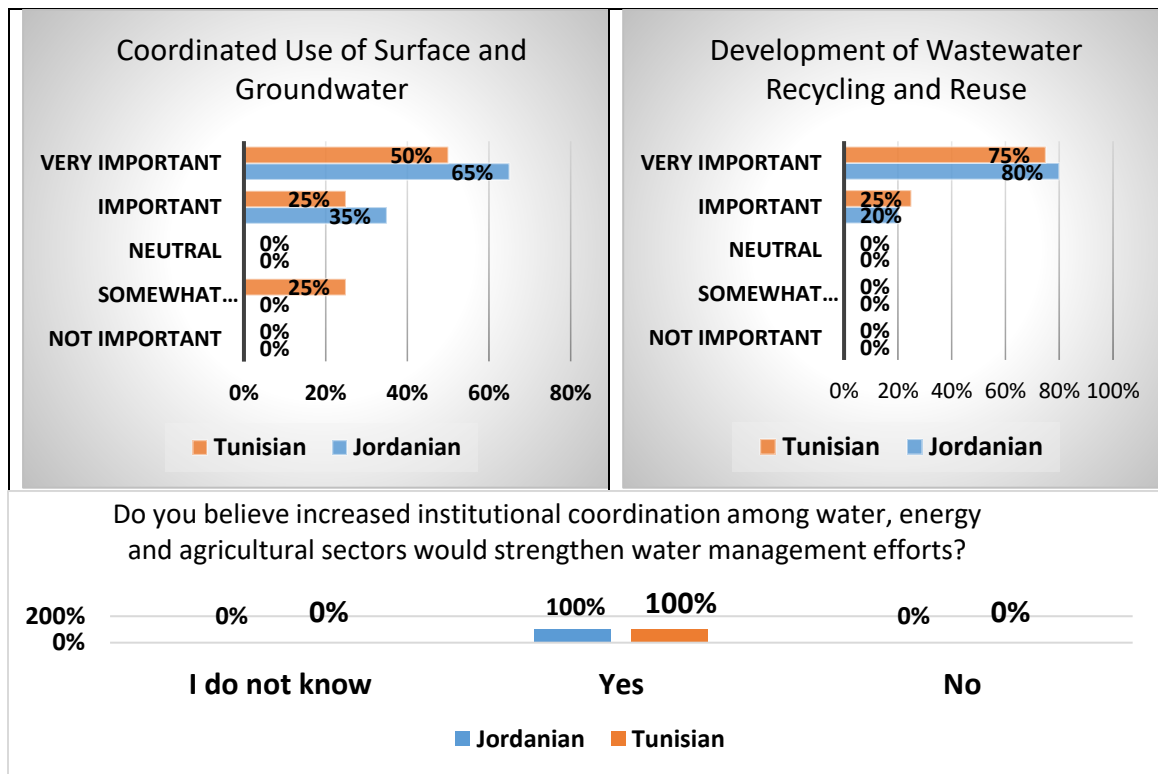
Figure 44. *Participants' Perceptions of the Coordination Use of Water and Technologies*

The similarities between Jordan and Tunisia water security continue to show when participants were split when asked if they believe their country's urban water

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service has improved in the past five years. 100% of Jordanian and Tunisian participants

believe their countries urban service delivery has improved over the past five years

(Figure 45).
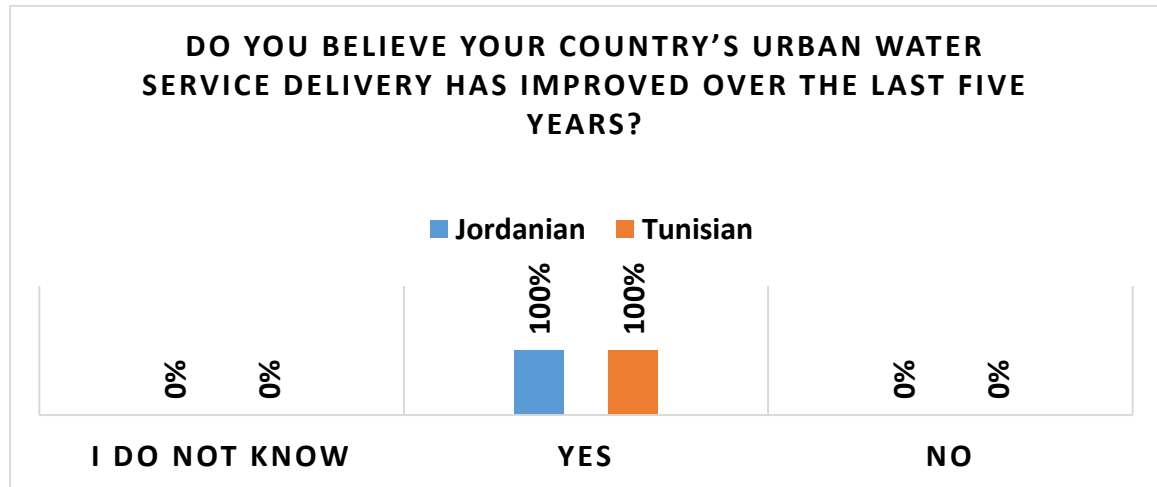
Figure 45. *Participants' Perceptions of Improvement of Urban and Rural Water Service Delivery.*

Figure 46 addresses the question regarding asking the participants how they

would rate the influence of social inclusion on water security in their respective countries.

80% of Jordanian participants believed Women and Youth had a neutral influence on

social inclusion, while 75% of Tunisians believed their impact was "very low." The state

of each country's political and cultural climate is very different, which this question

analyses.

RATING THE INFLUENCE OF SOCIAL INCLUSION FOR YOUTH ON WATER SECURITY

■ Jordanian   ■ Tunisian

	VERY LOW	LOW	NEUTRAL	HIGH	VERY HIGH
Jordanian	11%	26%	37%	11%	16%
Tunisian	50%	0%	0%	25%	25%

RATING THE INFLUENCE OF SOCIAL INCLUSION FOR WOMEN ON WATER SECURITY

■ Jordanian   ■ Tunisian

	VERY LOW	LOW	NEUTRAL	HIGH	VERY HIGH
Jordanian	5%	15%	35%	30%	15%
Tunisian	75%	0%	0%	0%	25%
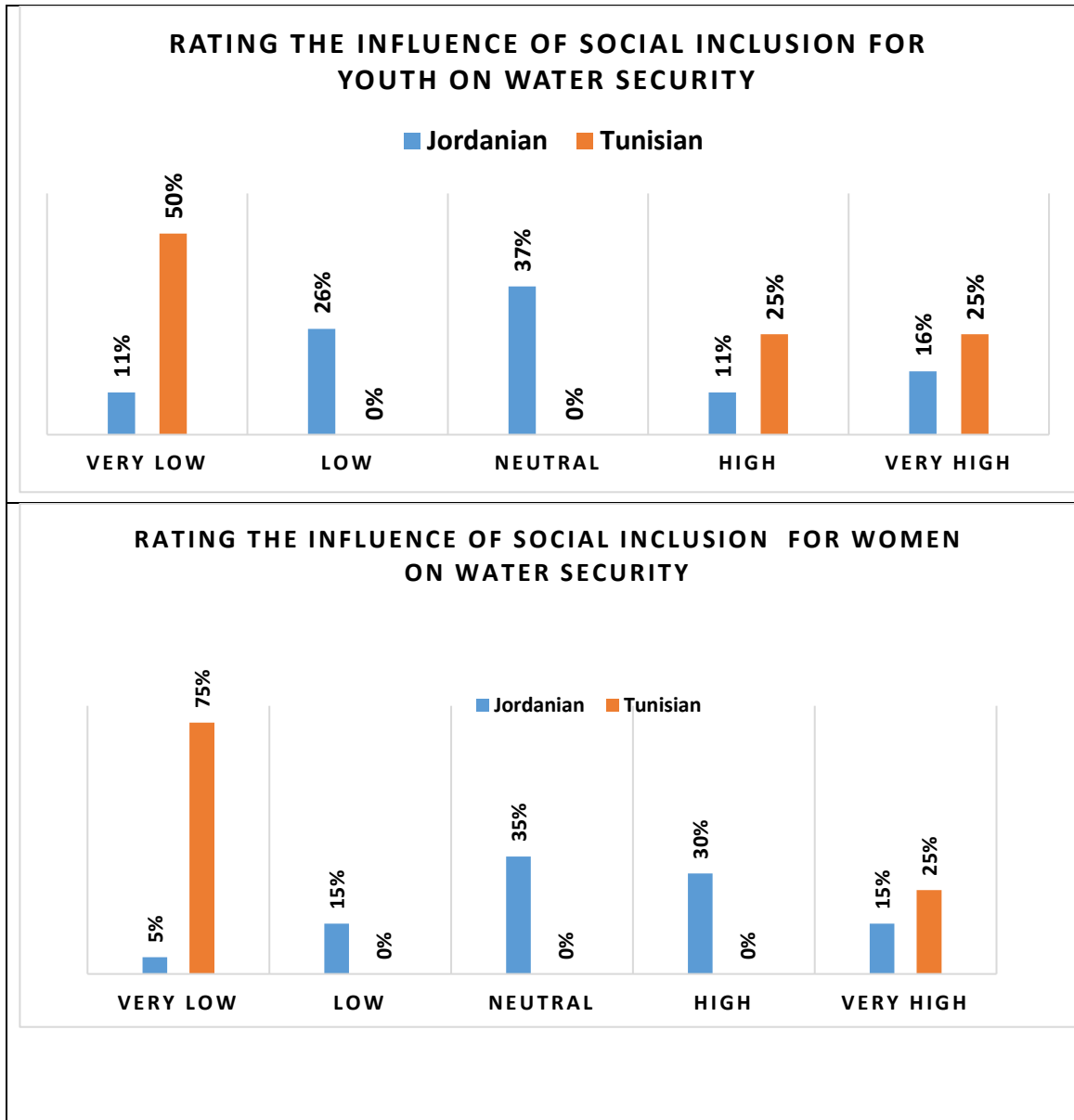
Figure 46. *Participants' Perceptions of the Effects of Social Inclusions of Youth and Women on Water Security.*

Water Service Delivery

This section stresses the participants' perceptions of water service delivery

(Figure 47). Most Jordanians and Tunisians believe that their country's urban/rural water

service delivery has improved in the last five years. Tunisia showed the complete

opposite, with most participants believing it has not improved in the urban/rural water

service delivery sector. These differences continue to show from the last section as the

survey dives deeper into the regulation of water security in the respective country.
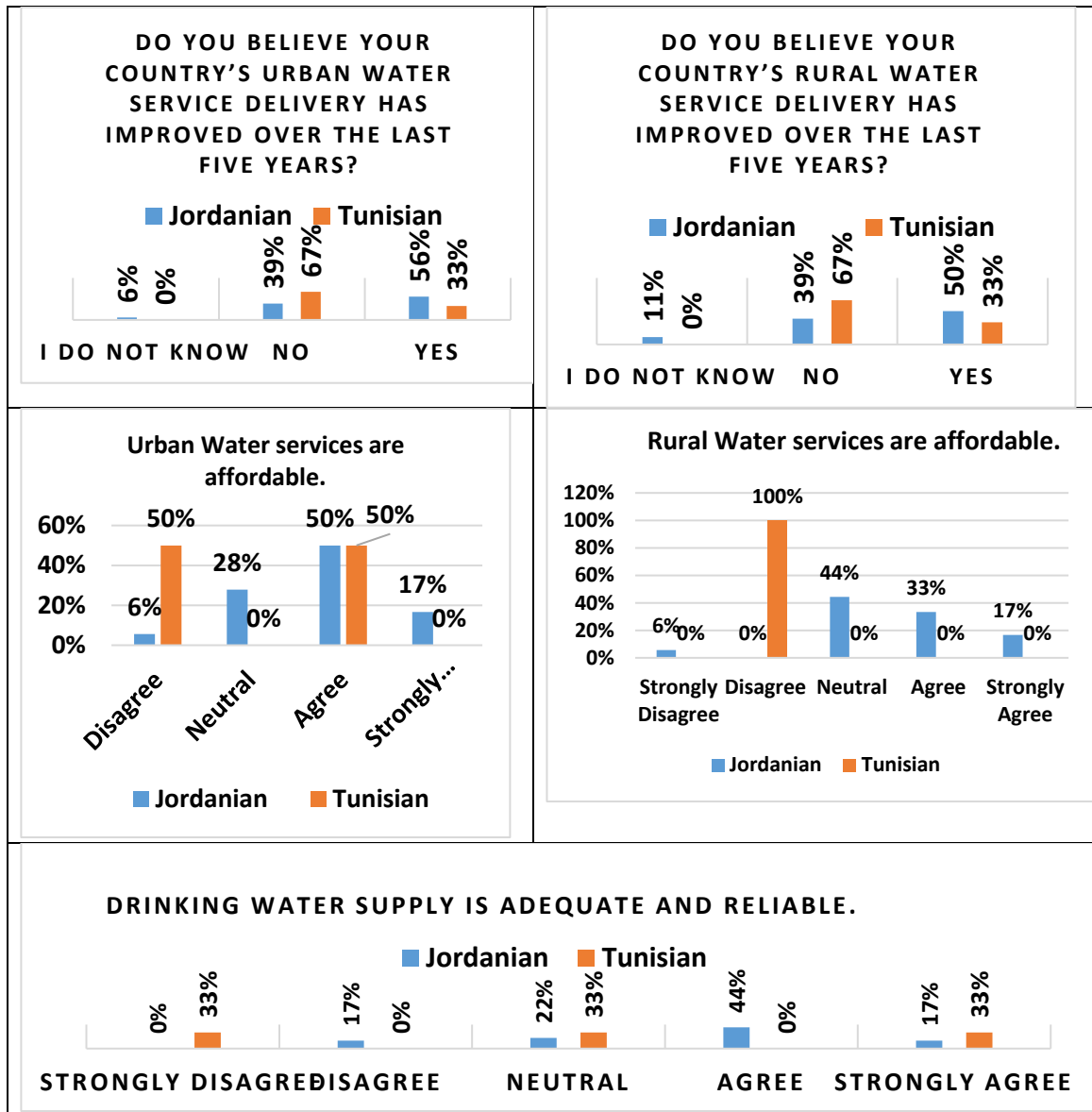
Figure 47. *Participants' Perceptions of Water Service Delivery in their Respective Countries.*

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Figure 48 sheds light on the differences mentioned in the past couple of questions, such that Tunisia does not have adequate and reliable drinking water, and their urban/rural water services are not affordable. The analysis of the Jordanian participants was opposite to that of Tunisia. 83% of Jordanians believe the drinking water supply is adequate and reliable, while over 90% believe the urban/rural water services are affordable.

The data analysis shows that the participant's assessment of importance for a variety of factors that contribute to improving water service delivery: public participation and outreach in water-related issues; customer service level; economic losses from inadequate water supply; the effects of intrastate conflicts; water loss recovery level; strengthening the social compact between the government and its citizens; and corruption. There were many critical similarities between Jordan and Tunisia, such as adopting anti-corruption measures in the water sector and understanding citizens' expectations concerning water services. The most significant difference was that Jordanians believed the strengthening of social effects between government and citizen was high while the customer service level in Tunisia was very low.
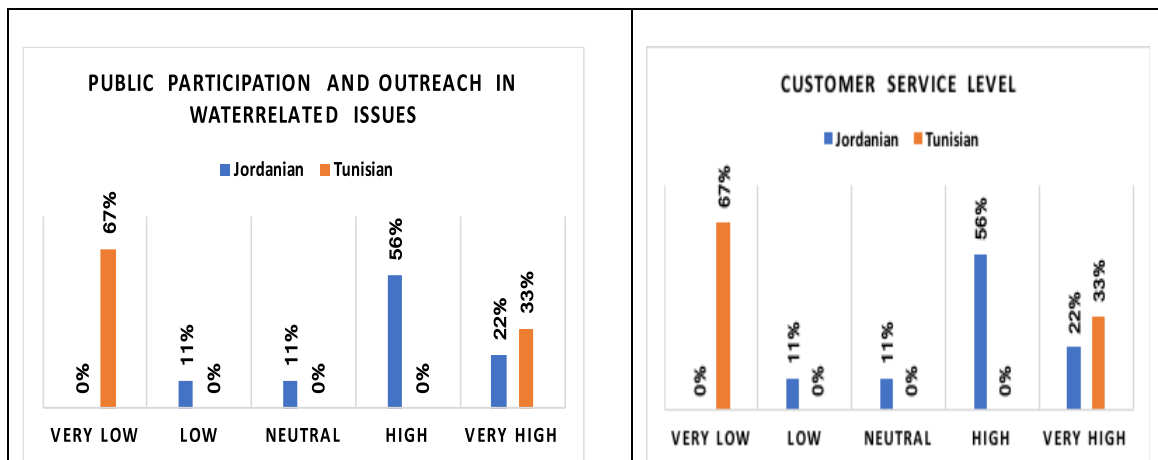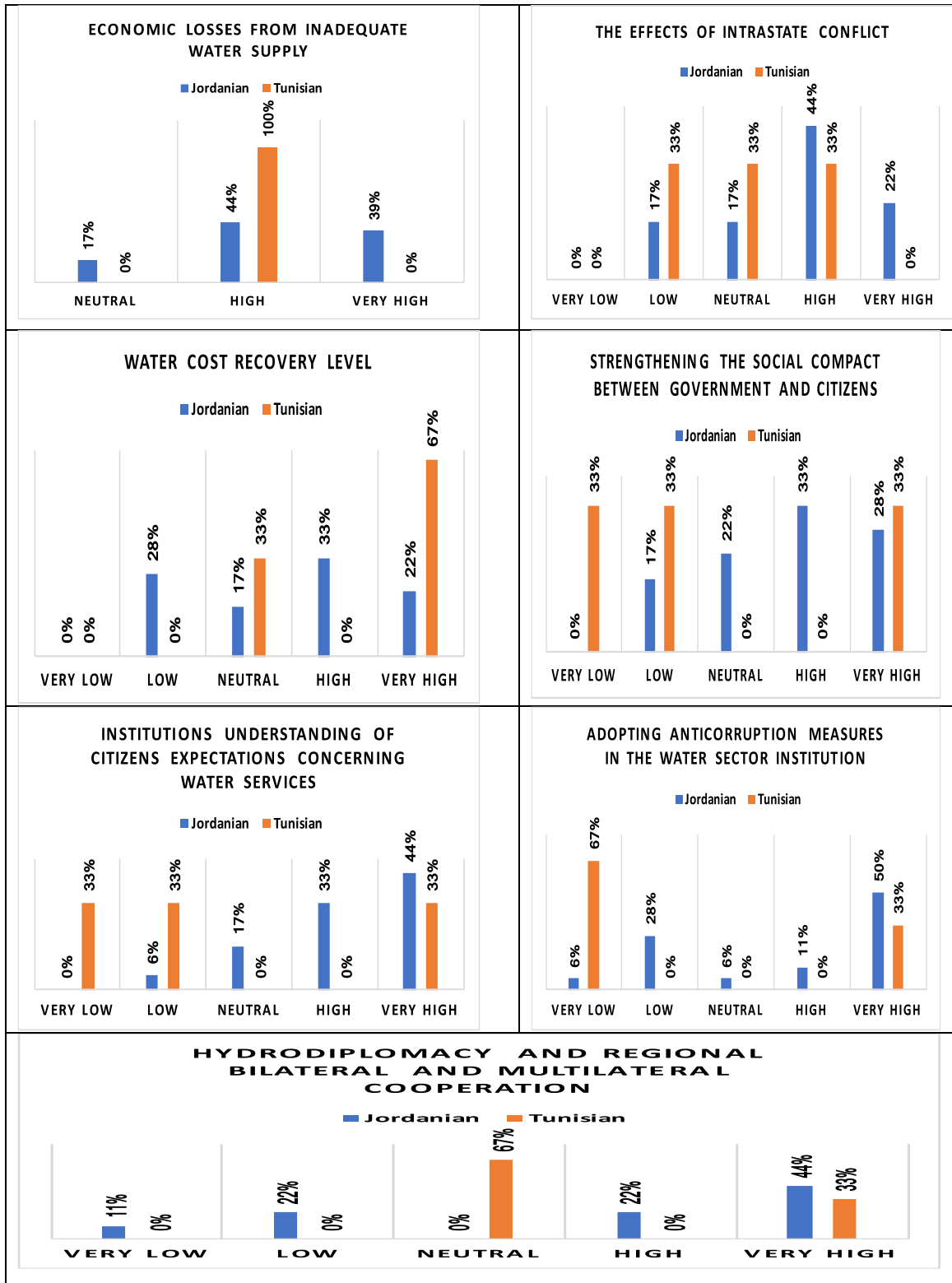
Figure 48. How Do You Assess the Importance of Each of the Following Factors in Improving Water Service Delivery?

