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Jordan in Deep Water:

Calling for an effective governance structure to address scarcity

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And most sincerely, I am indebted to my parents and siblings for the endless inspiration, confidence and affection.

"There is a water crisis today. But the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people - and the environment - suffer badly."

World Vision

ABSTRACT

Jordan is one of the top water poorest countries in the world, situated in a regional system characterized by instability. This paper aims to analyze Jordan's water scarcity through a case-based study from multiple governance angles, and asks the following research question: does water governance hold the key to improve Jordan's water scarcity? To answer this question, the paper first attempts to give an overall view of the scale of Jordan's water scarcity, including a brief look into the external factors that contribute to Jordan's water scarcity, then mainly analyzes Jordan's water governance structure through looking at the role of the main institutions, private sector and the international community involved in the water sector. Additionally, although this research paper does not provide a detailed analysis of possible solutions or recommendations, this paper claims that there are shortcomings in the focus of Jordan's water governance and finds out that there is more attention given to the supply side than the demand side. The research conducted in this paper makes an original empirical contribution because most of the literature works found on Jordan's water problems look at external factors such as climate change and population growth, while very few analyze the governance structure of the water sector. This paper argues that while external causes play a significant role in aggravating Jordan's water scarcity, the weak water governance performance has a bigger impact on water problems.

Key words: water governance, water scarcity, climate change, refugees, Jordan, MENA

Table of Contents

Electronic Signature I
Acknowledgement II
Abstract III
Figures V
Maps V
Tables V
1. Introduction 1
1.1 Background 1
1.2 Research Design 2
2. Literature Review 4
2.1 Water Scarcity 4
2.2 Water Governance 6
2.2.1 Effective Water Governance 8
3. Case Study: Jordan 10
3.1 Nature and Scale of Jordan's Water Challenge 10
3.2 Jordan's Water Governance Structure 20
3.2.1 Centralized Institutions 20
3.2.2 Lack of strong Private Sector Participation 21
3.2.3 Dependency on the International Community and Donors 23
3.2.4 Water Loss 24
4. Empirical Discussion 25
4.1 Analysis 25
4.2 Shortcomings in Jordan's water governance policies 30
5. Conclusion 33
6. Bibliography 36
7. Annexure 1 41
7.1 Thesis Report 41

FIGURES

Figure 1: Total Estimated Available Water From 2010 14
Figure 2: Distribution Of Gross Domestic Product (Gdp) Across Economic Sectors From 2008 To 2018 In Jordan 16
Figure 3: Main Institutions In The Water Sector 21
Figure 4: Effective Water Governance Structure 28

MAPS

Map 1: Map Of Jordan With Main Water Utilities 13

TABLES

Table 1: Estimated Water Use In Jordan By Sectors For 2020 And 2040 In Mcm/Year 15
Table 2: Some Potential Impacts Of Climate Change On Water 17
Table 3: Population Of Jordan Over Time, With An Eye On Regional Political Events 19

List of Abbreviations

BOT:	Built-operate-transfer
FAO:	Food and Agriculture Organization
GDP:	Gross Domestic Product
GIZ:	German Economic and Development Co-operation
IPCC:	Intergovernmental Panel on Climate Change
JVA:	Jordan Valley Authority
MENA:	Middle East and North Africa
MOPIC:	Ministry of Planning and International Cooperation
MWI:	Ministry of Water and Irrigation
NGO:	Non-governmental Organization
OECD:	Organization for Economic Co-operation and Development
PMU:	Project Management Unit
SDG:	Sustainable Development Goal
UNDP:	United Nations Development Programme
UNESCO:	United Nations Educational, Scientific and Cultural Organization
UNFCCC:	United Nations Framework Convention on Climate Change
UNICEF:	United Nations Children's Fund
USAID:	United States Agency for International Development
WAJ:	Water Authority of Jordan
WB:	World Bank
WHO:	World Health Organization

1. INTRODUCTION

1.1 BACKGROUND

They say water has memory, and if it can write and speak it would explain the universe to us. Indeed, water is the center piece of all life, it is universal and essential. Water availability and access to it are the some of the greatest concerns to all living organisms and institutions. Water covers 70% of our planet and it is easy to think that water is abundant; however, 1.1 billion people worldwide lack access to water and 1.7 billion persons are water scarce.[1] Human populations have controlled many of the natural waterways to allow civilizations to grow, but water systems are increasingly stressed and drying up.