Figure 49 indicates the participant's agreement with the statements/strategies to improve water services. Jordan and Tunisia showed many similarities in that they firmly believed the integrated urban water management is recommended to improve the quality/reliability of urban/agricultural water services. Water insecurity has significant adverse effects on the political/economic/environmental stability in the MENA region. The differences between these two countries were minimal, with only an average of 30 percent of Jordanian or Tunisia participants thinking inversely on the selected topics.
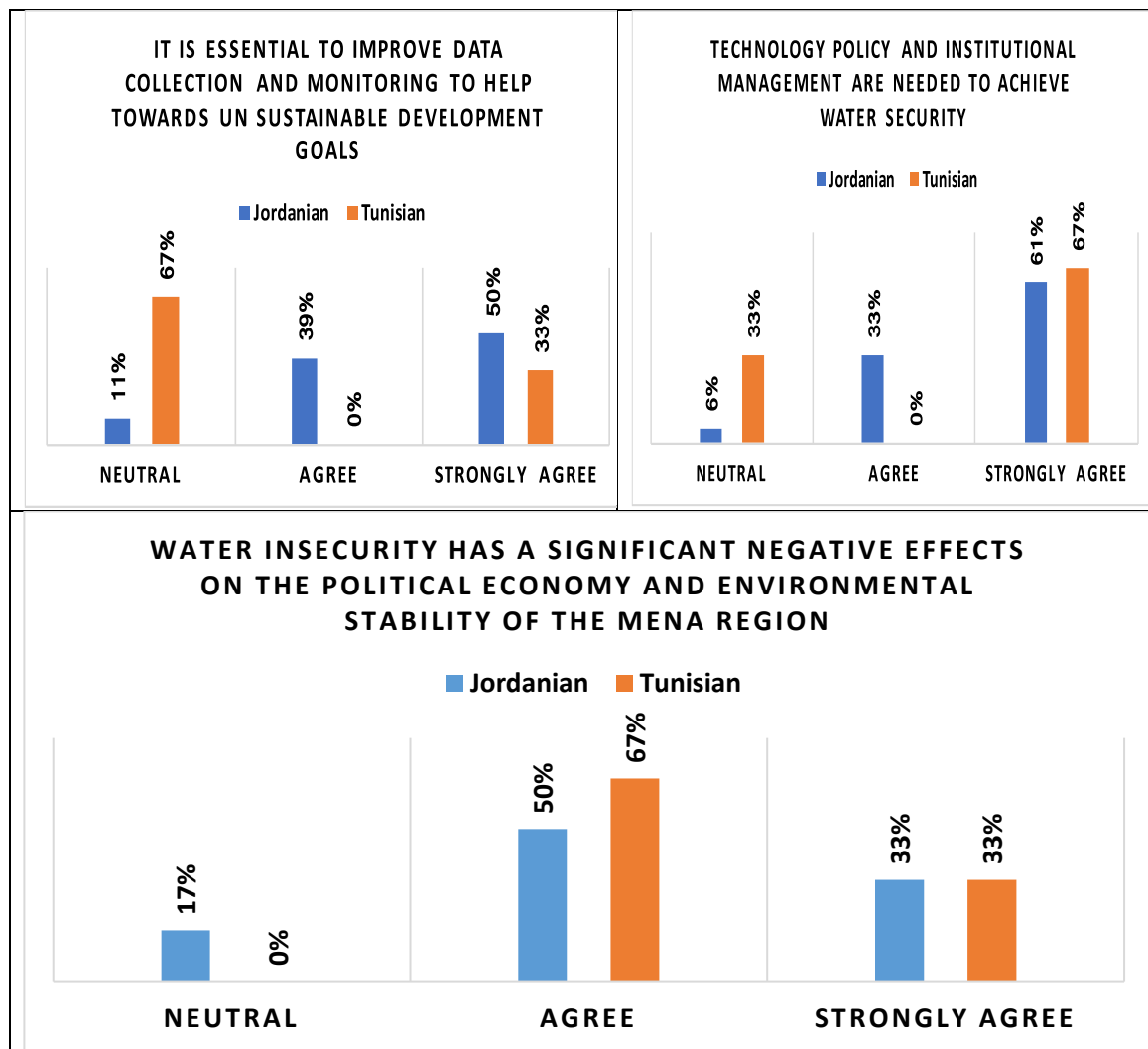
Figure 49. *Participants' Perception of Strategies to Improve Water Service Delivery.*

Water-Related Risk Mitigation

The last section of this survey sheds light on the many similarities between Jordan's and Tunisia's water crisis. Table 14 asks the participants to indicate their agreement level to a variety of statements on water-related risks. Jordan and Tunisia maintained the same average of agreeing to all of the statements analyzed such that all agree climate change affects water security, lack of water supply causes domestic social unrest, and water is used as weapons in conflicts.

Table 14

Participants' Perceptions of Water-Related Risks

Statement	Nationality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Climate change affects water security	Jordanian	0%	6%	6%	65%	24%
	Tunisian	0%	0%	0%	67%	33%
Water stress resulted from surface water has a significant impact on water security	Jordanian	0%	0%	6%	65%	29%
	Tunisian	0%	0%	0%	100%	0%
Water stress (lack of freshwater resources to meet demand) resulted from underground water has a significant impact on water security.	Jordanian	0%	0%	0%	35%	65%
	Tunisian	0%	0%	0%	100%	0%
Lack of water supply causes domestic social unrest.	Jordanian	0%	0%	6%	41%	53%
	Tunisian	0%	0%	0%	100%	0%
Water and water systems are used as weapons in a conflict.	Jordanian	0%	6%	18%	53%	0%
	Tunisian		0%	0%	100%	0%
Regional cooperation on water issues strengthens trust and collaboration	Jordanian	0%	6%	0%	59%	35%
	Tunisian	0%	0%	0%	67%	33%

Table 15 encompasses the analyses of the similarities of thoughts and suggestions to mitigate the water-related risk between participants from both countries. It shows with

a small number of differing opinions overall. Under 6 percent of Jordanian participants disagree water-related NGOs play an important role in peace, the influx of refugees causes tensions/adverse effects on water security, and international organizations play a constructive role in strengthening/ improving the water sector in MENA.

Table 15

Participants' Opinions towards a Variety of Suggestions to Water-Risk Mitigation Approaches

Statement	Nationality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Water-related NGOs play an important role in peace and stability in the MENA region.	Jordanian	6%	18%	29%	41%	6%
	Tunisian	0%	33%	33%	0%	33%
Virtual water (amount of water needed to produce different goods and services) strengthens water and food security simultaneously.	Jordanian	0%	12%	18%	41%	29%
	Tunisian	0%	0%	0%	100%	0%
Reliance on shared transboundary water (surface and underground) is essential	Jordanian	0%	6%	0%	59%	35%
	Tunisian	0%	0%	67%	0%	33%
The effectiveness of bilateral and multi-lateral water transboundary agreements - water diplomacy) depends on the extent to which they are constructive, transparent, and equitable.	Jordanian	0%	6%	6%	47%	41%
	Tunisian	0%	0%	67%	0%	33%
The influx of refugees causes tension and has adverse effects on water security in the host countries involved.	Jordanian	0%	0%	0%	41%	59%
	Tunisian	0%	33%	0%	67%	0%

The Jordanian and Tunisian responses show the most differences when asked their best solution to improve water security (Figure 50). Over 50% of Jordanian participants believe equal participation of all relevant water management planning stakeholders will be the best solution. Simultaneously, Tunisian participants are split between sufficient water for all sectors, reduced water pollution, and equal participation

of all consumers in water management planning. This answer reflects the country's state

and what they would need to bring attention to water security.
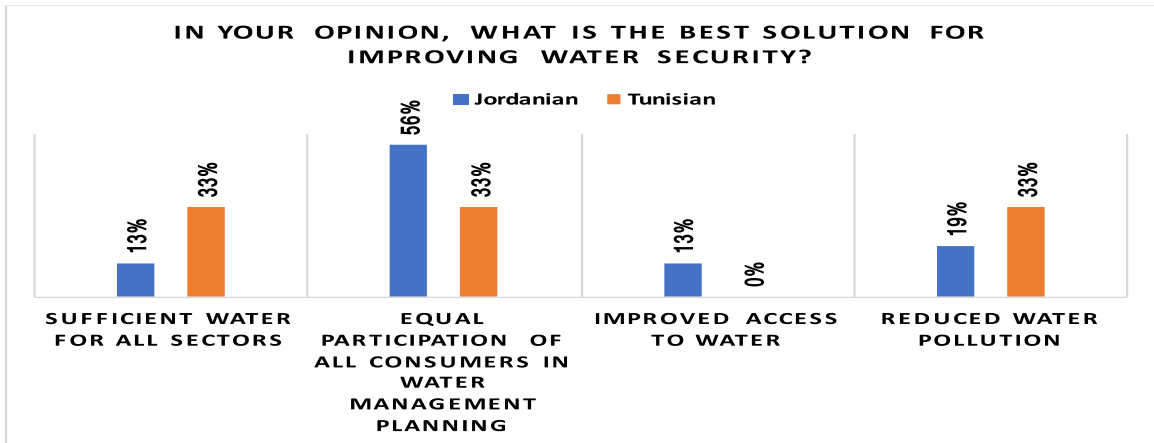
Figure 50. *Participants' Perceptions for the Best Solutions for Improving Water Security.*

Due to their differing solutions, Figure 51 emphasizes the difference in politics

between Jordan and Tunisia. These two countries showed the most differences when

asked if their country uses more water than it needs, with 50 percent of Tunisians

believing they do and 50% of Jordanians believing they do not. This difference continues

to merge when participants were questioned if reducing the amount of consumed

domestic water would be difficult. An overwhelming 80% of Jordanians agree, and 67%

of Tunisians disagree.
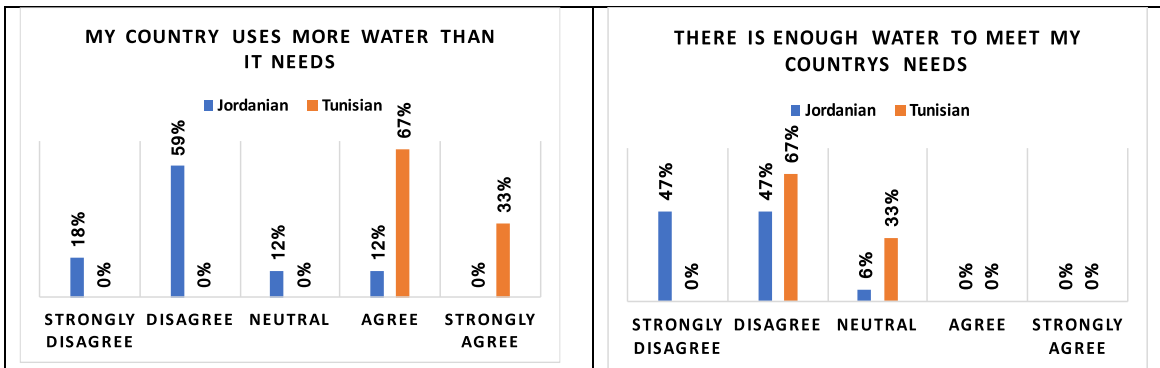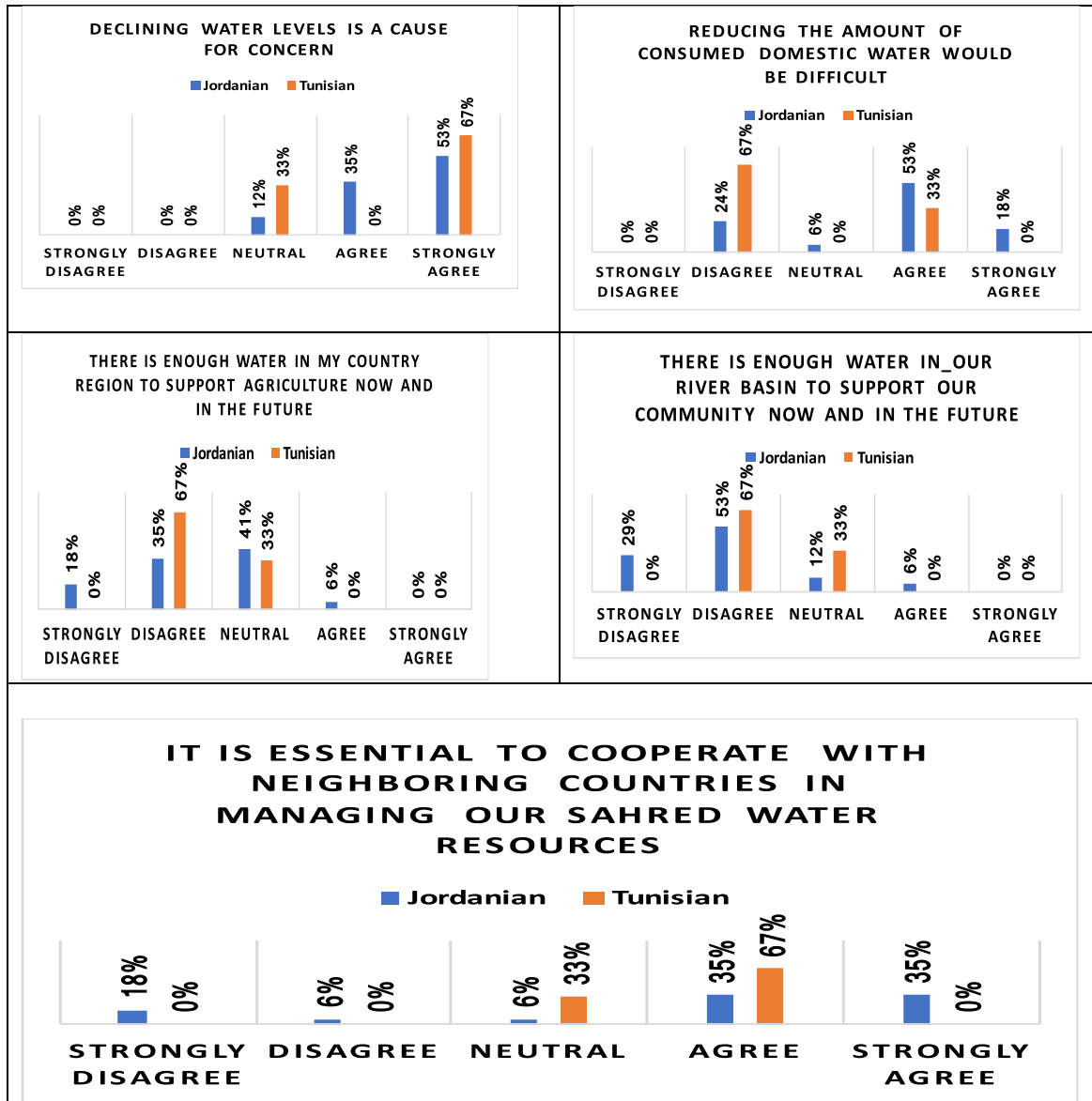
Figure 51. *Participants' Perceptions of Water Supply Risk and Hydro-politics.*

Jordan and Tunisia continued to show critical similarities and differences in public perception of their nations' water security. Figure 52 shows the participants' opinions of each of the following stakeholders' responsibility and performance in protecting water quality/quantity in their country. Jordan and Tunisia are split on the role of Water utilities in their country, where the former believes it has high responsibility,

and the latter believes it has a low. The two countries share similarities with low

responsibility level for the private sector and non-governmental organizations.
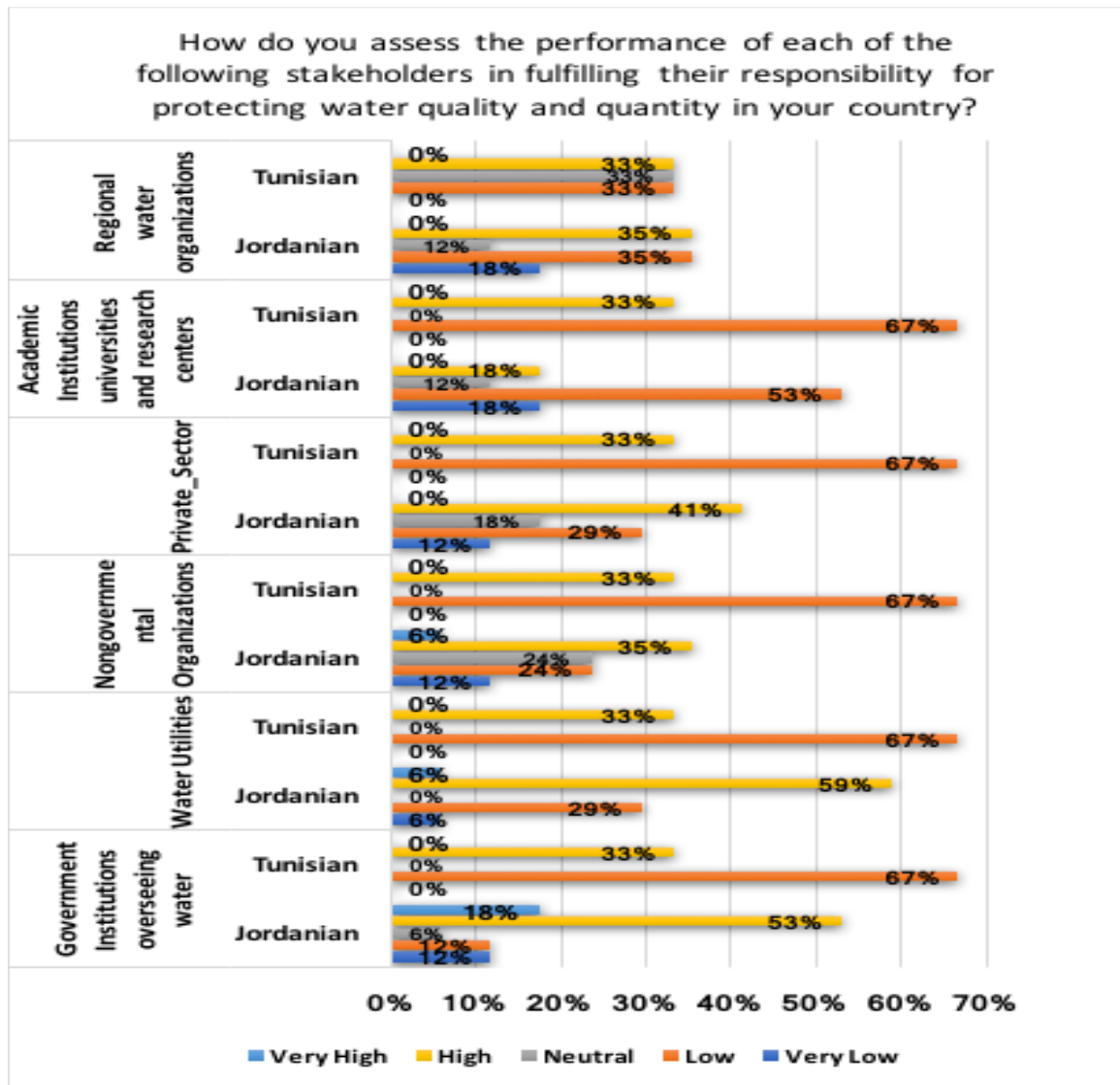
Figure 52. *Participants' Perceptions of Water Sector Stakeholders Performance.*

The last two survey questions summarize the participants' predictions based on

climate change and other water-related risks that were not covered in the survey (Figure

53). Jordanian and Tunisian participants believe that there will be less water availability

due to climate change.
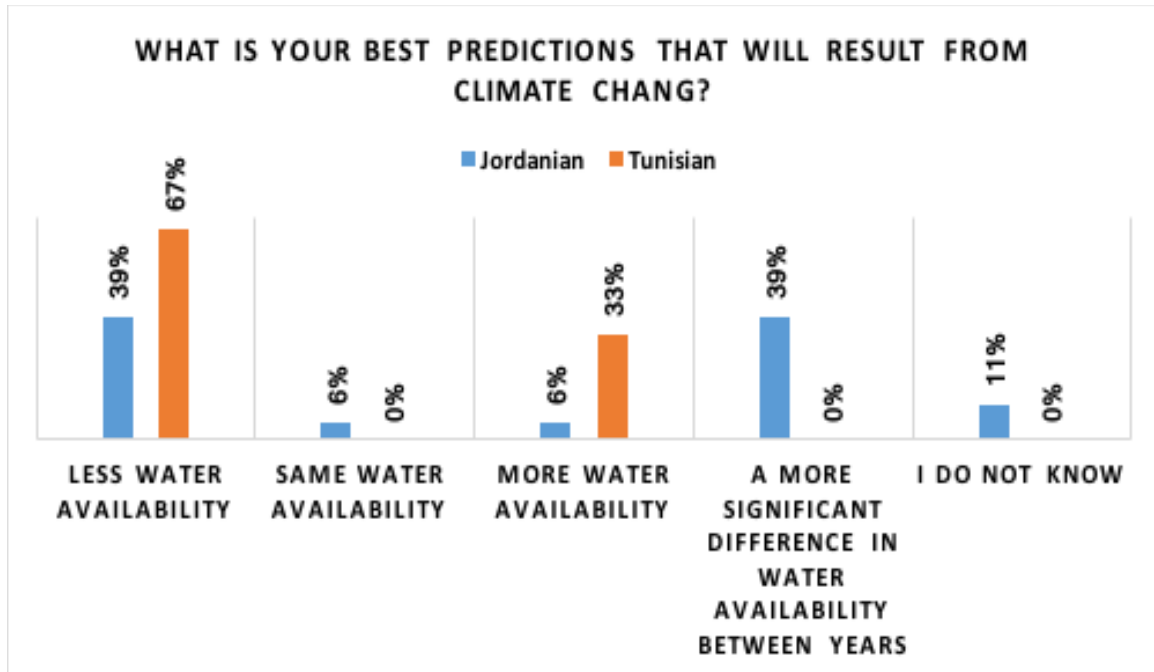
Figure 53. *What are your BEST predictions that will result from climate change?*

Most of the participants also believed the survey did not cover a variety of water-related risks. (Figure 54). Some of the respondents provided the following other water-related risks:

- Waste resulting from desalination methods for the applicable regulations such as reverse osmosis;

- Flood;

- Corruption;

- Coronaviruses- Crises & regulation and regulators protecting essential water services and customers;

- Cooperation in water establishment both the private and public sector;

- Demographic shifting and influx of refugees;

- Regional conflicts;

- Capacity building;

- Dissemination of information at the regional level;

- Water harvesting by making artificial dams.