Water shortages have been a constant problem in the Middle East and North Africa (MENA) and other parts of the world, but the Arab countries are lacking behind. The MENA region is home of 7.6% of the world's population but has only 1.4% of the world's freshwater.[2] One of the poorest water countries in the MENA is the Kingdom of Jordan. In 2015, the available fresh water was around 780 million m^3, while water demand for the same year was 1400 million m^3.[3] The long-term periods of droughts, the impacts of climate change, and the political instability since 1948 in the region with the continuous influx of refugees have further exacerbated Jordan's water scarcity. Moreover, much of Jordan's water supply comes mainly from surface water and then groundwater. However, due to the high population and low water availability, the aquifers have been over exploited. Jordan's water deficit has been accompanied by inefficiency in administration and management and deteriorating water supply networks. Responding to the water problem requires integrated effective approaches that address technical, political and practical challenges.

Academics, ministries, donors and other actors all agree that Jordan is facing water scarcity, but they disagree on the vital causes of water scarcity. The United Nations Development Programme

[1] "Water Scarcity," Organization, World Widelife Fund, accessed May 15, 2020.
[2] Hussein Al-Rimmawi, "Middle East Chronic Water Problems: Solution Prospects," *Canadian Center of Science and Education* 2, no. 1 (May 3, 2012): 28.
[3] "Jordan Water Sector Facts & Figures" (Amman: Ministry of Water and Irrigation, 2015), Facts.

(UNDP) explains that water crisis is largely of our own making; resulting not from natural limitations of water but is rather from deep failures in the water governance.[4] While there are several factors that lead to water scarcity, this paper focuses on water governance, and asks the following guiding question: does water governance hold the key to improve water scarcity?

The paper attempts to analyze the importance of incorporating an effective water governance that is needed to decrease and stabilize water scarcity and avoid complete water crisis. Water issues can be addressed from various perspectives; there are natural problems such as climate change's effect of precipitation, evaporation and droughts, socioeconomic and political problems that add stress on the limited water resources, and other structural internal problems that deal with fragmentation of responsibilities, knowledge, and practicality within the governance structure of the water sector. This research adds on the water literature of Jordan by explaining those various challenges to Jordan's water governance and goes further by arguing that water governance deserves more attention to address long term water scarcity. The paper does not intent to offer a comprehensive review of water governance literature, but to identify trends and challenges that highlight the importance of adopting a coherent internal governance structure.

1.2 RESEARCH DESIGN

The overall research question tackled in this study is

Does water governance hold the key to improve scarcity?

This research paper has adopted a case-based research as its methodological approach. The reason behind this approach is to analyze and investigate a class of events of interest with the aim to develop theories and generic knowledge on the impact of the causes of the class of events on the water security. There is a good amount of research done that could be found on Jordan's water scarcity but only takes a singular lens and is interested in a single external variable, such as climate change or refugees' influx impact.

[4] "Effective Water Governance: The Key to Sustainable Water Management and Poverty Eradication," UNDP (2007b**), quoted in** Charles Batchelor, "Water Governance Literature Assessment" (IIED, 2007), 1.

Despite being case-focused, the intention of this research is not to limit the exploratory variables to Jordan only. The research does not necessarily define a case as a "country observed during a period of time"[5], but can also stand for a population of cases and is not "directly representative". The case is broader than itself; the populations can be understood as a region, e.g. the Middle East, or other water scarce countries surrounded characterized by poor governance structure. The research can also be expanded into a comparative case study, such as a comparative analysis between water scarce countries, for example Lebanon, where a researcher can study the similar/different existing water governance structures and how they lead/avoid water insecurity. In addition, the case of Jordan studied in this paper could be considered a deviant case as it tries to probe new or left-out explanations and variables. The justification of the use of a case-based research in this paper is causal; to explore causal governance mechanisms of water scarcity in a single case.

The analysis done in this paper is based on qualitative research. Primary data was obtained from the main institutions of the water sector, including the Ministry of Water and Irrigation (MWI) and the Water Authority of Jordan (WAJ). Secondary sources include data gathered from reports done by the World Bank (WB), the German Economic and Development Co-operation (GIZ), the United States Agency for International Development (USAID), the Organization for Economic Co-operation and Development (OECD) and other international organizations and non-governmental Organization (NGOs) in Jordan and abroad. In addition, for interview statements, online news outlets were used. Other data was obtained from relevant scholarly work.