- the need for using local energy efficiency (EE) and renewable energy (RE) in the running of water utilities

- Lack of public awareness on the part of the society of the importance of water.
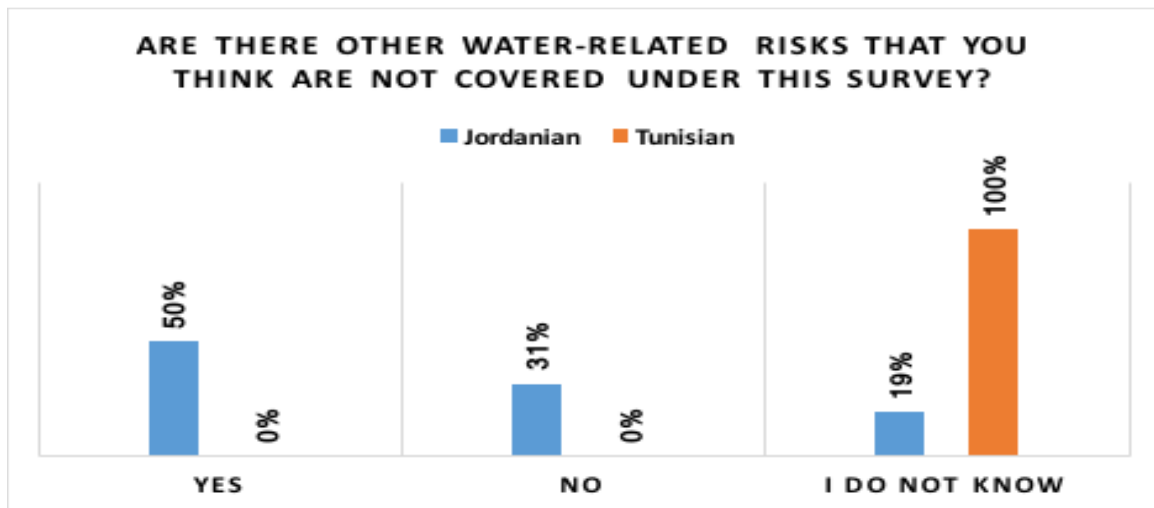
Figure 54. *Are there other water-related risks that you think are not covered?*

Interview Analysis

Following the survey phase, in-depth interviews with key informants were conducted to explore the findings and results generated from the survey responses in greater depth. As Yin (2014) emphasizes, interviews with key informants are often critical to a case study's success and can be one of the most crucial evidence sources. Accordingly, the researcher contacted a sample of survey respondents who show a willingness to participate in the interview.

The interview instrument was developed to gain more in-depth insight and build off the survey findings through a small data analysis approach, thematic coding, sorting

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and synthesizing, and theorizing. It consisted of 10 open-ended questions that were

primarily conversational to prompt discussion and allowed the respondents to elaborate

on their thoughts and introduce new ideas to the debate (Creswell, 2014). Giving the

respondents the freedom to speak what they know on the topic under discussion ensures

the establishment of good rapport between the respondent and the interviewer and

ensures new insights are generated, resulting in innovative ways of tackling the problem

under study.

These questions acted as verification for the information gathered and determine

the degree to which the in-depth interview questions can apply across the two countries

(Jordan and Tunisia). Due to the Coronavirus pandemic -COVID-19, the study envisions

that there will be limited access to the interviewees. Therefore, the interview questions

were sent via email and social media channels based on the provided preferred contact

information they submitted in question 11of their survey form. This unfortunate situation

led the researcher to conduct only four interviews (3 from Jordan and one from Tunisia).

These interviews aimed to spread nationality, age, gender, and position in the

organization/program and experience in the respective countries' water sector. Of all

interviewed, three men and one woman had about 5-20 years' experience working with

water government entities and private sector consultancies.

Q1: How would you describe water elites in general?

Informants provide a variety of descriptions of water elites. They have any or

very little knowledge of water elites. One of the Jordan informants stated: "In Jordan, the

water sector is led and managed by many professionals working through the public

servant system. Though the sector is officially described as a commercialized one, it is

owned and managed by the same group of managers, who came from the public servant

system that used to manage the water sector in the past. This meant that the overall

managing approach had remained the same, and the supposed advantages of

commercializing the water sector have not materialized." A female informant from

Tunisia described water elites as "generally of good experience in the various fields

related to this sector (drinking water, surface water management, operation of dams,

development of drinking water and sanitation master plans ...)."

The Jordanian informants provided more details responding to this question. One

of them stated that "Jordan has the knowledge and understanding of Water Elites as it

suffers from severe water shortages. Jordan has developed strategies, methodologies that

enabled them to cope with such a situation." There was a vague understanding of this

informant of the elite water term as he mixes it with other types of elites.

Q2: How knowledgeable do you think your country's water elites about the following

water security issues: water resource management, water delivery, and water-related risk

mitigation?

The interviewees provided various perceptions regarding the three areas related to

these questions: water resources management, water delivery, and water-related risk

mitigation.

Water resource management. The Jordanian interviewees stated that managing

water resources is "well but still ways to improve managing the water resources." One of

the informants was not "fully aware" of the leadership team in water resource

management and believed that "historically, the water sector's focus was on the delivery

side, with little done of the resource management. That is why the main focus of

addressing the challenges facing the water sector was building mega infrastructure works. This requires tapping on already depleting water resources." They both believed that the refugee calamity, coupled with the depleted resources' pressure, was immense, and little was done to reduce that pressure.

The Tunisian interviewee agreed that water resource management practices are "satisfactory compared to other countries in Africa, but it is important to operationalize the information system on water resources (SINEAU) to have all the data relating to the sector in the right time." She believed that the various water services interventions would improve the management of water resources, but it should occur at the right time. The right time would mean when Tunisia is not under war or through a global pandemic.

Water service delivery. The Jordanian interviewees stated that "there is a strong focus on service delivery. Over 98% of the population are receiving their water through the piped system." Others rated it as "doing well, but there are still ways to improve customer services."

The Tunisian interviewee agrees that "the rate of connection to the drinking water network is very satisfactory in urban areas (98%) and rural areas (94%). Improvements in the management of drinking water networks managed by agricultural development groups (users' association commonly known as GDAs) in rural areas are, however, eagerly awaited."

Jordan and Tunisia are both ways away from an above satisfactory water management system, and their water elites need to seek out help from neighboring communities in rural areas.

Water-related risk mitigation. The Jordanian interviewees did not go in-depth into this question but just stated that it was "doing well, but there are still ways to improve mitigating risk and to improve resilience." This was something that has been mentioned in each of the sections on this question from both countries.

The Tunisian interviewee provided a more in-depth explanation that centered around frustration from farmers and irrigation systems. She explained the "lack of coordination between the various services concerned with urban water management during flooding (ONAS, municipalities, Ministry of Equipment…). Absolute priority is given to drinking water over-irrigation in times of drought, which is an excellent measure but could cause frustration among farmers due to lack of communication."

Q 3: What do you think are some of the water elites' perceptions of water security sustainability for each of the following: water allocation, water supply, and water demand management?

The interviewees' perception of the three focused areas of water security showed that they were reluctant to provide details or clear answers.

Water Allocation. The Jordanian informants state that Jordan has a unique water distribution system, intermittent water supply system, and managing it well. One of the informants explained the "historical trend for water distribution in Jordan." It is maintained whether the distribution is meant to be between different sectors (i.e., agricultural, domestic, tourism, and industry).

The Tunisian informant explained that agriculture is the largest water resource in Tunisia, with 70 percent water allocation in Tunisia. This was the most considerable

similarity between Jordan and Tunisia, with a high percentage of the farming sector taking the country's water supply.

Water supply. When asking Jordanian informants' perceptions of water supply concerning water security, most of them mentioned that it is "good." One of them stated that it is essential to search for "water supply with fair distribution." This was an interesting find when trying to calculate what the deeper meaning of this statement was. There is a considerable amount of red tape in Jordan, and it goes into the water supply.

The Tunisian informant did not know to answer this question fully and said she needed to "need to review the orientation towards drinking water supply in rural areas by SONEDE because it entails additional operating costs for SONEDE, which cannot be covered by the tariff."

Water demand management (WDM). WDM aims to increase water efficiency through both wise use and reduction, which will reduce or postpone the need to build more dams and drill more boreholes (Macy, 1999). WDM is a management approach that aims to conserve water by influencing demand. It involves the application of selective incentives to promote efficient and equitable use of water. According to the International Union for Conservation of Nature (IUCN), WDM can "increase 'water availability through efficient allocation and use" (Goldblatt et al. 2000). This is guided by economic efficiency; justice and access; Environmental protection and sustainable ecosystem functioning; judging based on maximum participation; responsibility, accountability and political acceptance (2000).

In alignment with the two WDM definitions, the Jordanian informants stated that "there is a high-water demand, with limited resources and increase in population. They

are doing well but need to improve their water demand management." Nevertheless, they stated that it is currently done not at a satisfactory level. The Tunisian interviewee indicated that it is limited to a mediocre level, and WDM needs "to establish the water police system, provided in the new water code, actually under consideration by the Assembly of the Representatives of the People, to reduce the alarming proliferation of illegal drilling."

Q 4: What technologies do you think can improve your country's water balance and the MENA region?

Regarding the technologies that can improve the water balance at the national and regional levels, the Jordanian informants appear to be knowledgeable. For example, one of them suggested using water desalination, as most of the resources are high risk, wastewater treatment, and water reuse. Another person suggested the main issue is management; thus, that needed to improve first. The informant continued to list what Jordan needs to fix its management system: "data management systems, upgrade the monitoring systems (meters, data loggers, and others), and capacity building to enable the managers to visualize what can be done with correct data."

The Tunisian informants considered water as a fundamental human right. Accordingly, they perceived various ways to improve the water balance, such as conservation and public awareness, graduated tariff schemes with accountable billing and collection, accurate metering, and more efficient water use by agricultural interests. She was confident in her notion, "regarding the volume of wastewater generated annually by the domestic and industrial sectors, wastewater reuse may reduce the pollution of water resources and improve the water balance in Tunisia and the MENA region."

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In sum, they agree on the notion that the following technologies would help in the water balance: identify leaks quickly so they can be fixed (reduce physical losses), customer record-keeping that accurately captures water usage (reduce apparent losses), and finally, accurate metering.

Q 5: What do you consider the most effective methods to deliver affordable water services?

The Jordanian informants believed that among the most effective methods to deliver affordable water services are adopting fairness in water distribution and new water resource availability. They believe the way to solve water services' inequity is through a fair and restructured tariff system. This will provide smart incentives programs to increase water use efficiency that will improve sustainability and empower the productive water-related sectors. One informant stated it as simple as "three words: Physical Loss Reduction."

Similarly, the Tunisian informant stated that this could be accomplished by reviewing the structure of the tariffs of water services (drinking water and sanitation) in such a way as to cover operation costs while respecting the ability to pay society's poor trances. She identified this by type of counter or type of district and not by a segment of consumption. This is what the current state of Tunisia's water sector embodies.

Ironically, informants from entirely different countries, one more developed than the other, both believe the way to fix water services' exorbitant costs is through a change in tariffs. This sheds light on a more significant issue within the walls of the Middle East, incredibly underdeveloped countries such as Tunisia.

Q 6: What are the three highest risks that might negatively affect water security in your country and the MENA region?

All informants felt climate change would have significant negative effects on their nation's water security and the MENA region. The Tunisian informant just listed out climate change without really diving deeper into why she believes this to be the reason. This could partially be for the broad knowledge regarding this topic and the adverse effects climate change will have on not only our environment but our water. The Jordanian informants stated, "the availability of water resources, and climate change."

The Tunisian informant also stated pollution and political/social instability as the other negative water security factors. This is comparable to the Jordanian informants, who listed the below factors as what will hurt Jordan's water supply the most:

- *Lack of strategical approach for agribusiness and land use planning*

- *Shortage in water availability resources*

- *Undervaluing the stressed levels of water by the communities.*

- *Low financial resources allocated for maintenance (preventive and operational)*

- *Not relying on data for proper management.*

Overall, the Tunisian and Jordanian participants both believe the same underlying reasons for hurt in water security in their country and the MENA region. Jordanian informants went more in-depth in their ideologies due to the result affecting community members. This would include the continuation of water recklessness with little care of any losses into the rural areas.

Q 7: Do you think current water stress can cause domestic social unrest in your country? How?

According to the Water Resource Institute, water stress poses severe threats to human lives, livelihoods, and business stability (2019). It has a horrendous impact on social stability. All informants agreed that the current water stress could cause domestic unrest in their countries.

The Jordanian informants provided opposite answers to this question, ranging from domestic social unrest as a probable scenario and believing this would not happen. The informant who believed social unrest could occur explained if water becomes "even more scarce, and the price of production increases beyond people's ability to pay" unrest. "At a high level, it (domestic social unrest) is linked with agricultural development, food security, and land development."

The opposing Jordanian informant provided the following explaining; "the chance for having the water stress-causing domestic social unrest in Jordan is minimal. This is simple because water is made available in several forms and shapes. Those who are financially challenged will use the water they receive, when they receive it, and store the volume they can afford to pay for. Conversely, those who are financially comfortable can afford to store as much as they want, buy any additional volumes they might need, and buy more expensive water that they think has a better quality. Several studies with refugees (Iraq and Lebanon) indicated that the availability of water was the very lowest driver for them to return to their homelands."

The Tunisian informant agreed with the Jordanian informant, who believed water insecurity could drive social unrest. She stated, "Of course. The drinking water supply system in Tunisia is designed mainly on axes to transfer northern water collected in large dams to the main poles of the country (Grand Tunis, Sfax, and the Sahel). Regarding the

more frequent periods of drought and heatwaves in Tunisia due to climate change, drinking water service cuts are more and more recorded in the northern areas (especially rural areas). To express their dissatisfaction with this situation, some residents of the northern areas violate SONEDE infrastructure."

All the informants believed their side was accurate and provided research that was agreeable to their side. This is an issue that many water elites fear in the MENA region, but some do not believe it to be an issue. It is interesting how two-thirds of the informants agreed, and one-third did not. This data strongly compares the overall water elite world in this region.

Q 8: Do you think the current bilateral and multi-lateral transboundary water agreements improve water security in the MENA region?

All the interviewees believed this would be a hopeful statement that needs to include boundaries such that it is designed to preserve equality between countries. This dives deeper into the political power countries have in the MENA region equals the water security that the country embodies. The Tunisian informant described, "several weaknesses were noted during negotiations between Sudan, Egypt, and Ethiopia on the dam on the Nile." This is a fear that the informant believes will continue across the other nations in the MENA region.

One of the Jordanian informants continued by explaining, "It can improve water security," but only if designed to preserve equality between the countries and not based on political power.

Q 9: Do you think there is an impact of climate change on your country's water security and the MENA region?

All Jordanian and Tunisian informants unanimously agreed that climate change affects water security at both the national and regional levels. This position stems from the fact that the MENA region depends mainly on raining water as a source of living as most of the region suffer from the scarcity of water, thus highly dependent on rainfall volumes to replenish the stressed groundwater aquifers, the Jordanian informant commented.

The Tunisian interviewee provided an in-depth explanation of this question and expressed a strong belief that climate change has a significant impact on Tunisia's water security. She provided the following explanation:

Indeed, Tunisia is ranked 35th country vulnerable to climate change globally. The impact of climate change is already being felt in Tunisia:

- Higher variability of rainfall

- Intensification of extreme periods

- Accelerated rise in sea levels

- Heat islands

- The availability of water / uses strongly compromised

- Reduction of water intake

- Increase in temperature and therefore the needs of all uses

- Intensification of extreme periods / Drought and floods

- Important protection and conservation needs

 50% of forests' total economic value is for protection dams against sedimentation (12%) and (37%) for livestock.

Q 10: What do you consider the most critical water stakeholder in water security?

Informants agreed that water stakeholders should have an essential role in water security. However, they vary in their perspective of who the primary and the most influential stakeholders are water security.

The Jordanian informants note that all social and economic classes in the country are critical water stakeholders. They also included local communities due to the rural income that occurs in Jordan. One informant strongly mentioned the Ministry of Water and Irrigation because they believe it is the one that should have the vision and strategy on how to best run the water sector in Jordan.

The Tunisian information informants believed the most crucial water stakeholders were public and private companies in charge of water services and their ministries. These ministries included Ministries of Agricultural, Industry, and Tourism. She also mentioned unions representing professionals, municipalities, and the assembly of representatives of people. There are remarkable similarities between the informants and those they believe hold power to secure water stability in their country. Each country has its weaknesses in government and should not possess a monopoly on water security power.

Conclusions

Given the evidence presented, it is clear that Tunisia and Jordan have tried hard to increase the opportunities, including solutions for water security. In terms of protecting the water resources and managing effectively, both countries have been implementing both technological and governance innovations. This could meet the urgent need for action against the scarcity of water.

These innovations, including legislation and policies, have improved the water recycling process, as illustrated by an increase in water use efficiency. The

implementation of the technologies has helped both countries improve water resource management as it also enhanced the service delivery of water. To track and monitor the service delivery, both countries' governments have taken the initiative in assessing the infrastructure of water treatment and distribution in households and businesses.

The survey conducted with Jordan and Tunisia was successful, in that it brought out a mass amount of information from both sides. There was an interviewee with little as five years of experience in the water field versus 30 plus years of experience. This would show the knowledge difference between the interviewees, so when there was a 100% conclusion on a selected topic such as Global Climate Change, it was thoroughly reached.

The individual interviews shepherded in this research report highlighted many similarities and differences between the countries under consideration. It is notably shown that the development system regarding water is stronger in Jordan than in Tunisia. The interviewees' responses showed this to questions regarding water elites and water management. The Jordanian interviewees believed they either had good or satisfactory water security systems, while the Tunisian interviewee stated the opposite. The similarity between them was their strong notion regarding global climate change. This phenomenon has been happening for decades, but there has not been a vast enough movement to change its course.

They have developed a proper monitoring system so that there is a smooth and adequate allocation of water to provide for water for the growing population for both the countries to manage effectively. The comparative study of water security also revealed that the governments have been investing in diversified portfolios through public and private operators to prevent the waste and loss of water.

Overall, this case study provides much-needed insight on the water sector in Jordan and Tunisia, respectively. There is still more information to be found and ideas to acknowledge. Due to the ongoing global COVID-19 public health crisis, the survey and individual interviewee numbers were smaller than anticipated, so the comprehensive information source is not as thorough as possible. However, there was still a diverse board of interviewees for the survey and individual interviewees, which embodies wide age ranges, knowledge of water security, and gender.

CHAPTER VI – COMPARATIVE ANALYSIS OF CASE STUDIES

Water security is ever increasingly becoming a strategic concern for most Middle East and North African region countries. The researcher addressed the following research question and corresponding hypothesis in the contexts of each of the case studies, which will be analyzed comparatively in this chapter of the dissertation:

Research Question: To what extent, if any, are there significant similarities and differences between water elites' perceptions of the most critical factors affecting water security in the MENA region overall and in the countries within which they live therein specifically? (measured by water elites' perceptions of three relevant water security areas: water resource management, water service delivery, and water-related risk mitigation).

Hypothesis: Demographics and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service delivery, and water-related risk mitigation, in the MENA region overall and in the countries where they live therein.

The dependent variables are water resource management, water service delivery, and water-related risk mitigation. The independent variables are the demographic and national factors. In the analysis chapters, the researcher will be measuring and assessing the three sets of relationships, one for each of these three dependent variables.

This chapter presents a comparative case study analysis of water security in four countries (Egypt, Iraq, Jordan, and Tunisia) that were highly covered in Chapters Four and Five. Through this analysis, the data collection focused on water resource management, water service delivery, and water-risk mitigation. This chapter is

categorized into seven sections: Introduction, Participant Demographics Background (Questions 2-11), General Water Security Knowledge and Perceptions (Questions 12-18), Water Resource Management (Questions 19-28), Water Service Delivery (Questions 29-33), Water-Related Risk Mitigation (34-39 Questions), and Conclusions.

Participant Demographics Background

The researcher collected a total of 96 responses between April and August 2020. Thirty-six responses were excluded either for incompleteness and/or the respondents were from not the four selected MENA Countries. The typical average time spent on filling the complete survey was 18 minutes. Of the total number of the analyzed survey (60), 72% of participants are males, and 28% of them are females (Figure 55). Jordan has the highest number of participants (40%), whereas Tunisia has the lowest (8%).