The main limitation to this research is the lack of accurate and transparent data available on Jordan's water resources and water utilities' performance. There are many gaps found in the administrative records, including water supply and water losses. In addition, the quality of the data is rather weak and not comparable between different sources.

The structure of the study is composed as following: first, the paper provides a literature review on water governance and how it is related to the case study adopted; second, the paper examines the

[5] Matthijs Bogaards, "Case-Based Research on Democratization," *Taylor & Francis Group* 26 (2019): 62.

case study of Jordan by identifying the scale of the problem and the internal governance challenges in the water sector; third, the paper engages in an empirical analysis on the threats, opportunities and weaknesses observed, discusses the importance of adopting effective water governance structure possible policy solutions on the supply and demand side; and finally the last section of the paper concludes with final remarks and potential future research areas.

2. LITERATURE REVIEW

There are different approaches, multiple working definitions and various interests, perspectives and concerns for water. Understanding the implications of water scarcity and the importance of adopting effective water governance approaches can help in adapting the challenges and effects on the water sector brought by internal governance failures at the supply and demand side, and limiting the further challenges added on the water sector by external challenges such as climate change and regional instabilities.

2.1 WATER SCARCITY

Frank Rijsberman explains that an area is to be considered water scarce when a large amount of people living in that area are considered water insecure and have no access to safe and affordable water to meet their needs.[6] Some look at scarcity as the relationship between water availability and human population[7]; which is a more relevant approach to the case study looked at in this paper as later will be observed. According to the *Falkenmark Water Stress Indicator,* countries whose renewable water supplies fall under 1,000 m^3 per capita experience water scarcity.[8] For the case of Jordan, the renewable water supply per capita is 60m^3;[9] way below the threshold.

There are various reasons behind water scarcity. Some include an over exploitation of water bodies without an opportunity for natural recovery. For example, in Jordan, the extraction rates are far higher than natural recharge rates.[10] Others include the consequence of large population growth

[6] Frank R Rijsberman, "Water Scarcity: Fact or Fiction?," 2004, 1.
[7] Ibid, 2.
[8] Ibid.
[9] "Efficient and Sustainable Management of Water Resources in Jordan," Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), accessed May 5, 2020.
[10] "Water Resources & Environment, Investing In A Water-Secure Future Jordan," Usaid, accessed April 5, 2020.

relative to few available water resources.[11] Some provide reasons that are related to the implications of climate change intensifying water crisis.[12] Some scholars also explain that those water challenges are aggravated by uncertainty, whether its tension or conflict,[13] and extraordinary population growth.[14] On the other hand, there are some scholars who solely argue that water scarcity is a result of the inability to provide adequate infrastructure and technology to store and supply water.[15]

In the case study selected for this research paper, water scarcity is highly attributed to poor governance structure in the water sector. In the case of Jordan, water scarcity leads to inequitable water allocation and unequal access. The 6th Sustainable Development Goal (SDG), water and sanitation, aims to "ensure availability and sustainability management of water and sanitation for all,"[16] however, according to World Health Organization (WHO), 1.2 billion people lack access to safe water for domestic use,[17] and in Jordan there were 287,264 people in 2015 who did not have access to safe drinking water.[18]

Furthermore, it is critical and very essential to consider the concept of equity in water literature. The term equity, according to Rutgerd Boelens, is related to fairness, social justice and is related to rule-making processes and the distribution of resources in society.[19] Tom Perrault claims that in the context of water governance, equity is having a fair access to drinking water, furthermore, he argues that fairness and justice should be defined in terms of recognizing the needs of the socially excluded and their rights within the context of societal norms and institutions.[20] Moreover, he