The following four figures outline the participants' demographics and background. Figure 1 summarizes the respondents' data as it pertains to gender and nationality. Overall, the percent difference between male vs. female was large, but Iraq showed the widest margin, with 94% male and just 6% female (Figure 55). Tunisia showed the most diverse demographics and closest margin with 40% men and 60% women. Tunisia only encompassed 8% of the total respondents due to the tiny group of interviewees who chose to complete the survey.
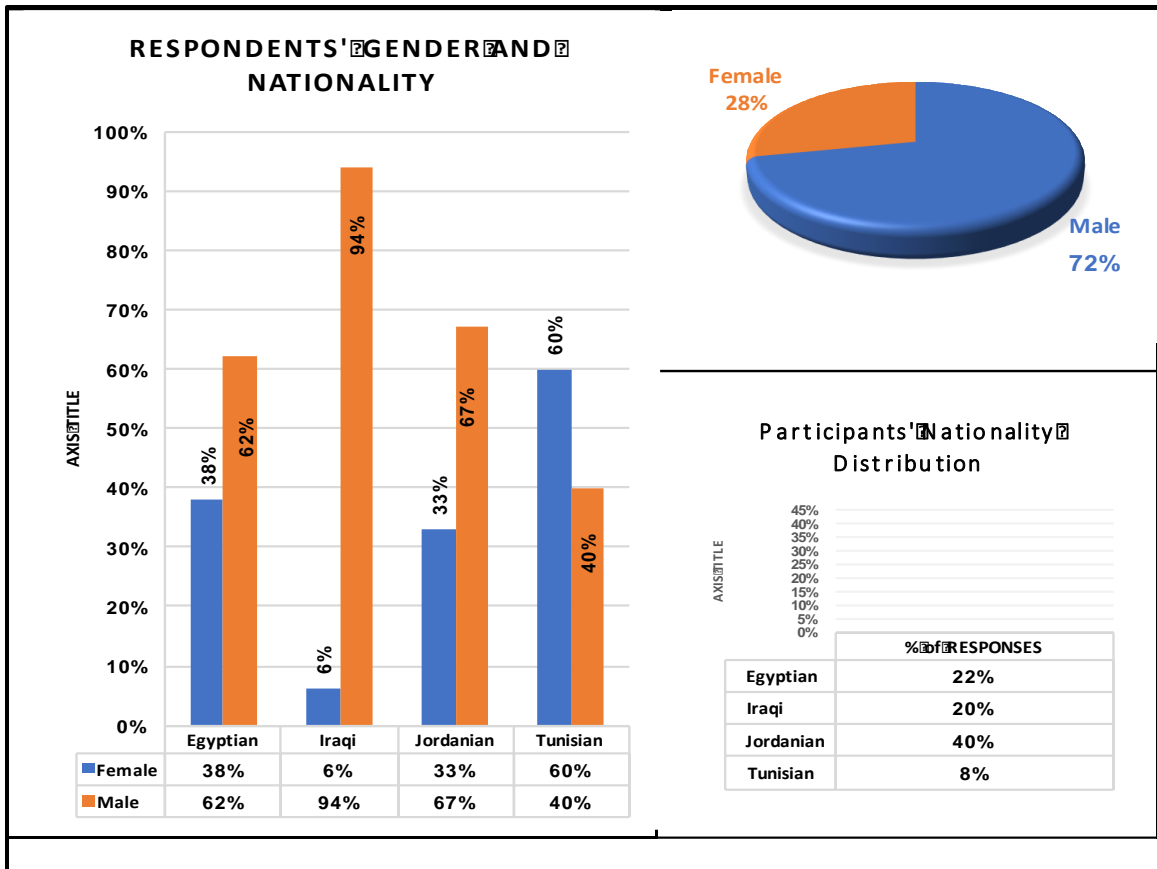
Figure 55. *Respondents' Demographics (Gender and Nationality).*

Figure 56 shows the demographics of the participants with Age Group, Educational Background, and Water Experience. The participants' age group varies from 25 years old to 65+ with the median age tied between 35-44 at 26% and 55-64 at 27%. All the participants' educational levels exceeded expectations, with over 53% earning a master's or doctoral degree. Figure 56 illustrates the respondents' water experience level with an exponential find of 33% over 20 years and 38% between 11-20. This will play into the knowledge shown with the answers to the survey about water elitism, offering a wide range of experiences to pull to form an educated conclusion to the hypothesis.
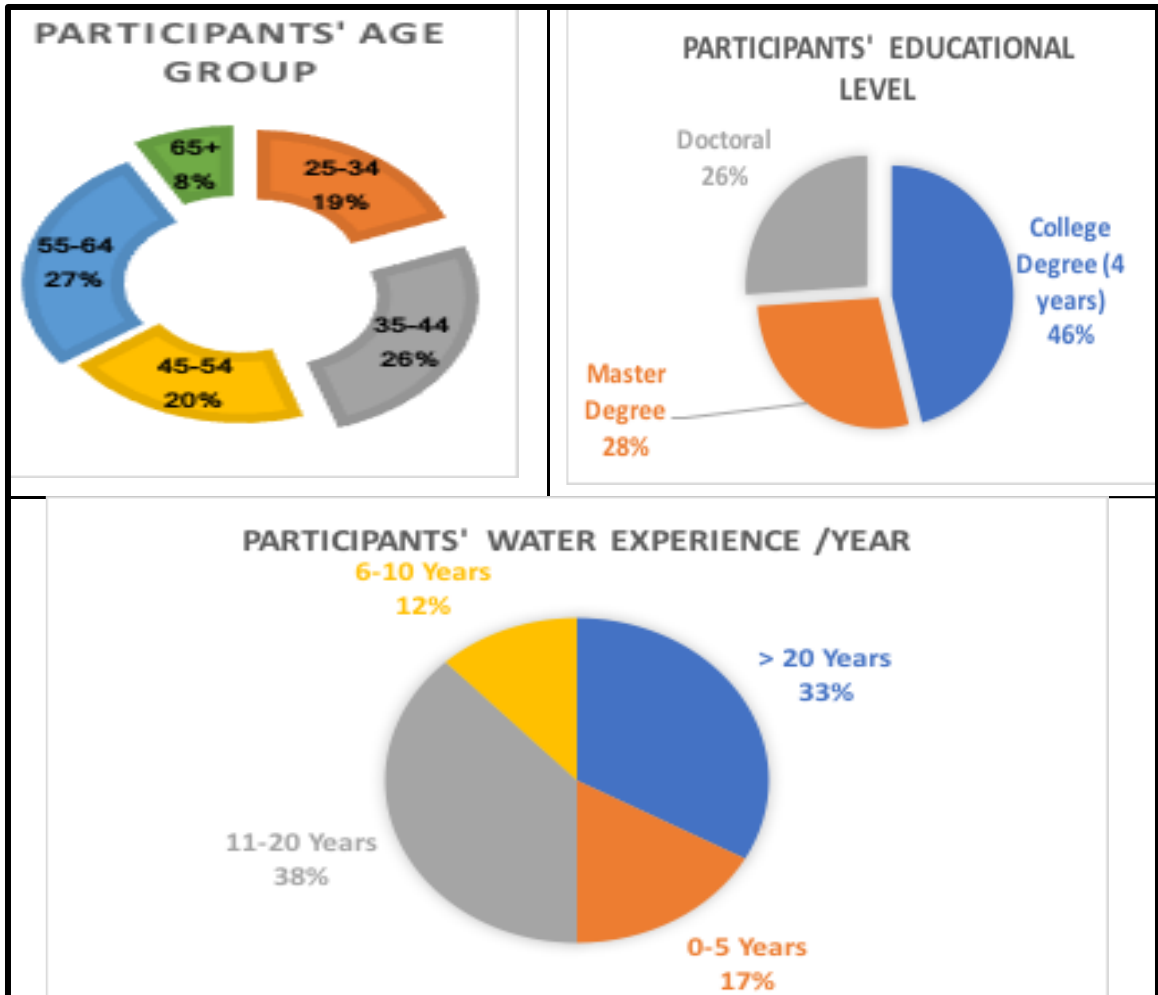
Figure 56. *Participants' Age Groups, Educational Background, and Water Experience.*

Figure 57 highlights the participants' language command and water research experience. This is vital to the survey's information to conclude the background from where ideas were formulated. All the sixty survey participants stated that Arabic is their first language. Fifty-two participants indicated that English is their second language. Five participants said that French is their third language (Tunisian). Concerning foreign languages, Iraq, Jordan, and Egypt are considered Anglophone countries, whereas

Tunisia is regarded as a Francophone country. Ten participants indicated that they have

command of other languages (Figure 3).

The final expert of Figure 57 allows the typical reader to understand the

interviewee's history of water education and research. An overwhelming 65% of

participants did not have any water-related research experience within the past five years.

As Jordan, Iraq, and Egypt resembled results in language; they also resembled water

research developments. This can dictate a pattern within the MENA community where it

might not be as prevalent to educate one-self on water research within their society.
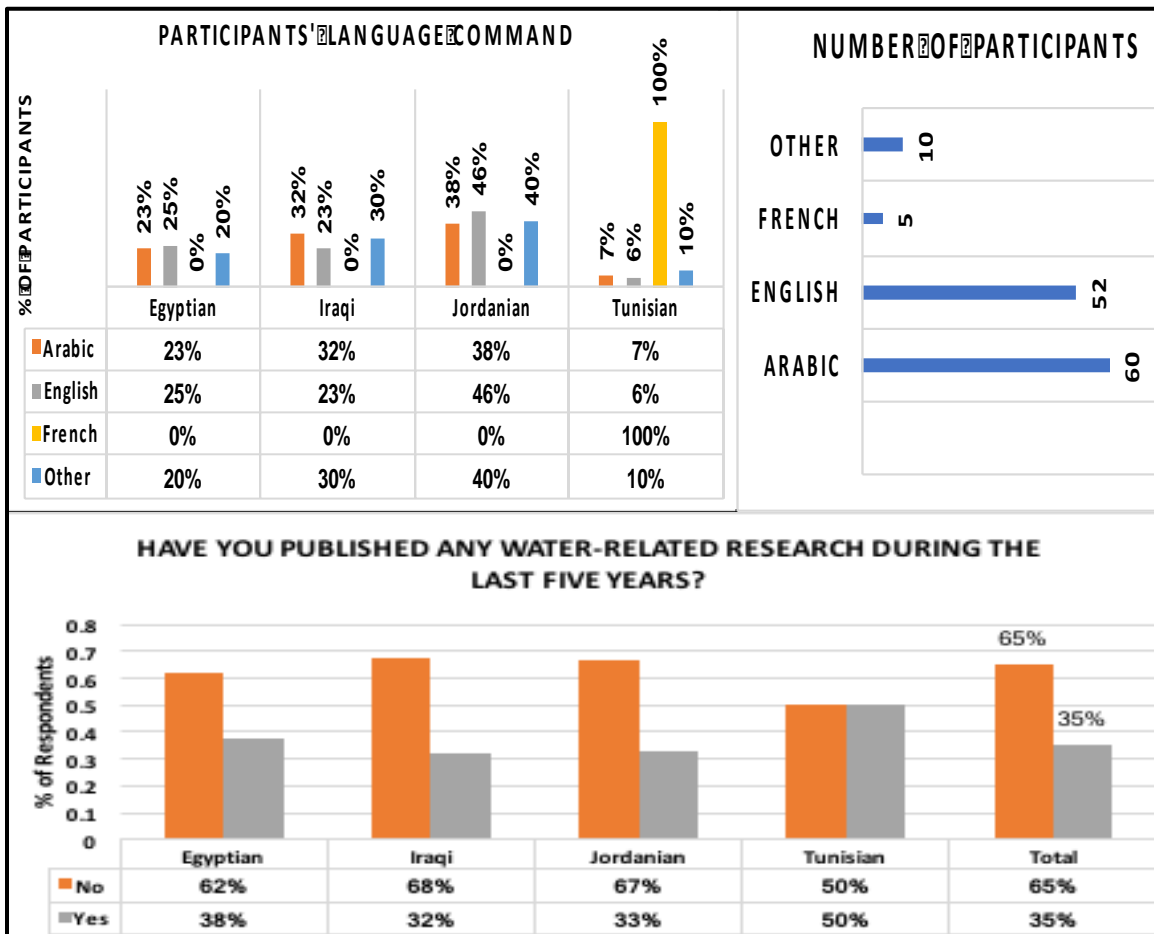
Figure 57. *Participants' Language Command and Water Research Experience.*

Figure 58 depicts the participants' answers to the question: "*Are you a member of a National, Regional, International Professional Group/Organization involved in water and sanitation?"* Almost half of the participants responded with "No" to the question continuing the overall identity of the selected MENA countries participants pertaining to their research endeavored in water research and education. Nearly 40 percent of participants were affiliated with a water or sanitation group/organization allowing the variance of "yes" and "no" to be depicted within the survey results. Though Egyptian and Tunisian participants have a higher membership percentage in professional organizations than their Jordanian and Iraqi colleagues, there is still a significant gap in this area that water MENA elites need to address.
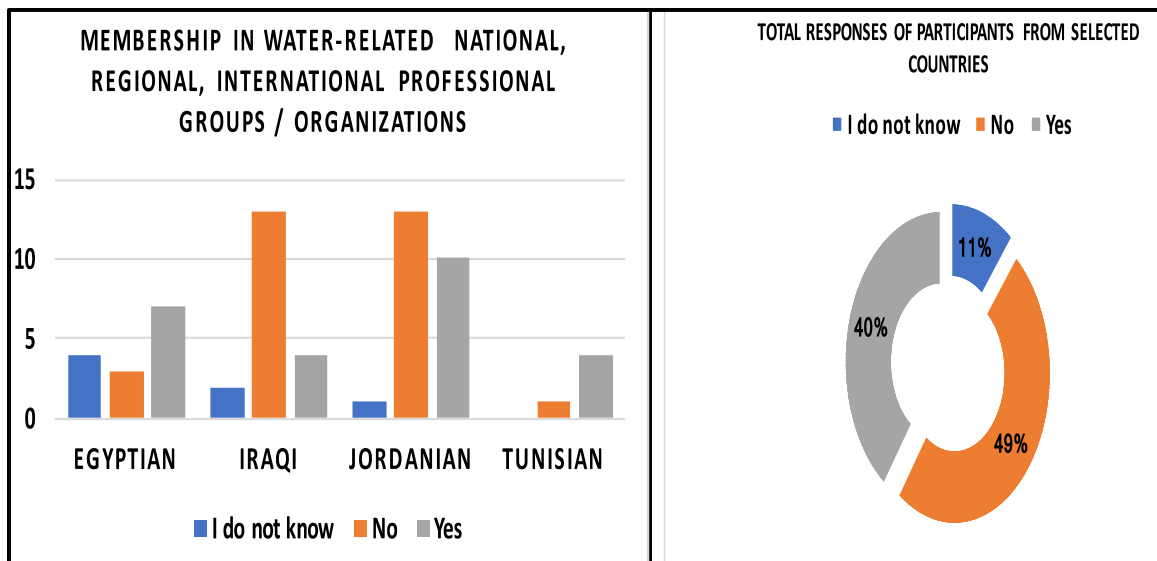
Figure 58. *Participants' Professional Affiliations.*

General Water Security Knowledge and Perceptions

This section carries the information given in Section 2 and allows the participants to identify their water security knowledge and perceptions. Figures 59 and 60 illustrated

the participants' general water security knowledge of their country and the entire MENA region as a whole.

Over half of each country's participants had prior knowledge of water security within their country, while less than half had any experience with the MENA region overall. Iraq had the most mixed results compared to the other countries as half of the participants were neutral or had very little/little knowledge of their individual country. The same could be said for Iraq and Jordan in Figure 6, as half of their participants had very little/little or neutral knowledge of the MENA region's water security.
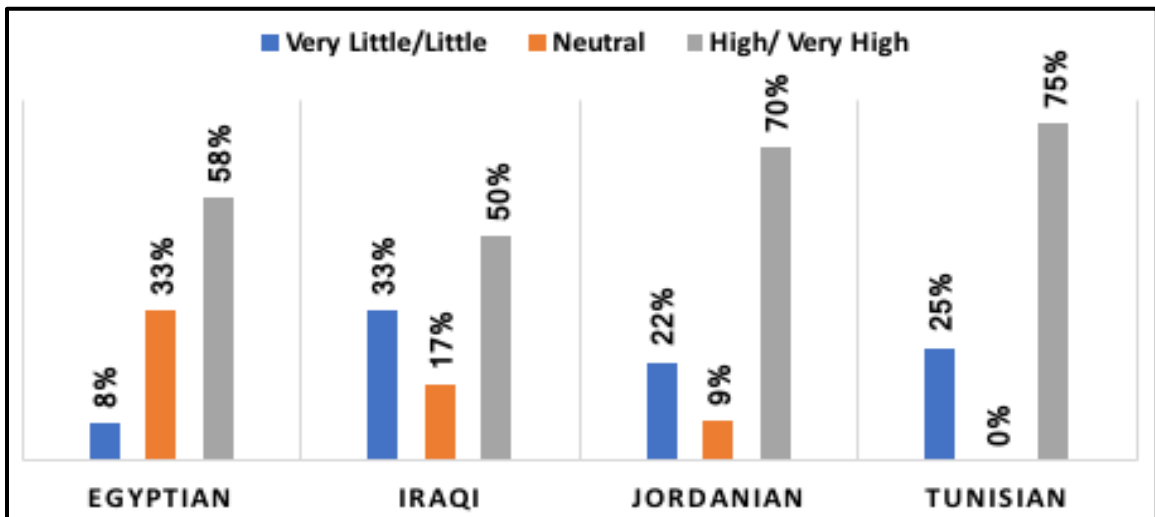
Figure 59. *Participants'' Rating of Their Water Security Knowledge in Their Individual Country.*

The Iraqi participants indicated the least score regarding MENA water security knowledge amongst other participants whereas the Jordanians perceived it as the highest (Figure 60). Tunisia and Egypt illustrated identical results, regarding their knowledge of the MENA region. These similarities and differences between each country's' participants could be explained through their background/education level of the topic and as a whole (Figure 60).

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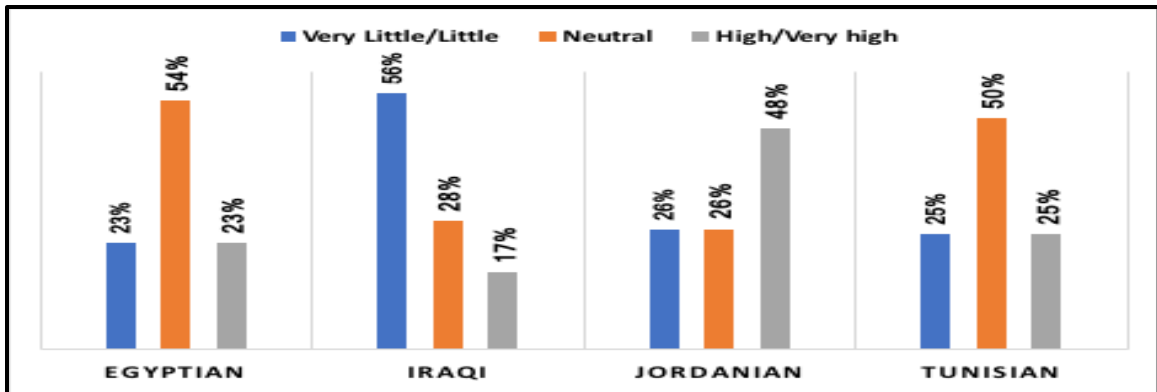
Figure 60. *Participants' Rating of their Water security knowledge about the MENA region.*

As the survey continues to dive deeper into the participants' understanding of water security, Figures 61 and 62 explain the respondents' perceptions of water as a national and state-level security issue. There was an overwhelming response from 3 out of the four countries, with 100% of their participants believing that water is a national security issue. Egypt stood out, with 23% of participants answering with, "I do not know." This can be in response to education on water security and their education/surroundings while growing older.

	Egyptian	Iraqi	Jordanian	Tunisian
I do not know	23%	0%	0%	0%
No	0%	0%	0%	0%
Yes	77%	100%	100%	100%
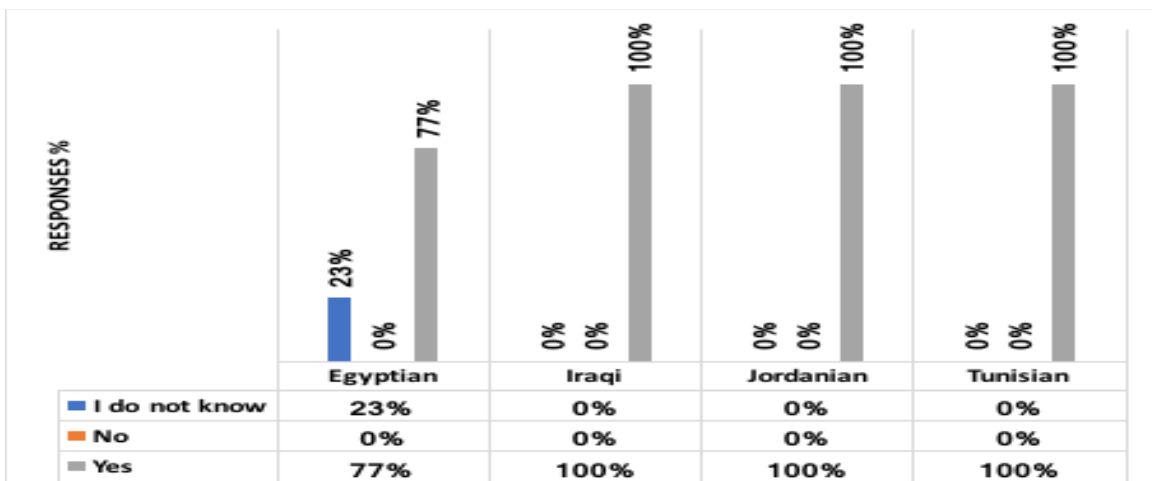
Figure 61. *Respondents' Perceptions of Water as a National Security Issue.*

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Figure 62 does not follow the same pattern as Figure 61 because 100% of Egypt's participants believed their own country's assessment of water security is very important. Iraq and Jordan had a small percent of their participants thinking their country's water security was not important at all. This data does not coincide with Figure 61 because how would one believe that water security was a national issue but not their own country's'.
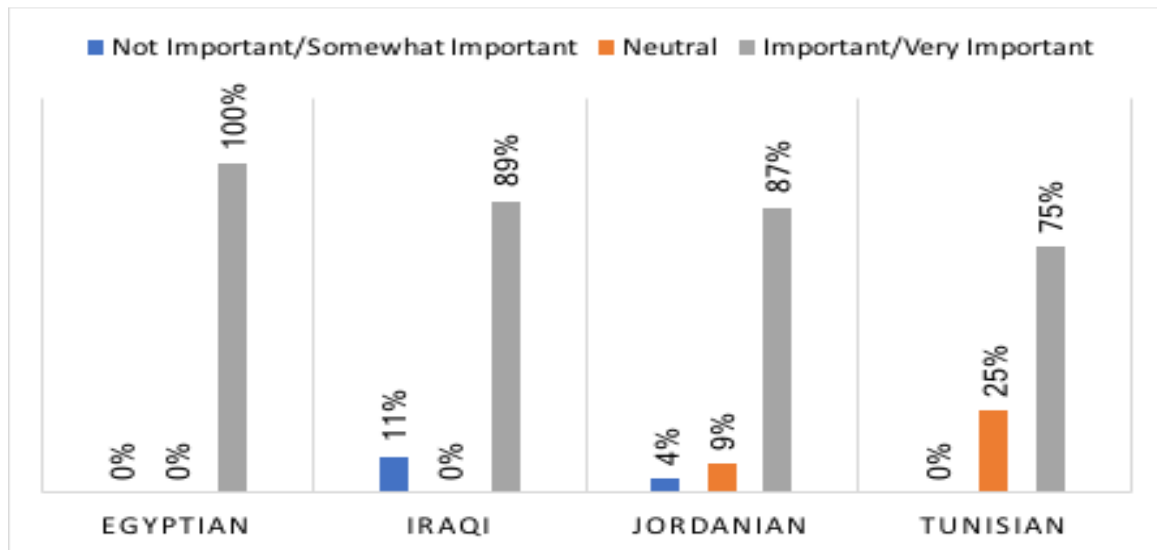
Figure 62. *What Is Your Overall Assessment of Water Security in Your Country?*

The participants were also able to answer a more in-depth question outside of National Security in Figure 63. They identified their opinions on the strict water security of the MENA region. The majority of all the country's participants believed this issue was important/critical. Each country had a small percent of their respondents believing water security was not important/somewhat important. The data is similar to Egypt and Iraq because some participants did not think their own country, or the world, had a water security problem in the last questions. The results from Jordan and Tunisia are unlike the

previous data. The same amount of Tunisian and Jordanian participants had a neutral/not significant response to their own country's water security assessment.
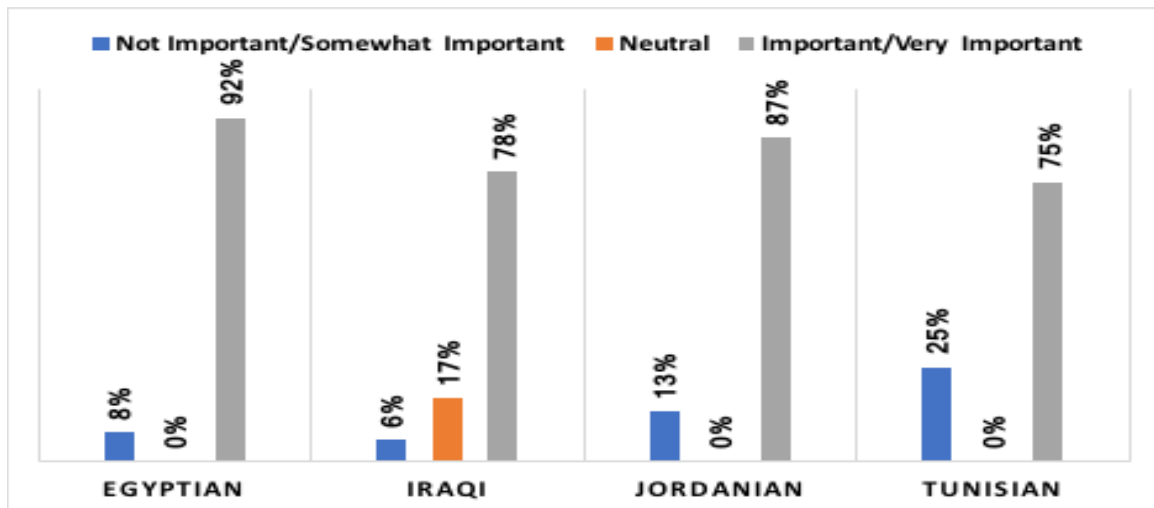
Figure 63. *What Is Your Overall Assessment of Water Security in the Middle East and North Africa Region?*

The survey changes paths and looks at each respondent's participation in decision-making within any large scale private/public water organization (Figure 64). Over half of each country's participants had direct involvement in private/public water organizations. Jordan and Tunisia has the most involved participants, with each country's "yes" response over 65%. Iraq was the lowest margin in this survey with 44% "no" responses and 50% "yes." This could be mainly to the country's ongoing intra-state conflict and lack of resources to devote to water security. Tunisia's educational background includes more than 60% of participants with graduate degrees, so their private/public water organizations' involvement aligns with their experience.
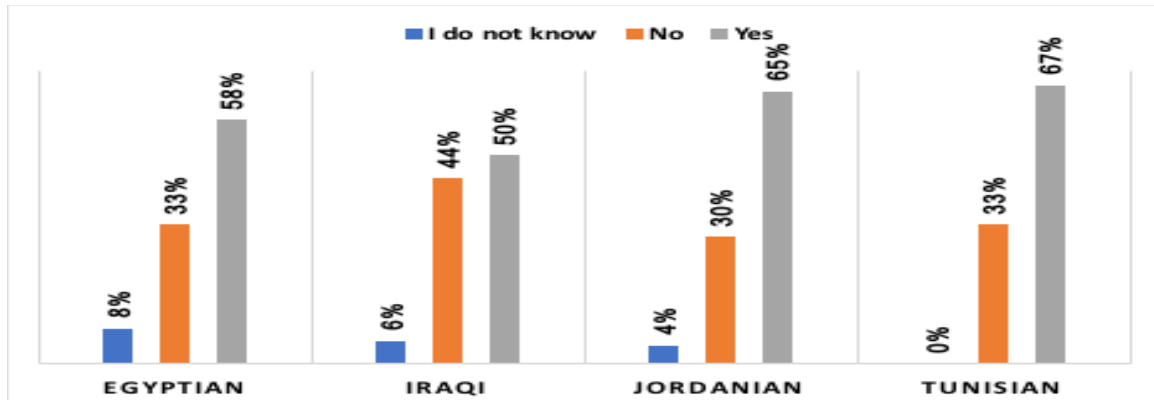
Figure 64. *Have You Had any Direct Participation in Decision-Making within any Large Large-Scale Private and Public Water Organizations?*

The final figure of this section concludes with the question of whether the participant believes they, themselves, are water elites in their country based on the definition of "Elite." Figure 65 proves this and illustrates Tunisia as one with 75% of the participants having held a water elite position in their country. Iraq and Egypt resemble the same data as only 44% or less of their participants answered 'yes' when asked if they were ever a water elite. 8 percent of Egyptian participants did not even know what that type of position would mean or if they were ever in one. Those responses suggest they were never in a situation that would qualify as a water elite. Jordan resembled Tunisia's very high percentage of "yes" responses but had a small percent of their participants with no water elite experience. It is not surprising for the data to be shown like this, as Tunisia and Jordan are identical in much of the survey overall.

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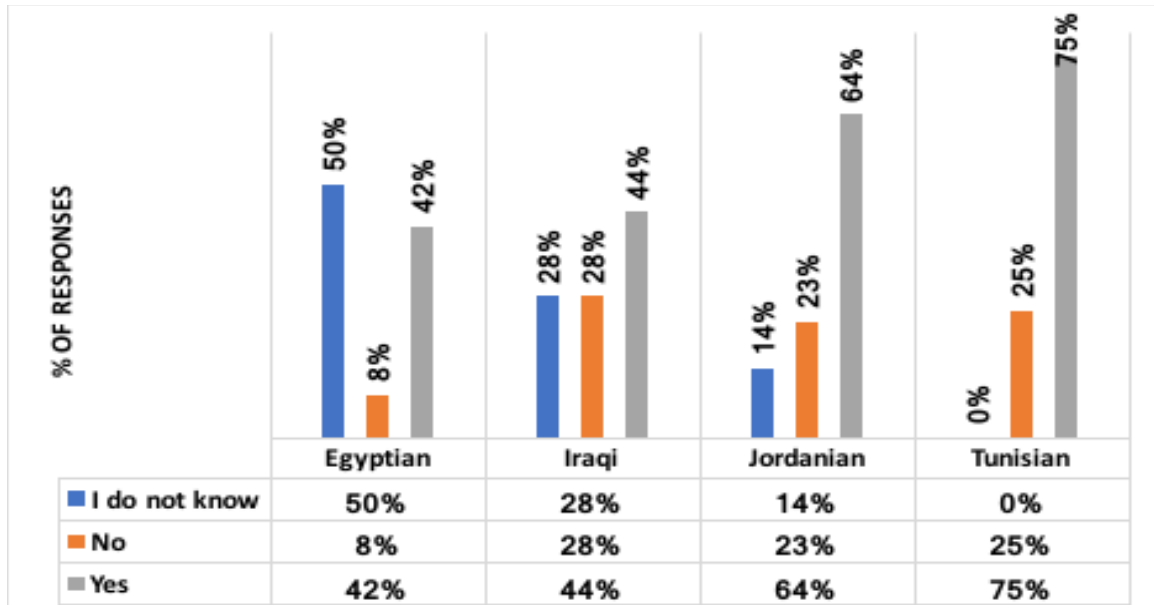
Figure 65. *Do You Consider Yourself One of The Water Elites in Your Country Based on the Definition of "Elite" Provided at The First Page of This Questionnaire?*

	Egyptian	Iraqi	Jordanian	Tunisian
■ I do not know	50%	28%	14%	0%
■ No	8%	28%	23%	25%
■ Yes	42%	44%	64%	75%

Water Resource Management

This section takes a different path in the survey by focusing on the participants' knowledge of water resource management in multiple practices. Figure 66 highlights the participants' perceptions of water demand management practices. There are four different parts of this question: water service fees/pricing, incentives/technologies, losses/leakages, and planning/prioritization of high-value water usages. Tunisia showed the most united front within its respondents, who agreed/strongly agreed to every scenario given in the survey from the chosen topics. Egypt led the most significant difference between its participants with very split responses across all four issues (Figure 66). In the area of water service fees and pricing, the Tunisian participants responded that this area is of the highest importance compared to the other participants'. The role of incentives and technologies were considered of important factors in water demand management efficiency and

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productivity. Planning, prioritization and water loss processes are perceived highly by most
participants across the four countries (Figure 66).
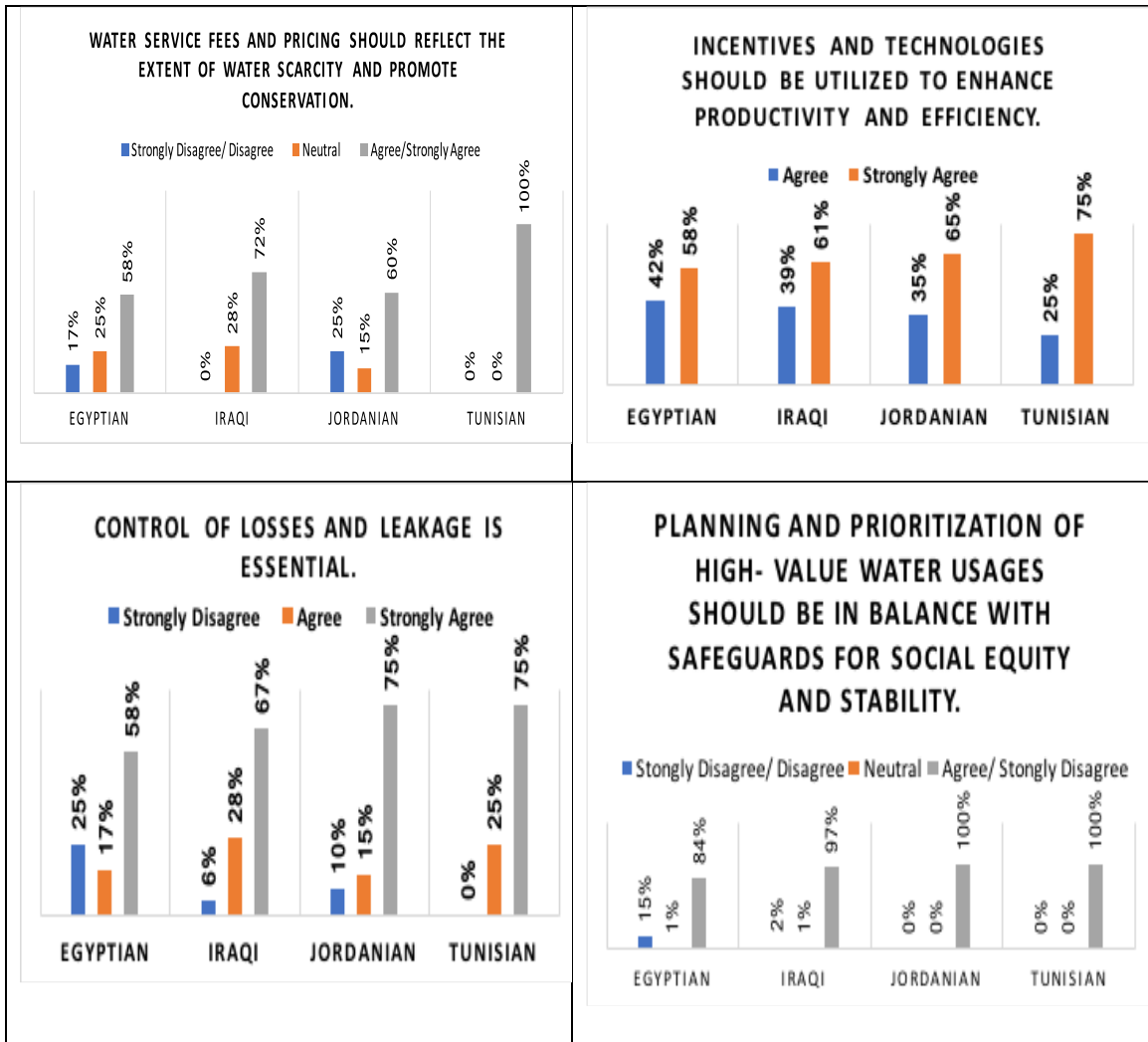
Figure 66. *Participants' Perceptions of Water Demand Management (WDM) Practices.*

Given the significant differences in results between Egypt and Tunisia, it is
essential to point out how incompatible the two North African countries are. There could
have been a trend line with the two countries' beliefs and perceptions of their people, but
the Egyptian and Iraqi results are quite comparable, as are the Tunisian and Jordanian
results. Within this entire survey, there were many cases where Tunisian and Jordanian
respondents shared similar attributes. There has not been a notion as to why this keeps

happening other than the participants' educational level. Egypt and Iraq are most similar in their economic shortcomings and poor water security structures.

In Figure 67, participants were asked how they perceive water reallocation practices in two areas:

- Water rights, subsidies, and pricing policies are re-allocated fairly.

  In this area, Iraqi and Tunisian participants had positive (agree/strongly agree) responses to this statement. Eighty-three of Egyptian participants, for example, agreed with the statement. Jordan was the exception, as its participants were divided between agreement and disagreement regarding this issue.

- Regulations and enforcement should be established and implemented to control unplanned overexploitation of water. A collective 72% of Jordanian participants perceived this area positively (agree/strongly agree).
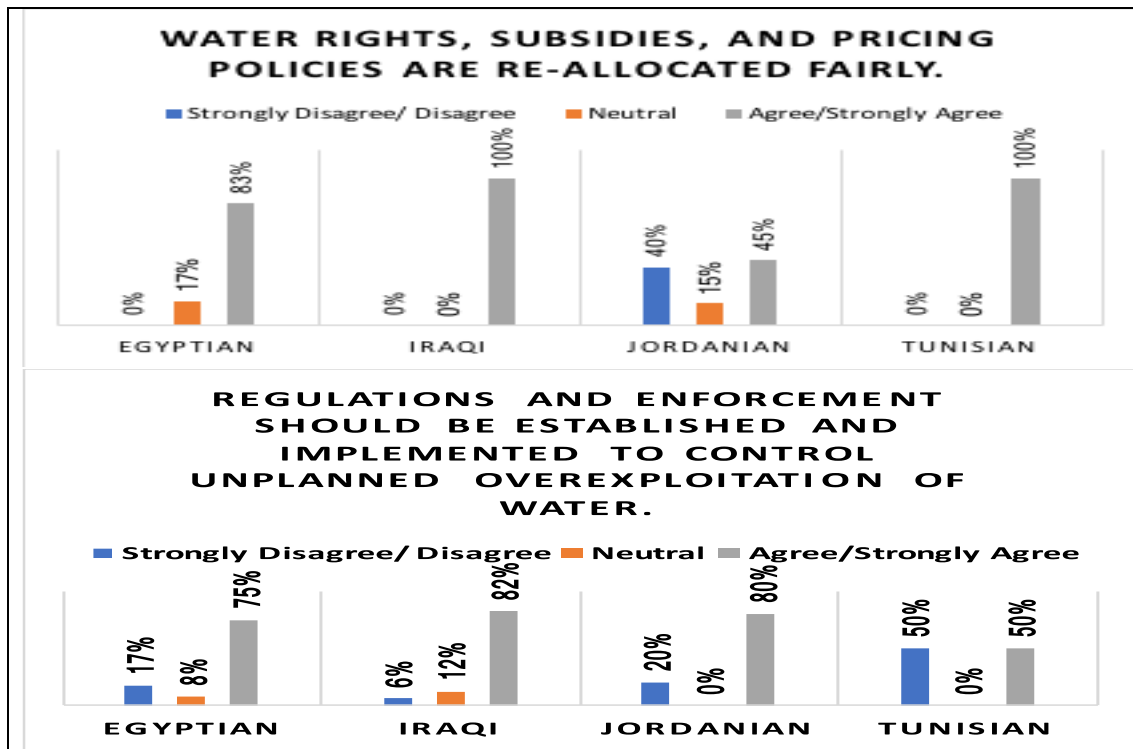
Figure 67. *Participants' Perceptions of Water Reallocation Practices.*

The importance of conventional and non-conventional water resources'

development methods in meeting water demand-supply were perceived in a variety of

ways by the participants. Iraq and Tunisia begin to show similar characteristics in their

participants' responses, while Jordan and Egypt do the same. Figure 68 outlined this idea

when respondents were asked how necessary conventional and non-conventional water

resources' development methods met water demand-supply. More than half of all

participants believed coordinated use of surface and groundwater were very important,

while Iraqi and Tunisian participants deemed it to be somewhat significant. This pattern

continues for only Iraq when asked their perception of the development of wastewater

recycling and reuse were neutral or somewhat important.
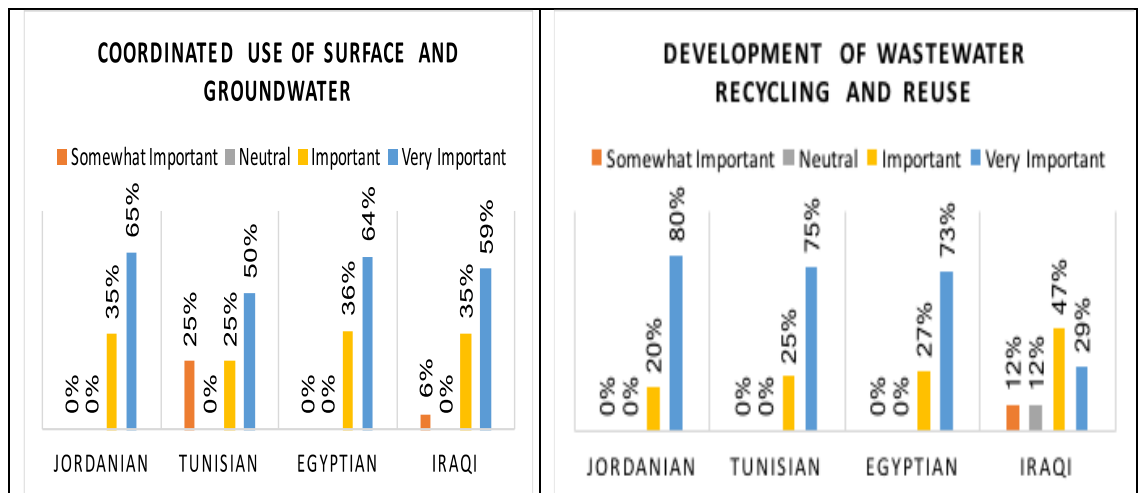
Figure 68. *How important is each of the following conventional and non-conventional water resources' development methods in meeting water demand-supply?*

The countries' similarities continue to differentiate within each survey question

and leave it unclear whether there is a pattern. Independent variables, demographics, and

national factors drive water elites' perceptions of water security, which is held through

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figure 69 results when participants were asked how they would rate the influence of social inclusion on water security within their respective country.

Figure 69 did not have any vast comparisons between each country, but it did hold extreme contrasts. Tunisia showed very split responses, with 75% of their participants believing women have a meager influence on their society and 25% considering they have very high. Jordan 45% believe women have a high impact, while 20% thought they had an external influence. The youth portion of this survey includes the same differences between Tunisian and Jordanian influence. Jordanians were split, with 27% believed they had a strong impact, and 37% had a low. Tunisia was very adamant with 50% responding youth's influence is low, and 50% that it is high.
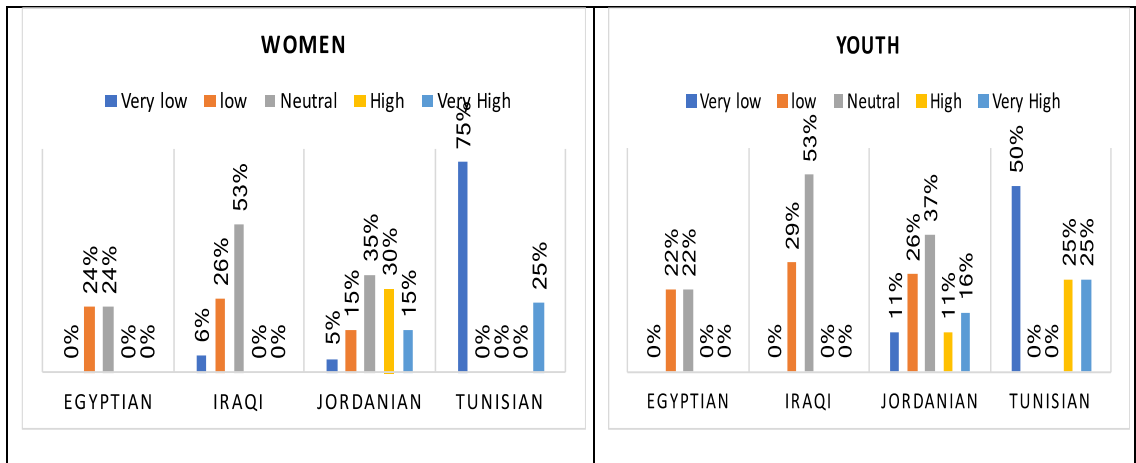
Figure 69. *In general, how would you rate the influence of social inclusion (women and youth) on water security in your country?*

Water Service Delivery

Water service delivery is one that participants showed significant differences across multiple segments of the survey. Figure 70 allows the respondents to think of their own country's improvements over the past five years regarding urban and rural water service delivery. Egyptians believed strongly in their government, with 100% of participants

responding they were satisfied with urban water service delivery, and 80% in rural areas. The largest differing country was Jordan, with a mixture of opinion across their respondents, 56% and 50% believing in their urban/rural water service delivery, respectively.
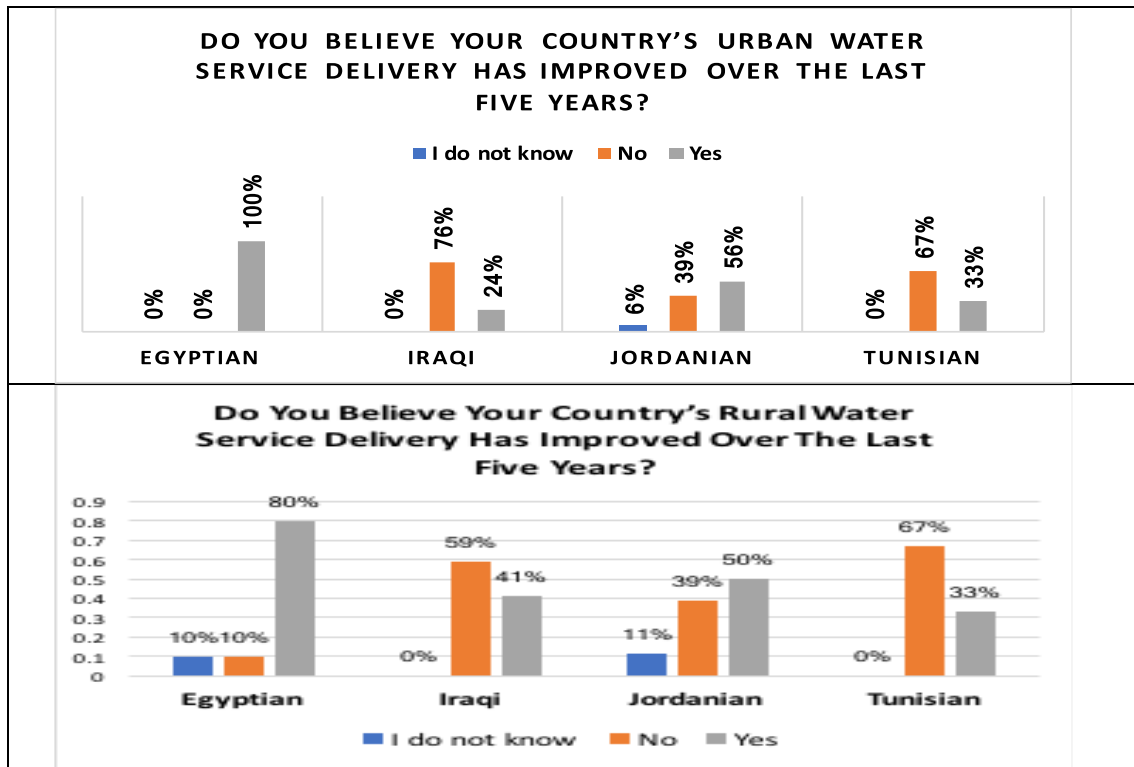
Figure 70. *Participants' Perceptions of Their Countries' Rural/Urban Water Service Delivery*

Iraq and Tunisia continued to show similarities in Figure 71, even though their respective countries' water service delivery processes differ entirely. As mentioned through research on Iraq, the past war and turmoil destroyed much of its water management system. Tunisia's water management system is not ideal but has significantly fewer obstacles than Iraq.