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[11] Matti Kumu et al., "The World's Road to Water Scarcity: Shortage and Stress in the 20th Century and Pathways towards Sustainability," *Scientific RepoRts*, December 9, 2016, 1–16.
[12] Liliana Miranda, Michaela Hordijk, and Rommy K. Torres Molina, "Water Governance Key Approaches: An Analytical Framework Literature Review," *Chance2Sustain*, July 2011, 5.
[13] Ibid.
[14] Kumu et al., *The World's Road to Water Scarcity*.
[15] Miranda et al, *Water Governance Key Approaches*, 5.
[16] "Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All," Sustainable Development Goal indicators, accessed April 3, 2020.
[17] "2.1 Billion People Lack Safe Drinking Water at Home, More than Twice as Many Lack Safe Sanitation," World Health Organization, July 12, 2017.
[18] "Jordan Water," Worldometer.
[19] Rutgerd Boelens, "Equity and Rule-Making," in *Searching for Equity: Conceptions of Justice and Equity in Peasant Irrigation*, ed. Rutgerd Boelens and Gloria Dávila (The Netherlands: Van Gorcum: Assen, 1998), 16.
[20] Tom Perreault, "What Kind of Governance for What Kind of Equity? Towards a Theorization of Justice in Water Governance," *Water International* 39, no. 2 (2014): 239.

explains that equity in water governance needs to be studied from the perspective of engagement between institutional arrangements, the government and society through which water is distributed and accessed.[21] The concept of access to water and equity is rather evident in Jordan as locals and refugees compete over limited water resources. Accessibility and equity can be addressed through a good governance structure that encourages participatory in its management policies and promotes transparency in supply and demand.

In her research, Karen Bakker makes a symbolic difference between H2O and water, she claims: "whereas H2O circulates through the hydrological cycle, water as a resource circulates through the hydro social cycle – a complex network of pipes, water law, meters, quality standards, garden hoses, consumers, [and] leaking taps;" drawing emphasis on the strong relationship between water and society.[22] This distinction indicates how water has a significant meaning and plays an important role in cultural and social practices, and that it is also worth to look at the modes of production and consumption of water at the local and national level to understand the forms of governance that are put in place for it. Furthermore, it is essential to take into consideration the relationship people have with water, for which ever reason or practice, by engaging the public in water related projects to get their feedback and expectations, for successful implementation. In Jordan, there is a lack of professional and efficient engagement of stakeholders with one another and with customers; leading to poor governance and lack of public awareness on water use.

2.2 WATER GOVERNANCE

When defining the concept of governance, many scholars and organizations refer to decision making, solving-problems, political, economic and administrative approaches. For example, according to the OECD, governance helps explain and improve civil society's participation when it comes to decision making and is a more well-organized approach in solving problems than administrative methods.[23] UNDP defines governance as the political, economic and administrative exercise of an authority when it comes to managing a country's matters at all levels, and it includes the complex processes and institutions where citizens exercise their rights.[24] Matthew Himley

[21] Ibid.
[22] Karen Bakker, "From State to Market?: Water Mercantilizacio¨n in Spain," *Pion* 34 (2002): 774.
[23] "Water Governance in OECD Countries: A Multi-Level Approach" (OECD, 2011).
[24] "Governance and Development" (UNDESA, UNDP, UNESCO, May 2012), 3.

explains that governance is a broad theoretical framework that analyzes the interaction between institutions and social actors who are involved in the decision making of natural resources under neoliberal capitalism.[25] The term governance helps address challenges that a society could face, whether at the local, national or global level from different angles such as environmental, economic, social or political. Governance provides coordination, rules, norms and order.

Governance can be also related to the functions of a government and the interactions between government and non-governmental actors. In recent years, the concept of governance has received more attention from various governments and organizations. For example, the United Kingdom Department for International Development looks at the historical roots of governance to identify authority problems, rethink 'aid modalities' and how international factors can undermine national governance matters.[26]

While there is not one shared definition of governance and despite the theoretical shortages in the concept, governance can be used to asses water issues. There are various definitions and perspectives for water governance. For example, Charles Batchelor defines water governance as a method through which allocative politics are implemented in water management and it generally holds the formal and informal institutions where authority is exercised (distributive governance).[27] Petra Dobner and Hans-Georg Frede convey that water governance includes all actions that are involved in guarantying a sustainable access to water for everyone.[28] For the purpose of this research, the paper looks at Pahl-Wostl's definition that explains water governance as "the social function that regulates development and management of water resources and provisions of water services at different levels of society and guides the resource towards a desirable state and away from an undesirable state."[29] Therefore, the concept of water governance is more about the process of decision making rather than the decisions themselves, and the impact and significance of

[25] Matthew Himley, "Geographies of Environmental Governance: The Nexus of Nature and Neoliberalism," *Geography Compass*, 2008, 433–451.
[26] Batchelor, *Water Governance Literature Assessment,* 2.
[27] Ibid, 1.
[28] Petra Dobner and Hans-Georg Frede, "Water Governance: A Systemic Approach," in *Society - Water - Technology*, ed. Reinhard F. Hüttl et al. (Cham: Springer International Publishing, 2016), 82.
[29] Claudia Pahl-Wostl, "An Evolutionary Perspective on Water Governance: From Understanding to Transformation," *Springer* 31 (May 31, 2017): 2921.

institutions that suggest the norms and rules that influence the relationship between humans and ecology.