The North African and Middle Eastern countries began to show similarities with their respective counterparts in those regions, such as Jordan and Iraq, and Tunisia and

Egypt. Iraq and Jordan showed the most significant comparisons when participants questioned their perception of whether urban/rural water services were affordable. Half of Jordan and Iraq's participants, for instance, believed that urban and rural water services were affordable. Tunisia stood out the most, with 100% of their participants responding, "strongly disagree" regarding rural water services being affordable.
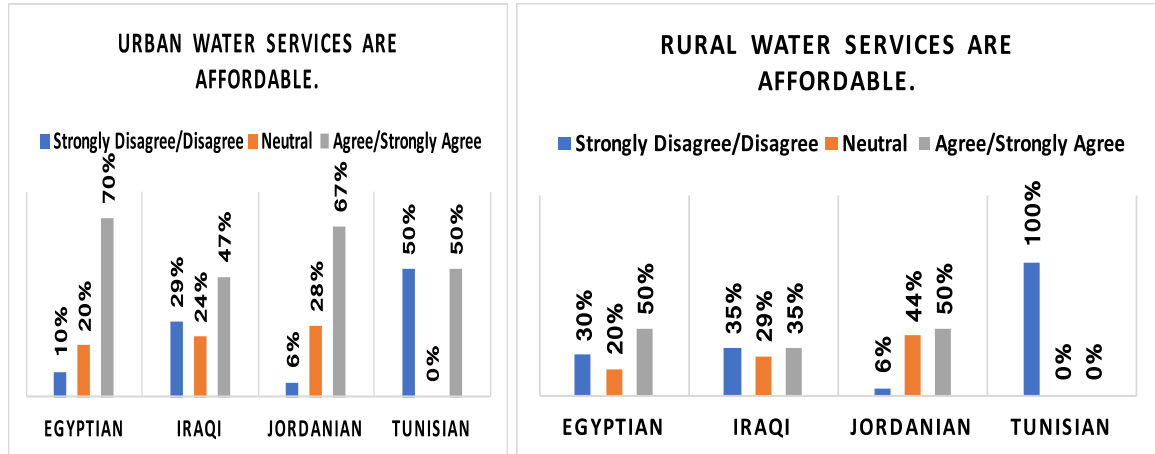
Figure 71. *Participants' Perceptions of Urban and Rural Water Services Affordability.*

The final part of Figure 72 tests the participants' perception of whether or not they identify with the drinking water supply is adequate and reliable. There were opposing views across all four countries, with Tunisia the most split among its participants; 33% across each answer choice, neutral, strongly disagree and agree/strongly agree. Egypt was the most constructive, with 100% agreeing/strongly agreeing or neutral that their drinking water supply is adequate and affordable.
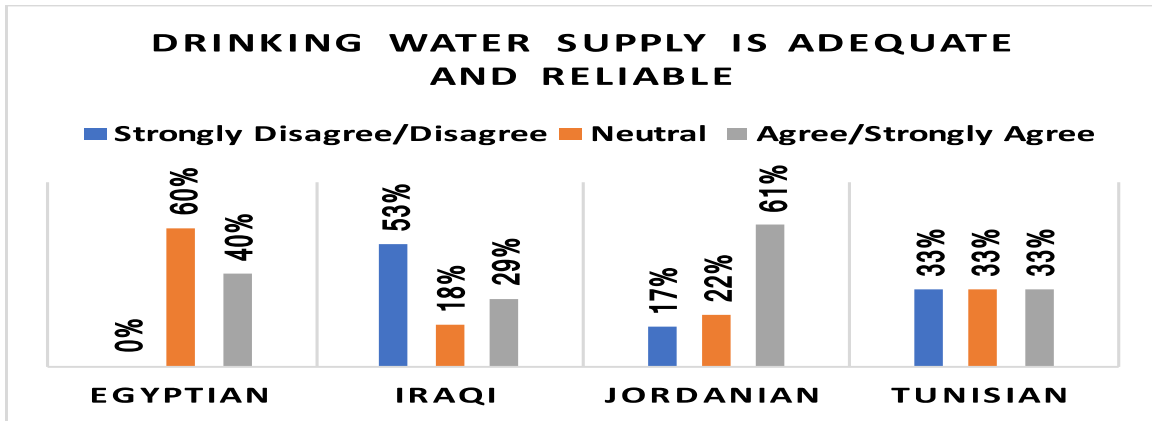
Figure 72. *Participants' Perceptions of Drinking Water Supply Adequacy and Reliability.*

The rest of the water service delivery section assesses the importance of various factors in improving water service delivery. Economic loss from the inadequate water supply was the factor all four countries believed would strongly affect water service delivery, with an average of 85% of participants answering "high/very high." Adopting anti-corruption measures in water sector institutions was a factor that all four countries believed would not affect water service delivery, with an average of 40% of participants answering "low/very low." Public participation and outreach on water-related issues showed the most difference across the four countries. Participants were split between those believing this factor has high or very low importance. Jordan and Egypt felt this to be very high, while Tunisia and Iraq thought it very low.

Overall, Figure 73 examines many different factors and highlights essential points that governments should refine, such as water cost recovery level and the effects of interstate conflict. These factors would not compare outside of the MENA region due to the internal conflicts and resulting insecurity those residing therein face daily.
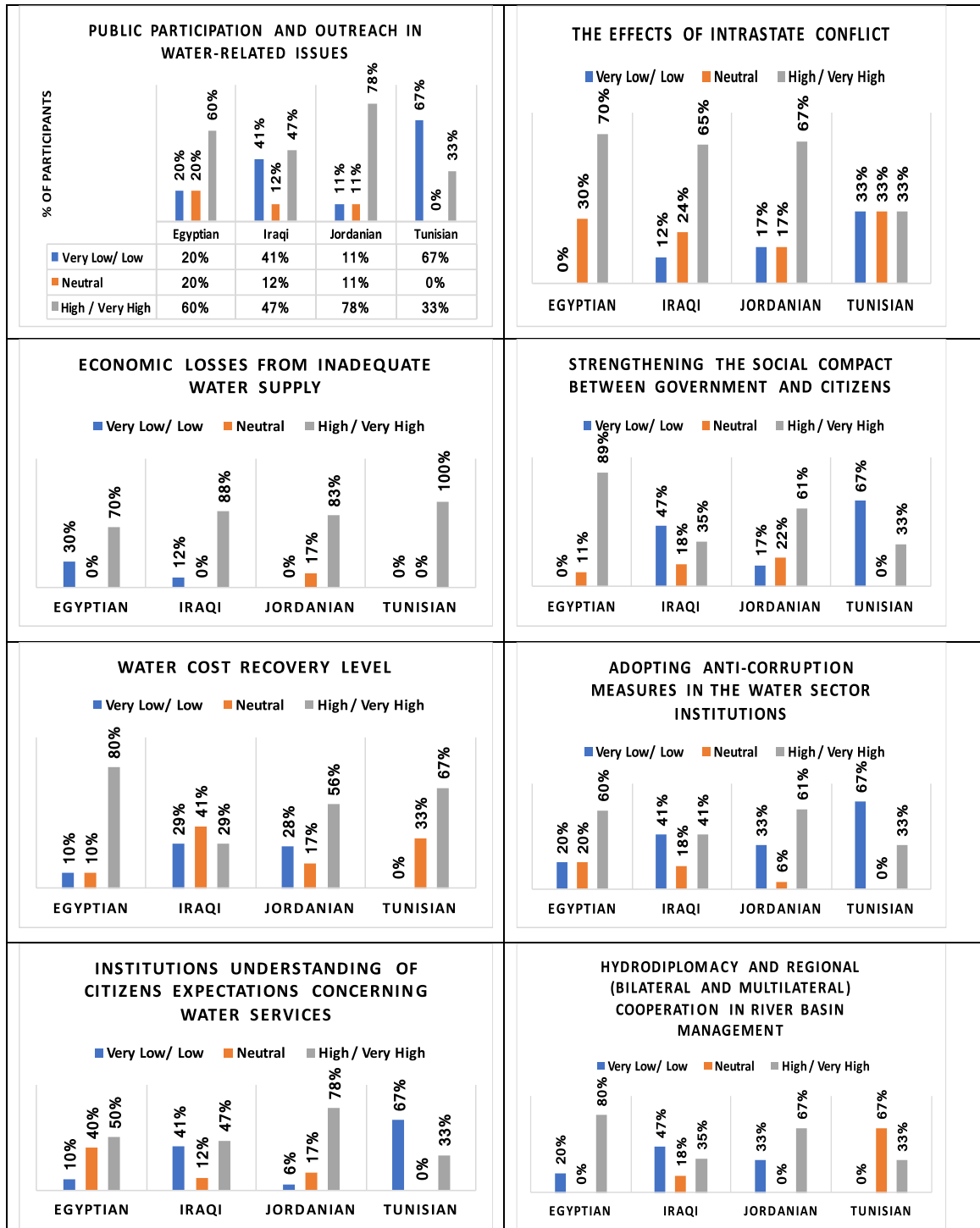
Figure 73. *How Do You Assess the Importance of Each of the Following Factors in Improving Water Service Delivery?*

The last figure of this section highlights the participants' level of agreement of

varying statements and strategies related to improving water services (Figure 74). Most

participants believed in all the ideas, especially that technology policy and institutional

management are needed to achieve water security. One statement that did not coincide

with the rest of the participants was the theory that it is essential to improve data

collection and monitoring to help achieve the United Nations' sustainable development

goals. Each country had small or nonexistent numbers participants expressing neutral

perspectives on this subject, while 67% of Tunisian participants did not fully agree with

that statement. This is due to the underlying problems each of their countries face within

their territory, so most citizens do not believe fundamental causes like water security

should only be improved for the United Nations' goals.
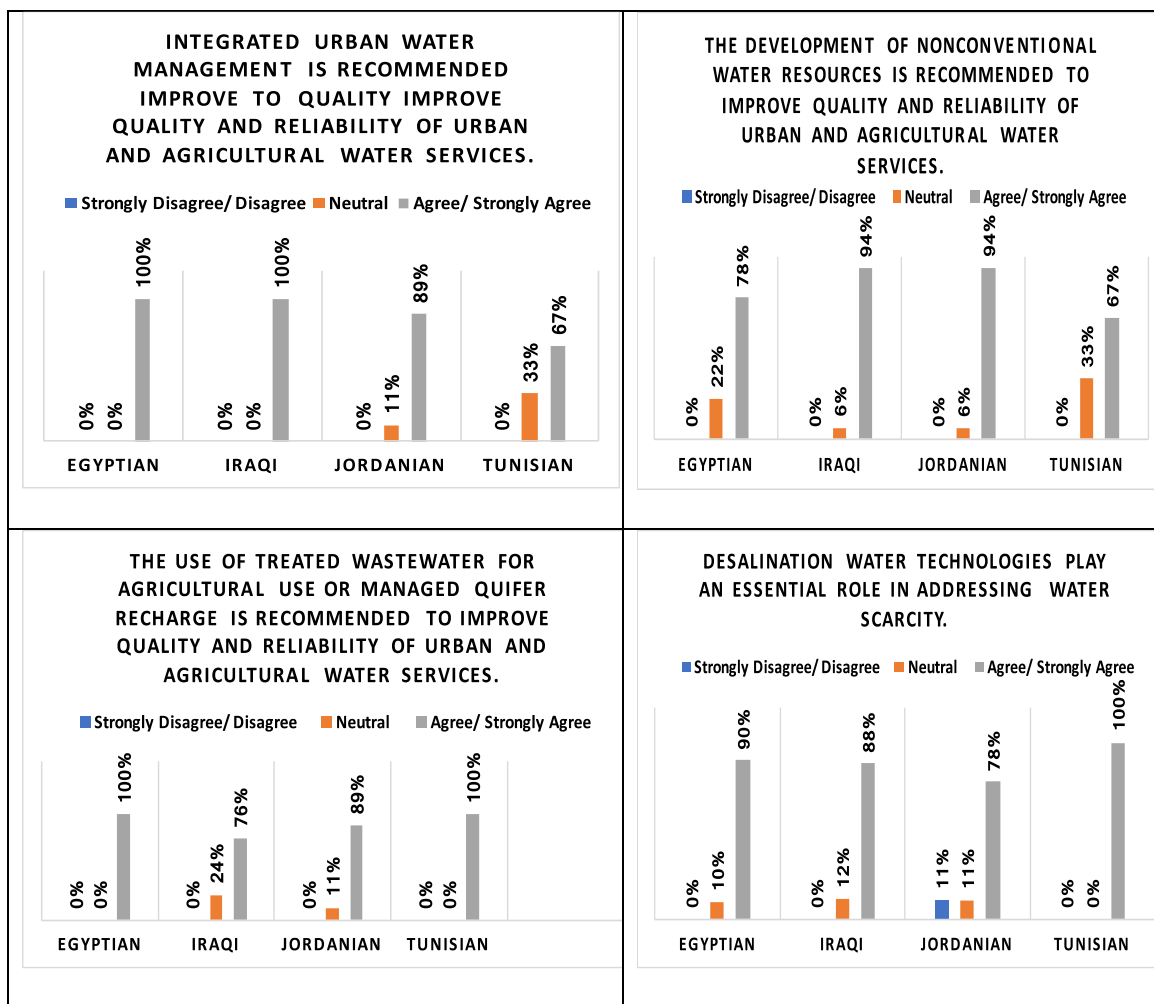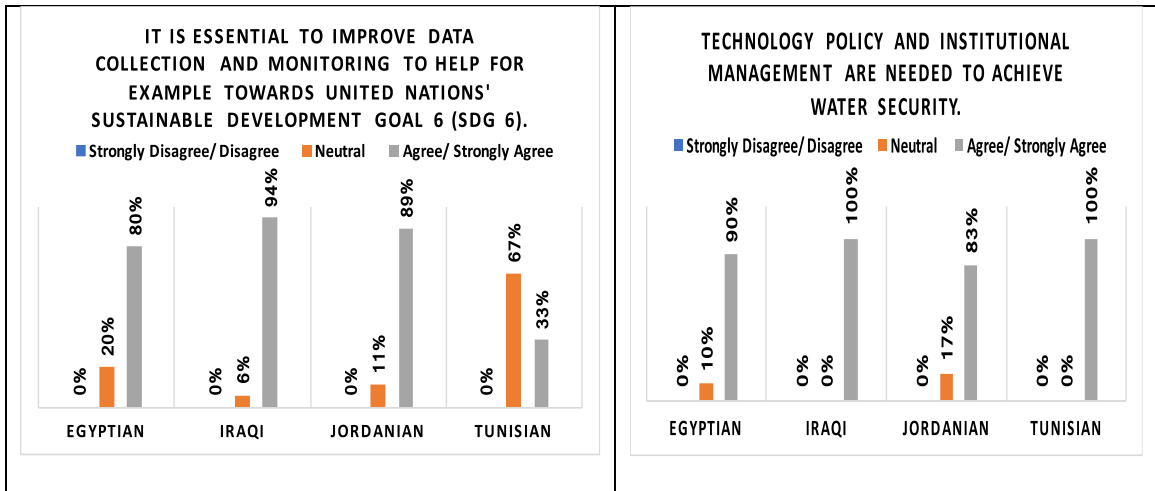
Figure 74. *Participants' level of agreement with statements/strategies to improve water services*

Water-Related Risk Mitigation

This section takes a more in-depth look into water-related risk mitigation and allows participants to find their perceptions of various essential factors that affect water security. Tables 16 and 17 dive into the varying comparisons and contrasts of each of the four country's participants' beliefs, such as climate change and peace in the MENA region.

Overall, in Table 1, the four countries believe the following factors strongly affect water security: 1) climate change; 2) water stress resulted from surface water; and 3) domestic social unrest.

These three factors are highlighted in 90% of participant feedback from each country, which indulges in the idea of the MENA region's most enormous problem. The war and crisis occurring across all the nations have caused scars to continue to populate years after the wars were ended.

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Table 16

Participants' Perceptions of Factors Impacting Water Security

Climate change affects water security.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	0%	20%	80%
Iraqi	6%	6%	88%
Jordanian	6%	6%	88%
Tunisian	0%	0%	100%
Water stress resulted from surface water has a significant impac on water security.			
Egyptian	0%	11%	89%
Iraqi	0%	12%	88%
Jordanian	0%	6%	94%
Tunisian	0%	0%	100%
Water stress (lack of fresch water resources to meet demand) resulted from underground water has a significant impact on water security.			
Egyptian	11%	22%	67%
Iraqi	0%	18%	82%
Jordanian	0%	0%	100%
Tunisian	0%	0%	100%
Lack of water supply causes domestic social unrest.			
Egyptian	0%	10%	90%
Iraqi	0%	6%	94%
Jordanian	0%	6%	94%
Tunisian	0%	0%	100%
Water and water systems are used as weapons in conflict.			
Egyptian	10%	10%	80%
Iraqi	0%	12%	88%
Jordanian	6%	18%	53%
Tunisian	0%	0%	100%
Regional cooperation on water issues strengthens trust and collaboration.			
Egyptian	0%	10%	90%
Iraqi	0%	0%	100%
Jordanian	6%	0%	94%
Tunisian	0%	0%	100%
Water-related NGOs play an important role in peace and stability in the MENA region.			
Egyptian	0%	30%	70%
Iraqi	24%	24%	53%
Jordanian	24%	29%	47%
Tunisian	33%	33%	33%

The main difference seen throughout Table 16 was what role water-related NGOs played in peace and stability within the region. Iraq, Jordan, and Tunisia had one-third of their participants responding with "strongly disagree/disagree" when prompted their opinion on non-governmental organizations (NGOs). This difference between participants would be partly due to their education of what NGOs have done around their neighborhood or cities. There were not any Egyptian participants that disagreed with the statement regarding the NGOs.

Table 17 highlights the same rhetoric, with the participants' perceptions of water security but with hydro-politics factors. There were more significant differences between each element across all four countries. The only factor that remotely had a high percentage of all participants agreeing was anti-corruption and integrity measures improving water resources utilization.

Tunisia showed a lack of similarity with the other three countries in most of the factors listed in Figure 21. Tunisians were neutral on, while over 85% of the other participants strongly agreed on the following:

1) Reliance on shared transboundary water is essential.

2) Effectiveness of bilateral and multi-lateral water transboundary agreements

There is not much background information about why the participants believed this to be different, barring their coinciding countries. One reason that could fall in Tunisia is a peninsula with half of its borders occupying the Mediterranean Sea. There is a close connection to transboundary water agreements that they believe should not be politicized.

One factor that stood out across the four countries, whose participants had a neutral opinion, was those international donors exacerbating tensions over water security

in the MENA region. Egyptian participants were the only ones who favored or strongly

agreed with this notion, while most of the other participants either held a neutral stance or

completely disagreed.

Table 17

Participants' Perceptions of the Hydropolitics-related factors Impacting Water Security

Virtual water (amount of water needed to produce different goods and services) strengthens water and food security simultaneosuly.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	22%	0%	78%
Iraqi	0%	18%	82%
Jordanian	12%	18%	71%
Tunisian	0%	0%	100%
Reliance on shared trasnpoundary water (surface and underground) is essential.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	0%	11%	89%
Iraqi	0%	18%	82%
Jordanian	6%	0%	94%
Tunisian	0%	67%	33%
The effectiveness of bilateral and multi-lateral water trasnsboundary agreements - water diplomacy) depends on the extent to which they are constructive, transparent and equitable.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	11%	11%	78%
Iraqi	0%	24%	76%
Jordanian	6%	6%	88%
Tunisian	0%	67%	33%
The influx of refugees causes tension and has negative affects on water security in the host countries involved.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	11%	22%	67%
Iraqi	18%	18%	65%
Jordanian	0%	0%	100%
Tunisian	33%	0%	67%
International donors exacerbate tensions over water security in the MENA region.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	20%	10%	70%
Iraqi	0%	53%	47%
Jordanian	35%	12%	53%
Tunisian	0%	67%	33%
International organizations play a constructive role in strengthening and improving the water sector in the MENA region.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	10%	30%	60%
Iraqi	12%	12%	76%
Jordanian	6%	6%	88%
Tunisian	0%	33%	67%
Anti-corruption and integrity measurs improve the utilization of water resources.	Strongly Disagree / Disagree	Neutral	Agree/ Strongly Agree
Egyptian	0%	11%	89%
Iraqi	6%	12%	82%
Jordanian	12%	12%	76%
Tunisian	0%	33%	67%

In Figure 75, the participants were tested in figuring out their ideas on the best solution for improving water security. The answer that resulted in almost 50% of the average response was equal participation of all consumers in water management planning. Egypt was conflicted with the four different answer choices and did not answer that majority of the participants rooted for. Jordan believed in the answer represented as the 50% average, with over 56% of Jordanian participants thinking that to be the best for improving water. The solution that the least number of participants chose was improved access to water, with an average of less than 15%.
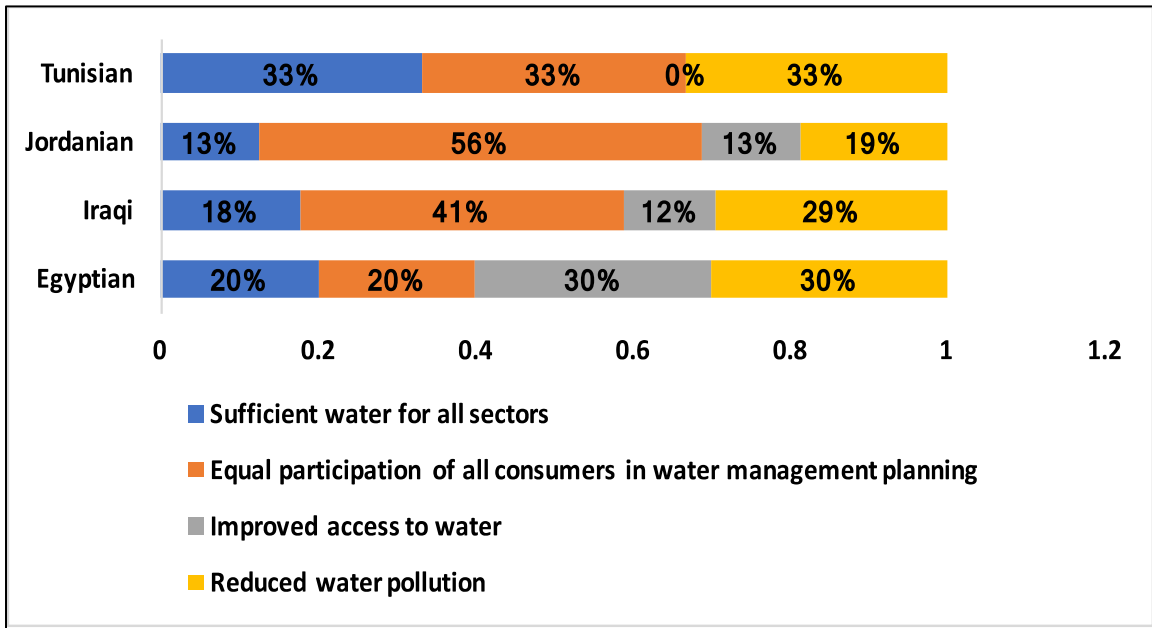
Figure 75. *In your opinion, what is the best solution for improving water security?*

As the survey continues to take a path into water-related risk mitigation, Table 18 highlights the participants' perceptions in the same way the past models did but focused on the mitigation measures. There were only two factors that the four countries remotely agreed on 50%; cooperation with neighboring countries and the declining water levels are

concerning. Most participants disagreed that their country did have enough water to meet its needs.

Table 18

Participants' Perceptions of Water-Related Risk Mitigation Measures

Statement	Nationlity	Strongly Disagree / Disagree	Neutral	Agree / Strongly Agree
My country uses more water than it needs.	Egyptian	50%	20%	30%
	Iraqi	18%	12%	71%
	Jordanian	76%	12%	12%
	Tunisian	0%	0%	100%
There is enough water to meet my country's needs.	Egyptian	90%	10%	0%
	Iraqi	24%	35%	41%
	Jordanian	94%	6%	0%
	Tunisian	67%	33%	0%
Declining water levels is a cause for concern.	Egyptian	0%	40%	60%
	Iraqi	0%	6%	94%
	Jordanian	0%	12%	88%
	Tunisian	0%	33%	67%
Reducing the amount of consumed domestic water would be difficult.	Egyptian	30%	20%	50%
	Iraqi	18%	18%	65%
	Jordanian	24%	6%	71%
	Tunisian	67%	0%	33%
There is enough water in my country/region to support agriculture now and in the future.	Egyptian	90%	10%	0%
	Iraqi	41%	18%	41%
	Jordanian	53%	41%	6%
	Tunisian	67%	33%	0%
There is enough water in our river basin to support our community now and in the future.	Egyptian	80%	0%	20%
	Iraqi	41%	29%	29%
	Jordanian	82%	12%	6%
	Tunisian	67%	33%	0%
It is essential to cooperate with neighboring countries in managing our shared water resources.	Egyptian	10%	0%	90%
	Iraqi	41%	0%	59%
	Jordanian	24%	6%	71%
	Tunisian	0%	33%	67%

Table 18 showed the similarities between the four countries is that they disagreed on many factors listed in the table such as:

1) Not enough water in their river basin to support their community now and in the future

2) Not enough water to support agriculture now in the future

This information allows the participants to verify their perceptions of the stakeholders responsible for ensuring their country has the proper water resources it needs. Table 19 highlights the participants' responses and those whom they believe their stakeholders have contributed to water security in their country. The majority of participants believe private and academic institutions have a very low contribution to water security. There were not any stakeholders that the participants who believed strongly in those institutions' contribution to water security. There are two stakeholders that 70% of Jordan's participants felt optimistic about: government institutions overseeing water and water utilities. This was an interesting answer to the high corruption happening across the MENA region and especially in Jordan.

Table 19.

Participants' Perceptions of Water Stakeholders Contributions to Water Security

Waer Stakeholders	Very Low/ Low	Neutral	High / Very High
Government Institutions Overseeing Water			
Egyptian	20%	50%	30%
Iraqi	71%	18%	12%
Jordanian	24%	6%	71%
Tunisian	67%	0%	33%
Water Utilities			
Egyptian	20%	30%	50%
Iraqi	65%	35%	0%
Jordanian	35%	0%	65%
Tunisian	67%	0%	33%
Non-governmental Organizations			
Egyptian	70%	20%	10%
Iraqi	53%	41%	6%
Jordanian	35%	24%	41%
Tunisian	67%	0%	33%
Private Sector			
Egyptian	70%	20%	10%
Iraqi	88%	12%	0%
Jordanian	41%	18%	41%
Tunisian	67%	0%	33%
Academic Institutions, Universities and Research Centers			
Egyptian	40%	30%	30%
Iraqi	47%	53%	0%
Jordanian	71%	12%	18%
Tunisian	67%	0%	33%
Regional Water Organizations			
Egyptian	20%	30%	50%
Iraqi	47%	35%	18%
Jordanian	53%	12%	35%
Tunisian	33%	33%	33%

The participants could continue expressing their perceptions of water mitigation across their country and the MENA region. Still, they were also asked to give their best prediction on the result of climate change (Figure 76). The majority of participants believed the result would be less water availability, while others thought there would be a significant difference in water availability between the years. This is important to understand the participants' situational awareness due to the high possibility and impact climate change will have on water security.
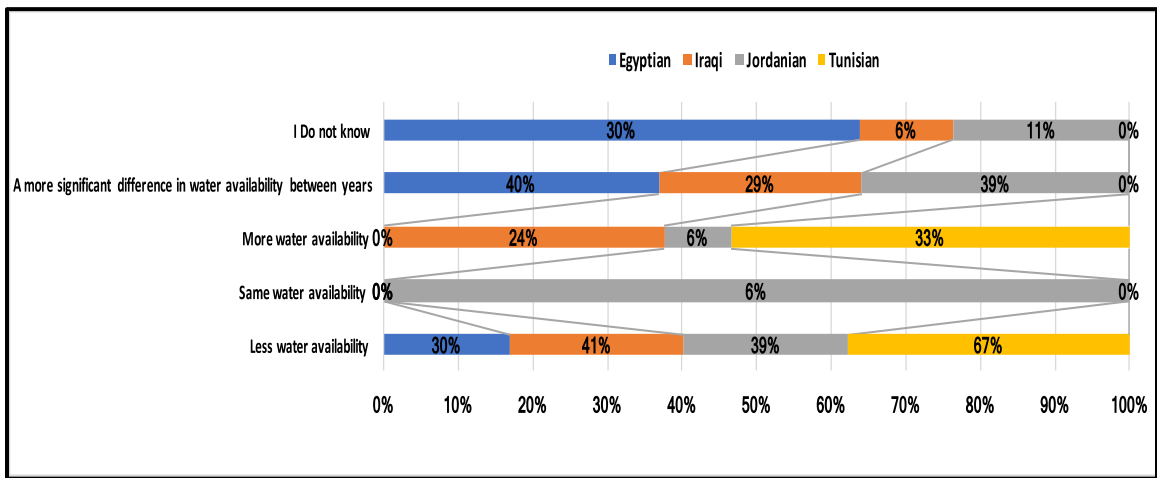
Figure 76. *What are your BEST predictions that will result from climate change?*

The last question through Section 6 allows the participants to decide whether this survey covered all water-related risks (figure 77). Most participants did not know or replied no, while a small minority answered yes. There are thousands of water-related risks; this dissertation could not cover, but participants could distinguish the most probable one throughout this survey.

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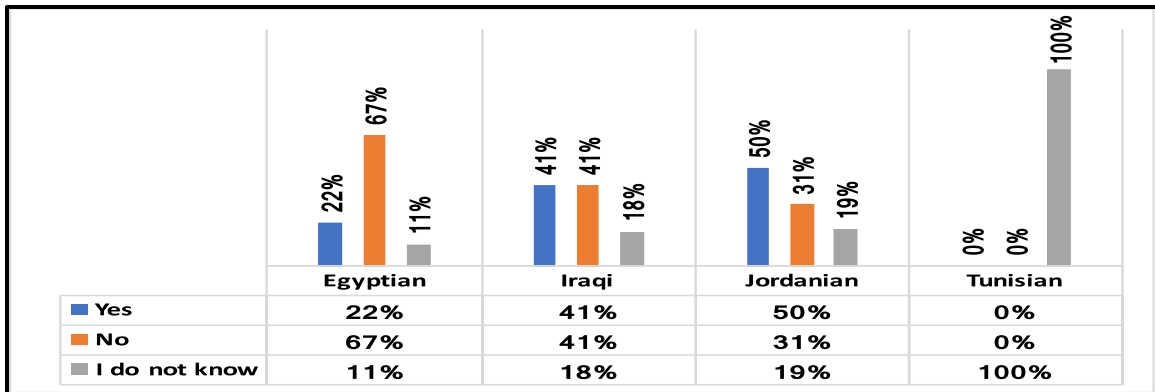
Figure 77. *Are there other water-related risks that you think are not covered?*

Conclusions

The comparative analysis between the four countries under consideration, Iraq, Tunisia, Egypt, and Jordan, has brought serious attention to the MENA region's water security environment. The dependent variables, water resource management, water service delivery, and water-related risk mitigation, allowed the participants to distinguish significant commonalities and differences between each section. Their answers reflected their ideas and demographic and national factors that reflected how they were raised.

Water Resource Management illustrated the comparative analysis between each set of countries, whether between Egypt and Tunisia, Tunisia and Jordan, or Egypt and Iraq. Tunisia showed the most united front within its responses, who strongly agreed with the factors indicated on water resource management. The similarities between each country continued to differentiate as each survey question was drawn, which could have been various factors. This could include the participants' responses were not fully aware, such as human error, or the questions were not fully understood. For the hypothesis to be proved, the demographics and national factors had to drive their water elites' perception.

Water Service Delivery assesses the importance of various factors in improving water service's Economic loss from the inadequate water supply was the factor all four countries believed would strongly affect water service delivery, with an average of 85% of participants answering "high/very high." Iraq and Tunisia continued to show similarities, even though their country's water service delivery processes differ entirely. The North African countries and Middle Eastern countries began to show similarities within their respective partners, such as Jordan and Iraq, and Tunisia and Egypt. Iraq and Jordan showed the most significant comparisons when participants questioned their perception of whether urban/rural water services were affordable.

Most participants believed that technology policy and institutional management are needed to achieve water security. Public participation and outreach in water-related issues showed the most difference across the four countries. Participants were split, believing this factor has either high or very low importance. This is due to the underlying problems each of their countries face within their territory, so most citizens don't believe important causes like water security should only be improved for the United Nations' sustainable development goals.

Water-Related Risk Mitigation dives into the varying comparisons and contrasts of each of the four country's participants' beliefs, such as climate change and peace in the MENA region. The four countries participants believe the following factors strongly affect water security: climate change; water stress resulted from surface water; and domestic social unrest. When participants were tested on hydro politics-related factors in risk mitigation, the only factor that a high percentage of all participants agreed on was anti-corruption and integrity measures improving water resources utilization.

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Tunisia showed a lack of similarity with the other three countries in the majority of risk mitigation factors. Still, it could be due to the close connection to water Tunisia has, unlike its counterparts. Egyptian participants were the only ones who favored international donors, exacerbating tensions over water security in the MENA region. Finally, most participants understood the risk of climate change and believed it would cause low water availability across the world.

Overall, the comparison between all four countries successfully identified differing patterns between the North African countries vs. the Middle Eastern countries. There was a difference in the scope of what the participants all believed, which allows the researcher to develop a new idea of why the participants chose to answer. Bringing a larger pool of respondents provides a deeper meaning to the scope and how the hypothesis will indeed be affected by the independent variable of background and nationality.

CHAPTER VII - CONCLUSION

This chapter presents a thorough assessment of the extent of the validity of the hypothesis under consideration, followed by an explanation of the significance of the scholarly contribution this dissertation represents. It also discusses opportunities for future research that build on it, followed by closing observations and policy recommendations.

The conclusions were built upon collecting and analyzing the data from the survey and interview participants from the four MENA countries (Iraq, Egypt, Jordan, and Tunisia) under consideration. The central research question was as follows. *To what extent, if any, are there significant similarities and differences between water elites' perceptions of the most critical factors affecting water security in the MENA region overall and in the countries within which they live therein specifically?* To help answer this research question, three relevant water security areas are examined: water resource management, water service delivery, and water-related risk mitigation. This arrangement helped in narrowing the focus of this dissertation.

Assessment of Hypothesis

The following section assesses the extent of the validity of the hypothesis, with its extended three areas examined in this dissertation. The hypothesis states that "*demographics and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service delivery, and water-related risk mitigation, in the MENA region overall and in the countries where they live therein.*" The hypothesis examined whether respondents from the four selected countries (Iraq, Egypt, Jordan, and Tunisia) have similar or different water security

perceptions in three topical areas: water resource management, water service delivery, and water-related risk mitigation.

Characteristics of the Typical Respondent (Water Elite)

This section illustrates the importance of water elitist and the characteristics they should have shown below:

1) National level experience in water-related issues.

2) Five years of experience in the water field in high-ranking professional positions.

3) Published conference presentations to their credit.

4) Active membership in relevant national, regional, and international organizations related to water issues.

The selected participants in this study were interviewed thoroughly, so the elitist water criteria were met by most of the interviewees. The selected MENA countries (Jordan, Iraq, Egypt, and Tunisia) have witnessed broader public stakeholder participation and a slow progression toward improving water security and sanitation.

As this dissertation's purpose was to illustrate a deeper meaning of water elites' perceptions of water security in the MENA region, the four countries chosen for this research have identified, explained, and analyzed national elites' contrasting perceptions in Jordan, Iraq, Egypt, and Tunisia. Each part of this analysis includes a brief synopsis of the research findings and discussions used to conclude.

Demographics of the Surveyed Water Elitist Respective Country

Before assessing all case studies the analysis of each country's participants is essential in determining the extent of the validity of the hypothesis. The hypothesis states

that demographic factors drive water elites' perceptions of their country and the MENA region.

Iraq's demographics were diverse in age range but not gender. There were 17 males vs. one female interviewee, but age ranges from 25/34 to 65+, respectively. Participants from Iraq did not have very high educational degrees outside of a 4-year college degree; only 3 out of 18 participants had a doctoral degree, which can explain some indifference and lack of knowledge of their perception of water security in the educational context. However, the majority of participants in Iraq had over 11 years of water experience. They had a wide range of jobs, such as chief engineer, chemist, and environmental consultant. Iraq's participants showed limited contributions in water-related research publications but a high commitment to water security organizations.

Egypt's participant demographics were not comparable to Iraq with a split gender contribution, 40% women, and 60% men. The age range was wide, with the median average of 35-44, unlike the median of 45-54 for Iraq. These age ranges will explain the level of experience to be higher in Iraq vs. Egypt, as there are younger participants in Egypt. Most Egyptian participants also had a doctoral degree and 11-20 years of experience in the water sector. Many Egyptian participants worked in water-related institutions as chief engineers, professors, chairman of the water company, and director of hydraulic analysis.

Jordan's demographics met in the middle of Egypt and Tunisia, with only 25% of participants with female identity and a median age of 55-64. Jordan also had the most diverse educational background, with a split of participants with college, doctoral, and master's degrees. Jordan also showed the most experience in all the four countries, with

over 60% of participants embodying over 20 years of experience. This analysis is essential to note because Jordan also had the highest percentage of participants compared to other countries. Jordanian participants also all had careers in water-related institutions.

Unlike any other country assessed in this dissertation, Tunisia's demographics were with the smallest number of participants. There were only 5 participants, but Tunisia had an even spread of gender and age. The median age was very young, with 60% of participants between 25-34 years old. This situation will affect years of experience, with most participants only having 0-5 years of water sector experience. All the Tunisian participants had master's degrees and jobs in water-related institutions. The division of Tunisia vs. the other countries is extensive and will play a massive role in analyzing the hypothesis. Throughout the case studies' comparative analysis, Tunisia showed the widest difference in thought than other participant countries.

Comparative Analysis of All Case Studies

As illustrated in the evidentiary chapters of the dissertation, great attention has been paid to identifying and selecting the case studies used in this dissertation and to ensuring that they are conducted using a rigorous and comprehensive methodology. After conducting the research, the information collected was distilled into the complete case study presentations found in Chapters 4 and 5. It was then grouped into the figure and tables in Chapter 6 to provide a visual method for comparing case studies and identifying key trends in the participants' perceptions towards the three dependent variables. The case studies to assess the extent of the validity of the hypothesis that "demographic and national factors drive water elites' perceptions of water security, as measured by perceptions of water resource management, water service provision, and water-related

risk mitigation, in the MENA region in general and in the countries they live in specifically. This information was then used to accept or reject the hypothesis by extracting the following three extended or sub-hypotheses derived from the central hypothesis:

- Sub-hypothesis 1: Demographic and national factors drive water elites' perceptions of water security, as measured by water resource management perceptions.

- Sub-hypothesis 2: Demographic and national factors drive water elites' perceptions of water security, as measured by perceptions of water service delivery.

- Sub-hypothesis 3: Demographics and national factors drive water elites' perceptions of water security, as measured by water-related risk mitigation measures.

Based on the results of the cross-tabulation of survey and interview questions, the data provide evidence that the perceptions of participants from each country have significant commonalities and differences within each of the three topics.

Individually, each respective country's participants were split in responses from the overall MENA region's water security knowledge question in the survey. Each country's participants had uniform responses when asked if they believed water security was a concern in their country and the MENA region. This section's hypothesis is deemed accurate, with all participants' ideologies and perceptions resulting from their demographics and national factors. The analysis can be illustrated by assessing three

foundational concepts of water security; water resource management, water service delivery, and water-related risk mitigation.

The utility of semi-structured interviews was already demonstrated early in the study. The preliminary study also showed that the follow-up interview process was fruitful from a research validation perspective and represented a meaningful exercise for the interviewees themselves.

Water Resource Management

The first Sub-hypothesis examined whether the demographic and national factors drive water elites' perceptions of water security, as measured by water resource management perceptions. This sub- hypothesis was tested by administering 10 questions addressing water demand management, water supply, and water reallocation. The data provided strong evidence in support of the first sub-hypothesis in the four selected MENA region countries. It was apparent in all water resource management facets such as efficiency, sustainability, diversification, water source (ground and surface), and recycling.

Water Resource Management illustrated the incomparable and similar characteristics of each country within the MENA region. There were many instances during the study where some countries exhibited common responses to one question but provided disparate responses a question later. Tunisia had the most cohesive interviewee list, in terms of shared views on many of the questions, but that can be partly due to the small number of overall Tunisian participants compared to the other countries.

Water Resource Management aims to promote the coordinated development and management of water, land, and related resources; therefore, the participants were tested

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to understand what is most important when it comes to Water Demand Management

Practices. The similarities shown through perceptions regarding statements such as

"Water Service Fees and Pricing should reflect the extent of water scarcity and promote

conservation," conveyed key similarities between Iraq and Tunisia, and Egypt and

Jordan. Egypt and Tunisia showed the most comprehensive array of differences, which

coincides with a significant difference in demographics the participants embody.

The younger array of Tunisia participants has shown robust agreement to many

statements that identify a problem with water security. The countries with the highest

years of water experience, Jordan and Egypt, showed great morale and understanding of

the demand for efficient water supply and the definition of water scarcity. The country

with the lowest degree of education showed the perception of "somewhat important" and

"very low" when asked their opinion on the conventional/non-conventional water

resource development and influence of women/youth in water security. These findings

add to the conclusion of demographics/national factors playing a significant role in water

elite perceptions of water security in their country and the MENA region.

Water Service Delivery

The second Sub-hypothesis examined whether demographic and national factors

drive water elites' perceptions of water security, as measured by perceptions of water

service delivery. Water service delivery has various facets, such as customer orientation,

affordability, public-private partnership, reliability, and financial sustainability.

This hypothesis was tested by administering four questions addressing urban water

service; rural water service delivery; adequacy and reliability of water supply; public

participation and outreach; economic losses; the intra-state conflict; water cost recovery

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level; the social compact between government and citizens; institutions understanding of citizens' expectations; adopting anti-corruption measures; and hydro-diplomacy and regional cooperation in river basin management. Furthermore, it tested the water service delivery strategies such as integrated urban water; quality and reliability of urban and agricultural water services; the development of non-conventional water resources; the use of treated wastewater for agricultural use; and managed aquifer recharge; and desalination water technologies; data collection and monitoring. The data provides strong evidence in support of the first sub-hypothesis in the four selected MENA region countries.