When studying water governance, one must take into account the varying political, social, economic and the administrative organizations that manage the water resources and services and its delivery. In Jordan, there are various actors involved in the water sector, form public to private, national and international. According to the UNDP, water crisis is a crisis of governance, and water governance deficiency means firstly the failure to provide adequate water for the poor, secondly the absence of apt attention to water regulations and thirdly imbalance between socioeconomic and environmental demands.[30] As this paper tries to understand the challenges Jordan faces in its water sector, analyzing the structure of water governance helps identifying the importance of governance in tackling water scarcity.

2.2.1 Effective Water Governance

There are several main dimensions to water governance. There is a social dimension that discusses the equitable water use, an economic dimension that talks about the role of water in the economic growth and water efficiency, a political dimension that deals with stakeholders and citizens and their access and ability to influence the political process of water governance, and finally an environmental dimension that refers to sustainability.[31] While these are the main dimensions to water governance, there are also key elements that ensure good governance. Some of those include transparency, equity and accountability. According to UNDP, good water governance includes rule of law, ethics and a broad participation.[32] Good governance also needs a collective decision-making body, effective institutions and legal frameworks.[33]

[30] "Concepts and Approaches for Effective Water Governance in the Arab Region," Water Governance in the Arab Region: Managing Scarcity and Securing the Future (United Nations Development Programme, 2013), 72.
[31] Kanaan Ambalam, "Reallocation of Water Resources in the Arab Region: An Emerging Challenge in Water Governance," *European Journal of Sustainable Developmen* 3, no. 3 (October 2014): 283–98.
[32] UNDP, *Concepts and Approaches,* 72.
[33] Ibid.

According to Olli Varis and Cecilia Tortajada, for a successful water governance, there needs to be an understanding of modernization and the challenges it brings.[34] Varis explains that as water affects people's lives, suitable changes in water governance can make a large positive social impact.[35] For example, as many Arab countries are facing political transitions, water governance reforms can increase participation and transparency.[36] Morocco, for example, decentralized its water management and let local authorities participate.[37] However, reforms in many countries in the MENA region are difficult to take place or are often delayed mostly due to reasons including corruption, weak institutions and lack of public awareness. UNDP's report further argues that roles and responsibilities in the Arab countries are often unclear and there is almost no water governance.[38] When studying the Arab region, there are also several challenges in maintaining an effective water governance, including an equitable stakeholder participation and a lack of proficient regulation.[39] Furthermore, the region also experiences an inequal water provision, especially in water scarce countries and post-conflict countries. For example, Iraq is unable to provide an efficient amount of water services to its people due to the destroyed water institutions and infrastructure.[40] As a result, in order to maintain an effective water governance, there needs to be efficiency, inclusivity with a horizontal management, openness, accountability and sustainability.

Furthermore, water governance helps guide and enhance sustainable water management and delivery, and as water becomes scarcer, there is an even more need for an effective water governance that would ensure an equitable and efficient access to water. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), water crisis is not mainly caused by lack of water but is rather a cause of a failure in water governance.[41] While climate change and societal change increase the burden on water resources, it is vital to address water challenges through adapting efficient water management approaches. The Intergovernmental Panel

[34] Olli Varis and Cecilia Tortajada, "Water Governance in the MENA Region: Policies and Institutions" (InWEnt, 2009), 19.
[35] Ibid.
[36] Ibid.
[37] UNDP, *Concepts and Approaches,* 73.
[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] "Water: A Shared Responsibility" (UNESCO, 2006).

on Climate Change (IPCC) acknowledges that governance holds the key in achieving a long-term sustainable solution to water scarcity,[42] and this paper agrees with this acknowledgement.