Water service delivery across the four countries was the most similar result within the three fundamental topics. Economic loss from the inadequate water supply was the factor most participants believed was a reason for inefficient water service delivery. The North African and Middle Eastern countries showed comparisons when interviewees were asked about water affordability. Iraq and Jordan did not believe their services were affordable, which would comply with the very high rates that lead to unemployment and closes of businesses across these two states.

The MENA countries showed similarities within their respective partners concerning water service delivery. Jordan has the most participants with the most experienced elites, and the country's participants were split in their perspectives on many of the questions asked about water service delivery. This was the same for the Iraqi participants, who had an identical percent of responses as Jordan. The African countries showed the most contrast, even though they are both the closest in the distance and socio-economic classes. In most of the statements assessed, Egypt and Tunisia had

incomparable responses, such that 100% of Egyptians believed their country urban water service delivery improved, but only 33% of Tunisians believed the same.

The four countries, Egypt, Jordan, Tunisia, and Iraq, did not develop a pattern with the responses in water service delivery statements. A wide array of differences continued to occur and validated the concept of the hypothesis and its extended sub-hypotheses. The hypothesis is proven that each country had incomparable responses, even though the demographics might have been the same. Tunisia showed the most disunity, and Egypt showed the most unity. There were instances where all four countries believed in all the ideas presented related to improving water services coinciding with the perception that similarities can be drawn with varying demographic principles.

Water-related risk mitigation

The third sub-hypothesis examined whether demographics and national factors drive water elites' perceptions of water security, as measured by water-related risk mitigation measures.Water-related risk mitigation has various facets, such as conflict and migration, food security, climate change, and transboundary waters.

This hypothesis was tested by administering six questions addressing various water-related risks such as climate change, water stress; domestic social unrest; weaponizing water in conflict; regional cooperation; virtual water, reliance on transboundary water, and refugees' influx, anti-corruption, and integrity measures. Potential solutions for improving water security were addressed in these questions, such as sufficient water for all sectors; improved water supply overall; equal participation of all water stakeholders; and reduced water pollution. Participants were asked about their perceptions of water sufficiency for their countries' needs, water balance, and cross-border water cooperation.

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They were also asked about water stakeholders' performance levels, such as government institutions, water utilities, non-governmental organizations, private sector, academic institutions, and regional water organizations. Finally, participants were asked about the impact of climate change on water security regarding water availability. The data provides strong evidence in support of the third sub-hypothesis in the four selected MENA region countries

This area drove into the continued contrasts of each of the four country's water elitist perceptions. One issue on which elitists agreed was climate change efforts and world peace without war. Each country's background has included some political war or domestic social unrest, so the increase in water inefficiency coincides with factors that allowed water scarcity to occur.

The hypothesis was tested and proven in this section because four countries, with similar national factors, believed in the same three factors that strongly affect water security: climate change; water stress resulted from surface water; and domestic social unrest.

These three factors are highlighted in 90% of participant feedback from each country, which indulges in the idea of the MENA region's most enormous problem the war and crisis occurring across all the nations have caused scars that continue years after the wars were ended. National factors were a variable included in the hypothesis because even though demographics may be different, the countries in this research study have very similar national histories.

Tunisia showed the largest contract between all three countries, attesting to the varying demographic background behind each of the Tunisian participants. Tunisia has

the youngest age range with the least amount of water experience, which aligns with the idea of not fully encompassing the water sector's broad and intricate nature. The majority of participants disagreed that their country has enough water to meet its needs. Overall, the comparison and contrasts between all four countries successfully identified and supported the hypothesis of demographics and national factors driving the water elite's water security perceptions.

Future Research and The Study's Scholarly Contribution Significance

The researcher notes that there are many future research opportunities with the potential to build on this dissertation. Research is needed in various MENA countries to provide a comparative assessment with the findings obtained in Iraq, Egypt, Jordan, and Tunisia. At a starting point, this should include countries that share many of the same demographic, cultural, and water resources characteristics and challenges. The researcher proposed countries that are mostly adjacent to the four selected countries, as shown in table 20.

Table 20

Proposed MENA Countries for Future Comparative Water Elite Research

Current Selected Countries	Proposed Arab Countries	Proposed Non-Arab Adjacent Countries
Iraq	Syria	Turkey, Iran
Egypt	Sudan and Libya	Ethiopia
Jordan	Palestinian Territories and Saudi Arabia	Israel
Tunisia	Algeria	NA

This proposed selection of countries will provide unique opportunities to examine further how water elites in these countries perceive water security in relation to water

resource management, water service delivery, and water-related risk mitigation approaches.

Future research should also compare and contrast the water elites' perceptions of water security in other non-Arab adjacent countries such as Iran, Turkey, and Ethiopia (Table 1). This situation is critical, as these countries have access to the major rivers and tributaries such as Tigris/Euphrates and the Nile Rivers. They are building dams, which many Arab countries claim allow unfair distribution of water resources, which might cause conflict in the MENA region.

The researcher found out that this dissertation would inspire the further analysis of the water sector's corruption risks at both the MENA and regional levels. .The analysis could include: assessing the effects of anti-corruption measures, defining corruption indicators, and combating corruption such as improving government oversight.

As mentioned in the study, the term "Water Elites" remains a new research subject. That has not been covered in the water-related studies. In looking at ways to advance this topic in water literature, this should be further examined using creative methods to identify and analyze the level of interaction, knowledge, and influence of these water elites.

Closing Observations and Policy Recommendations

This research's findings provide practical recommendations for policymakers and service providers looking to promote water security in their respective countries in particular and the MENA region in general. This situation will also reduce the water insecurity perceptions in their countries.

As a concept, water security is open to multiple interpretations, and here the researcher has identified different approaches to the subject from different perspectives. The main topics covered include the interrelated variables of water resource management, water service delivery, and water-related risk mitigation; the dimensions of the non-military and international relations related to water security.

Water security is a multi-faceted discipline, going beyond mere balancing technical and hydro-political factors. The interlinkages between water, food, energy nexus and nexus water, technology, and human capital are understood but not sufficiently reflected in policies and practices. For example, the MENA region countries failed to acknowledge that human activity is intrinsic to the water cycle, necessitating a more flexible and dynamic approach. Professional water elites should engage effectively, starting from simple water balance concepts to human-impacted water systems. Water elites can predict water insecurity and inform appropriate action. Water security signifies a "safe operating subspace" within the three-pronged water security areas discussed in the dissertation: water resource management, water service delivery, and water-related risk mitigation.

Lessons Learned

The data collection was a significant challenge. This covers both the online survey and follow-up interviews. The survey was initially developed and approved by the dissertation committee and the IRB. It was then uploaded on Survey Monkey. The researcher envisioned utilizing the Arab Countries Water Utilities Association as the primary channel to disseminate the survey. Though there was close coordination between the researcher and the ACWUA team during the inception, the number of the collected

surveys was not enough for the study. As a result, the researcher initiated communication with his professional network via email and social media.

Consequently, more surveys were collected. One of the Iraqi respondents recommended having the survey translated into Arabic that might increase participation. Therefore, the researcher, whose native language is Arabic, took the initiative, translated the survey into Arabic, and posted it on Survey Monkey Platform. This increased participation significantly, mainly from Iraq and Tunisia. The process was challenging and time-consuming (April –September 2020), requiring flexibility, responsiveness, resiliency, and full engagement. The participation level would have been increased significantly if the survey was developed in three languages (Arabic, English, and French) as it will reach out to more potential professional respondents from an early stage. English is the first foreign language in Iraq, Jordan, and Egypt, whereas French is the first foreign language in Tunisia.

Regarding the follow-up interviews, it was another major challenge. During the survey collection, many respondents indicated their readiness to participate in the follow-up interviews. Some of them provided clear and correct contact information, but others either provided the information partially or left it blank. The researcher initiated communication with those respondents with full contact information. The responsiveness level was not as expected. Amongst the reasons that respondents

Three of the four countries (Iraq, Jordan, and Egypt) have totalitarian regimes. A concept prohibits opposition parties, restricts individual opposition to the state and its claims, and exercises a too high degree of control over public and private life (Schafer, 2004). They require certain elite groups to support their agendas. Therefore, these

countries' current water elites play critical roles in communicating the regime's agenda to their citizens. Therefore, the level of credibility and trustworthiness of these elites might be of question. The researcher expects that there are other water professionals of high credibility who are not favored by the regimes, who can lead in a variety of roles in improving the water security in their respective countries and the region. The dominant culture dimensions in the MENA region could shed the light on this social phenomenon. Arab co be more collectivist societies prefer tightly-knit social framework in which maintaining harmony is of a paramount importance (Hofstede, 2015).

Furthermore, most MENA region countries' power distance dimension suggests that leaders and followers might endorse society's level of inequality. (A bit more clarity needed in articulating this point and its implications.) According to Hofstede's Model, there is a high level of power distance in these societies, as they have a hierarchic social structure and individuals have their place without any meritorious justification (2011). Consequently, it would be beneficial to address cross-cultural issues that might limit water elites' abilities in relevant research. In addition, researchers should consider that the MENA region countries are high context cultural societies with distinctive cultural dimensions. Such efforts will assist researchers in selecting the most effective and efficient approach to approach this socio and hydro-political phenomenon.

Finally, the investigation of the concept of water elites increased the originality of the study. This concept and its effects on water security remain unfamiliar to many researchers in this field. Therefore, this dissertation's findings could attract other water security researchers' attention. Potential benefits of such research can lead into

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conducting a systematic and innovative regional and global analysis of water elite's

formation as a stratum amongst other elite groups.

The security dimensions of MENA's water security are obvious. Nevertheless, the

research literature on human actors who have disparative impact on these dimensions is

very limited. This dissertation will open the door for other researchers to consider those

who qualify water elites as a main group within the other elite group and how they

interact with them. Also, such water elites can be studied hierarchically aligned through a

variety of professional water-related disciplines such as climate change, hydro-

diplomacy/hydro-politics, environmental security, water resource management, water

utilities, hydrology, etc.

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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.
- Face-to-face data collection will not commence until USM's IRB modifies the directive to halt non-essential (no direct benefit to participants) research.

PROTOCOL NUMBER: IRB-20-93
PROJECT TITLE: WATER ELITES' PERCEPTIONS OF WATER SECURITY IN THE MIDDLE EAST AND NORTH AFRICA REGION
SCHOOL/PROGRAM: School of SSGS, Political Science and Legal St
RESEARCHER(S): Ghaleb Akari, Robert Pauly

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
> 6. Collection of data from voice, video, digital, or image recordings made for research purposes.
7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: April 1, 2020

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

APPENDIX B –Survey Instrument

International Development Doctoral Program

University Of Southern Mississippi

Self - Administered Survey

Water Elites' Perceptions of Water Security In The Middle East And North Africa

Region

Terminology:

Please read the following so that you become more acquainted with two specific terms

used in this questionnaire survey.

The term <u>Water Security</u> is used in this survey to refer to specific concepts that are based

on the following two definitions:

- *Water Security is the reliable availability of an acceptable quantity and quality of*

  water for production, livelihoods and health, coupled with an acceptable level of

  risk to society of unpredictable water-related impacts" (Grey and Sadoff 2007).

- *"The capacity of a population to safeguard sustainable access to*

  adequate quantities of acceptable quality water for sustaining livelihoods, human

  well-being, and socio-economic development, for ensuring protection against

  water-borne pollution and water-related disasters, and for preserving ecosystems

  in a climate of peace and political stability." (UN-Water 2013)

<u>Elites:</u> "A select group that is superior in terms of ability or qualities to the rest

of a group or society" (Oxford Dictionary 2019). This survey addressing a

specific group that is related to the water-related issues. This group is

referred to as "National Elites".

Survey Structure:

The survey consists of five sections:

I. Participant Demographics Background (Questions 2-11)

II. General Water Security Knowledge and Perceptions (Questions 12-18)

III. Water Resource Management (Questions 19-28)

IV. Water Service Delivery (Questions 29-33)

V. Water-Related Risk Mitigation (34-39 Questions)

I Participant Demographic Background

1. Gender (Male/ Female)? (Select One)

   o Male

   o Female

2. Age

   o 25-35 years

   o 36-45 years

   o 46-55

   o >56 years

3. How long have you worked in the water sector in your country?

   o 0-5 years

   o 6-10 years

   o 11-20 years

o >20 years

4. What is your occupation (write the institution if applicable)?

_____

5. Please select ONE nationality that applies to you?

Iraqi	Jordanian	Tunisian	Egyptian	Other

6. What is your educational background? (Select One)

o College (4 years)

o Master Degree

o Doctoral

7. Select <u>up to three</u> languages that you can communicate with professionally.

o Arabic

o English

o French

o Other. Specify……………………….

8. Have you published any water-related research during the last five years? (Select

One)

o Yes

o No

o I do not know

9. Are you a member of a national, regional, international professional groups or organizations that are involved in the water and sanitation?   (Select One)

- o Yes

- o No

- o I do not know

If you answer yes in the above question, please indicate up to three name(s) of this(ese) organization(s)

- o _____

- o _____

- o _____

10. Are you interested in participating in a short follow-up interview in a later stage? (Select One)

- o Yes

- o No

If your answer is "yes" please provide your name and contact information such as Skype, WhatsApp, or Facebook messenger.

Communication Tool	
Name	
SKYPE	
WhatsApp	
Facebook Messenger	

General Water Security Knowledge And Perceptions

11. I rate my knowledge of water security in my country in the following terms. (Select One)

Very Little	Little	Neutral	High	Very High
1	2	3	4	5

12. I rate my knowledge of water security in the Middle East and North Africa Region overall as follows. (Select One)

Very Little	Little	Neutral	High	Very High
1	2	3	4	5

13. I consider water a national security issue. (Select One)

- o Yes
- o No
- o I do not know

14. What is your overall assessment of water security in your country? (Select One)

Not Important	Somewhat Important	Neutral	Important	Very Important
1	2	3	4	5

15. What is your overall assessment of water security in the Middle East and North Africa Region? (Select One)

Not Important	Somewhat Important	Neutral	Important	Very Important
1	2	3	4	5

16. Have you had any direct participation in decision-making within any large large-scale private and public water organizations? (Select One)

- o Yes

- o No

- o I do not know

17. Do you consider yourself one of the water elites in your country based on the definition of "elite" provided at the first page of this questionnaire? (Select One)

- o Yes

- o No

- o I do not know

Water Resource Management

Water Demand Management

18. Please indicate your level of agreement with the following statements. (Select One in Each Row)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Water service fees and pricing should reflect the extent of water scarcity and promote conservation.	1	2	3	4	5
Incentives and technologies should be utilized to enhance productivity and efficiency.	1	2	3	4	5
Control of losses and leakage is essential.	1	2	3	4	5

Water Reallocation,

19. Please indicate your level of agreement with the following statements. (Select One in

Each Row)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Planning and prioritization of high- value water usages should be in balance with safeguards for social equity and stability.	1	2	3	4	5
Water rights, subsidies, and pricing policies are re-allocated fairly.	1	2	3	4	5
Regulations and enforcement should be established and implemented to control unplanned overexploitation of water.	1	2	3	4	5

Water Supply

20. How important is each of the following conventional and non-conventional water

resources' development methods in meeting water demand supply. (Select One in

Each Row)

Statement	Not Important	Somewhat Important	Neutral	Important	Very Important
Coordinated use of surface and groundwater	1	2	3	4	5
Development of wastewater recycling and reuse	1	2	3	4	5

21. Do you believe increased institutional coordination among water, energy and agricultural sectors would strengthen water management efforts? (Select One)

   o   Yes

   o   No

   o   I do not know

22. Do you believe public-private partnership is an effective approach to tackle the operational constraints of water utilities? (Select One)

   o   Yes

   o   No

   o   I do not know

23. In general, how would you rate the influence of social inclusion (women and youth) on water security in your country? (Select One in Each Row)

Group	Very Little	Little	Neutral	High	Very High
Women	1	2	3	4	5
Youth	1	2	3	4	5

Water Service Delivery

24. Do you believe your country's urban water service delivery has improved over the last five years? (Select One)

   o Yes

   o No

   o I do not know

25. Do you believe your country's rural water service delivery has improved over the last five years? (Select One)

   o Yes

   o No

   o I do not know

26. Please indicate your level of agreement with the following statements. (Select One in Each Row)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Urban Water services are affordable.	1	2	3	4	5
Rural Water services are affordable.	1	2	3	4	5
Drinking water supply is adequate and reliable.	1	2	3	4	5

27. How do you assess the importance of each of the following factors in improving water service delivery? (Select One in Each Row)

Factors	Very Low	Low	Neutral	High	Very High
Public participation and outreach in water-related issues.	1	2	3	4	5
Customer service level.	1	2	3	4	5
Economic losses from inadequate water supply.	1	2	3	4	5
The effects of intra-state conflict.	1	2	3	4	5
Water cost recovery level.	1	2	3	4	5
Strengthening the social compact between government and citizens.	1	2	3	4	5
Institutions understanding of citizens' expectations concerning water services.	1	2	3	4	5
Adopting anti-corruption measures in the water sector institutions.	1	2	3	4	5
Hydro-diplomacy and regional (bi-lateral and multi-lateral) cooperation in river basin management (For example: Tigris-Euphrates, Nile, Jordan, and Medjerda Rivers).	1	2	3	4	5

28. Please indicate your level of agreement with the following statements/strategies to improve water services.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Integrated urban water management is recommended improve quality and reliability of urban and agricultural water services.	1	2	3	4	5
The development of nonconventional water resources is recommended to improve quality and reliability of urban and agricultural water services.	1	2	3	4	5
The use of treated wastewater for agricultural use or managed aquifer recharge is recommended to improve quality and reliability of urban and agricultural water services.	1	2	3	4	5
Desalination water technologies play an essential role in addressing water scarcity.	1	2	3	4	5

It is essential to improve data collection and monitoring to help for example towards United Nations' Sustainable Development Goal 6 (SDG6).	1	2	3	4	5
Technology, policy and institutional management are needed to achieve water security.	1	2	3	4	5
Water insecurity has a significant negative effects on the political, economic and environmental stability of the MENA region.	1	2	3	4	5

WATER-RELATED RISK MITIGATION

29. Please indicate your level of agreement with the following statements to improve water services.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Climate change affects water security.	1	2	3	4	5

Water stress resulted from surface water has a significant impact on water security.	1	2	3	4	5
Water stress (*lack of fresh water resources to meet water demand*)) resulted from underground water has a significant impact on water security.	1	2	3	4	5
Lack of water supply causes domestic social unrest.	1	2	3	4	5
Water and water systems are used as weapons in conflicts.	1	2	3	4	5
Water and water systems are targets or casualties of violence.	1	2	3	4	5
Regional cooperation on water issues strengthens trust and collaboration.	1	2	3	4	5
Water-related NGOs play an important role in peace and stability in the MENA region.	1	2	3	4	5
Virtual water *(amount of water needed to produce different goods*	1	2	3	4	5

and services) strengthens water and food security simultaneously.					
Reliance on shared transboundary water (surface and underground) is essential.	1	2	3	4	5
The effectiveness of bilateral and multi-lateral water transboundary agreements (water diplomacy) depends on the extent to which they are constructive, transparent and equitable.	1	2	3	4	5
The influx of refugees causes tension and has negative effects on water security in the host countries involved.	1	2	3	4	5
International donors exacerbate tensions over water security in the MENA region.	1	2	3	4	5
International organizations play a constructive role in strengthening and improving the water sector in the MENA region.	1	2	3	4	5

Ani-Corruption and integrity measures improves the utilization of water resources.	1	2	3	4	5

30. In your opinion, what is the best solution for improving water security? (Select One)

- o Sufficient water for all sectors

- o Equal participation of all consumers in water management planning

- o Improved access to water

- o Reduced water pollution

31. Please indicate your level of agreement with the following statements regarding water in your country. (Select One in Each Row)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My country uses more water than it needs.	1	2	3	4	5
There is enough water to meet my country's needs.	1	2	3	4	5
Declining water levels is a cause for concern.	1	2	3	4	5

Reducing the amount of consumed domestic water would be difficult.	1	2	3	4	5
There is enough water in my country /region to support agriculture now and in the future.	1	2	3	4	5
There is enough water in my country to support the industry now and in the future.	1	2	3	4	5
There is enough water in our river basin to support our community now and in the future.	1	2	3	4	5
It is essential to cooperate with neighboring countries in managing our shared water resources.	1	2	3	4	5

32. How do you assess the performance of each of the following stakeholders in fulfilling their responsibility for protecting water quality and quantity in your country? (Select One)

Statement	Very Low	Low	Neutral	High	Very High	I do not Know
Central government	1	2	3	4	5	

Provincial government (governorates)	1	2	3	4	5	
Local government (municipal councils)	1	2	3	4	5	
Non-Governmental Organizations	1	2	3	4	5	
Private Sector	1	2	3	4	5	
Academic Institutions (universities, research centers)	1	2	3	4	5	
Regional Water Organizations	1	2	3	4	5	

33. What is your BEST predictions that will result from climate change (Select One)

Climate Change Results	
Less water availability	
Same water availability	
More water availability	
A more significant difference in water availability between years	
Do not know	

34. Are there other water-related risks that you think are not covered under this survey?

   (Select One)

o   Yes

o   No

o   I do not know

If you answer "Yes" what are they?

_____

_____

Date ………………………………

Thank you for your Participation.

APPENDIX C – Interview Instrument

1. How would you describe water elites in general?
2. How knowledgeable do you think your country's water elites about the following water security issues?
   – Water resource management
   – Water service delivery
   – Water-related risk mitigation
3. What do you think are some of the water elites' perceptions of water security sustainability for each of the following?
   – water allocation
   – water supply
   – Water demand management
4. What technologies do you think can improve the water balance in your country and the MENA region?
5. What do you consider the most effective methods to deliver affordable water services?
6. What are the three highest risks that might have negative effect on water security in your country and the MENA region?
7. Do you think current water stress can cause domestic social unrest in your country? How?
8. Do you think the current bilateral and multi-lateral transboundary water agreement contribute in improving the water security in the MENA region?
9. Do you think there is an impact of climate change on the water security in your country and the MENA region?
10. What do you consider the most important water stakeholder in water security?

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