3. CASE STUDY: JORDAN

3.1 NATURE AND SCALE OF JORDAN'S WATER CHALLENGE

The Hashemite Kingdom of Jordan, located on the Western bank of Jordan river and bordered by Saudi Arabia to the South and East, Iraq to the North-east, Syria to the North and Israel and Palestine to the West (see MAP 1) is one of the driest countries in the world and the 5th most water stressed.[43] Jordan, an upper-middle income country with a population of 10 million inhabitants, has very limited natural resources and suffers from harsh climate and continuous regional instability. The country depends highly on remittances and grants and imports the majority of its energy and large amounts of its water. The geographic situation of Jordan and the regional conflicts have highly contributed to Jordan's water scarcity.

The country suffers from a great gap between the population's demand for water and the actual availability of water resources. In 2008, there was around 145 m^3 of available water per capita, which is drastically below the international average of 1,000 m^3 and the absolute scarcity line of 500 m^3 per capita.[44] The demand continues to increase in Jordan; threatening the stability of the country. The available water supply in Jordan is estimated at 892 million m^3, with 79% from renewable groundwater sources, 8.3% from non-renewable fresh fossil groundwater, and 13.1% from treated wastewater (see Figure 1).[45] Additionally, the government of Jordan pumps water to households on an average of 2 times per week.[46] The average amount of water supplied per Jordanian is 0.09 m^3 per day compared to the average regular consumption rate of 0.17 m^3.[47] As a result of water scarcity, sectors in Jordan compete greatly, including for agriculture and domestic uses. Furthermore, Jordan uses surface water and ground water sources to meet its water demand,

[42] IPCC, "AR5 Synthesis Report: Climate Change 2014" (Geneva, Switzerland: IPCC, 2014).
[43] Rutger Hofste, Paul Reig, and Leah Schleifer, "17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress," *World Resources Institute* (blog), August 6, 2019.
[44] Yorke Valerie, "Politics Matter: Jordan's Path to Water Security Lies through Political Reforms and Regional Cooperation," *NCCR Trade Working Paper*, April 2013, 14.
[45] Ibid, 15.
[46] Ibid.
[47] Elaine Denny et al., "Sustainable Water Strategies for Jordan" (Ann Arbor, Michigan, International Economic Development Program Gerald R. Ford School of Public Policy University of Michigan, Ann Arbor, 2008), 3.

with an abstraction rate higher than the recharge rate.[48] The country has a negative water balance of 20%, with a demand of 1.15 billion m^3 annually and only a renewable available supply of 850 million m^3.[49] As a result, in order to meet the excessive demand, there is an over-pumping of non-renewable groundwater. For example, 10 out of the 12 major groundwater basins in Jordan are over extracted.[50] In addition, the rainfall in Jordan is seasonal and unpredictable, with high evaporation rates.[51] The total rainfall averages 8,230 million m^3 per year, which is the lowest in the region.[52] As a result, even a minor change in water levels will have a large impact on several sectors in the country, including agriculture, industry and health.

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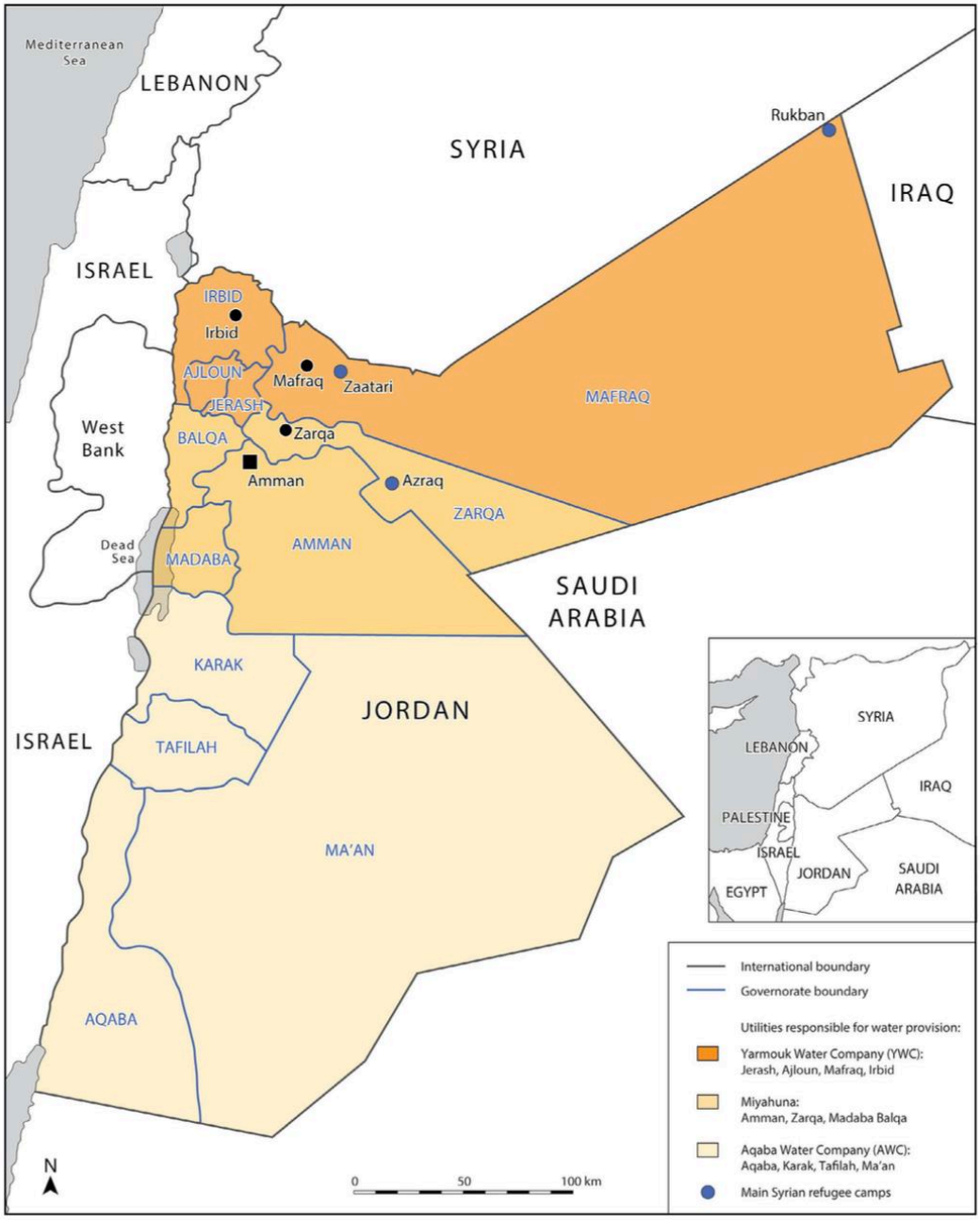
48 USAID, *Investing in a water secure future Jordan.*
49 Denny et al., S*ustainable Water Strategies for Jordan*, 2.
50 Elizabeth Whitman, "A Land without Water: The Scramble to Stop Jordan from Running Dry," News, September 4, 2019.
51 Christine Draake, "Water Resource Conflicts in the Middle East," *Journal of Geography*, 1997, 2, **quoted in** Denny et al., S*ustainable Water Strategies for Jordan*, 2.
52 Valerie, *Politics Matter*, 10.
53 Yorke Valerie, "Politics Matter: Jordan's Path to Water Security Lies through Political Reforms and Regional Cooperation," *NCCR Trade Working Paper*, April 2013, 14.
54 Ibid, 15.
55 Ibid.
56 Elaine Denny et al., "Sustainable Water Strategies for Jordan" (Ann Arbor, Michigan, International Economic Development Program Gerald R. Ford School of Public Policy University of Michigan, Ann Arbor, 2008), 3.
57 USAID, *Investing in a water secure future Jordan.*

million m3.[58] As a result, in order to meet the excessive demand, there is an over-pumping of non-renewable groundwater. For example, 10 out of the 12 major groundwater basins in Jordan are over extracted.[59] In addition, the rainfall in Jordan is seasonal and unpredictable, with high evaporation rates.[60] The total rainfall averages 8,230 million m3 per year, which is the lowest in the region.[61] As a result, even a minor change in water levels will have a large impact on several sectors in the country, including agriculture, industry and health.

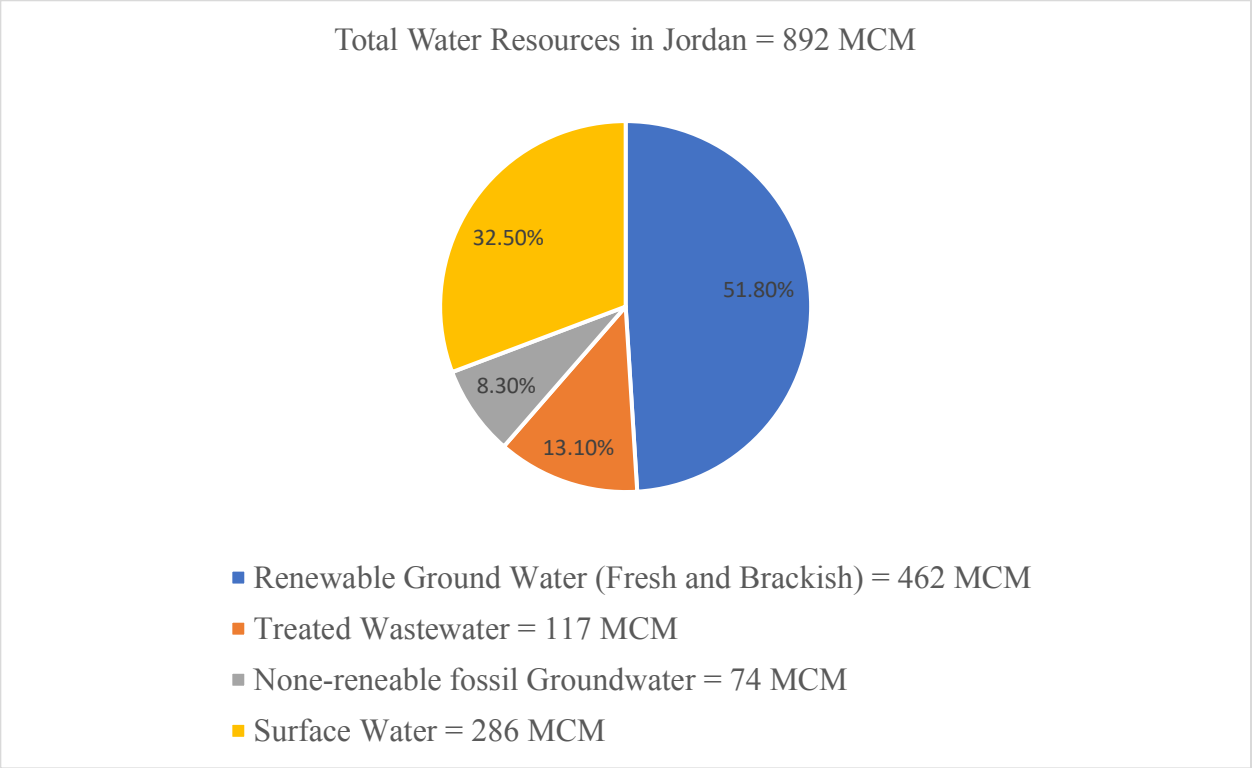
[58] Denny et al., S*ustainable Water Strategies for Jordan*, 2.
[59] Elizabeth Whitman, "A Land without Water: The Scramble to Stop Jordan from Running Dry," News, September 4, 2019.
[60] Christine Draake, "Water Resource Conflicts in the Middle East," *Journal of Geography*, 1997, 2, **quoted in** Denny et al., S*ustainable Water Strategies for Jordan*, 2.
[61] Valerie, *Politics Matter*, 10.

MAP 1: Map Of Jordan With Main Water Utilities[62]



[62] IIED, 2017.

FIGURE 1: Total Estimated Available Water From 2010[63]



When it comes to managing water resources, it is necessarily to understand the usage of water in different sectors. Water use is mainly divided between the agricultural, industrial and municipal sectors (see Table 1). According to Jordan's Water Strategy 2008 – 2022, the agricultural sector, including irrigation, consumes 72% of Jordan's water supply, while the industrial and municipal sectors consume 28%.[64] Over the past decades, there has been an increase in municipal water use as income has been increasing and peoples' lifestyles changing, which have resulted in an increase in water consumption with a special focus on urban areas.[65] As the population continues to grow and the demands rise, water use is expected to escalate as well.

[63] Author's own presentation of data from MWI, *Water Budget Projected Demand and Resources (2010- 2025) retrieved from Yorke 2013: 14.*
Note: *MCM = million m3*
[64] Velma Grover, Abdel Raouf Darwish, and Eliza Deutsch, "Integrated Water Resources Management in Jordan," *The Economic Research Forum (ERF)*, December 2010, 2.
[65] Ibid, 3.

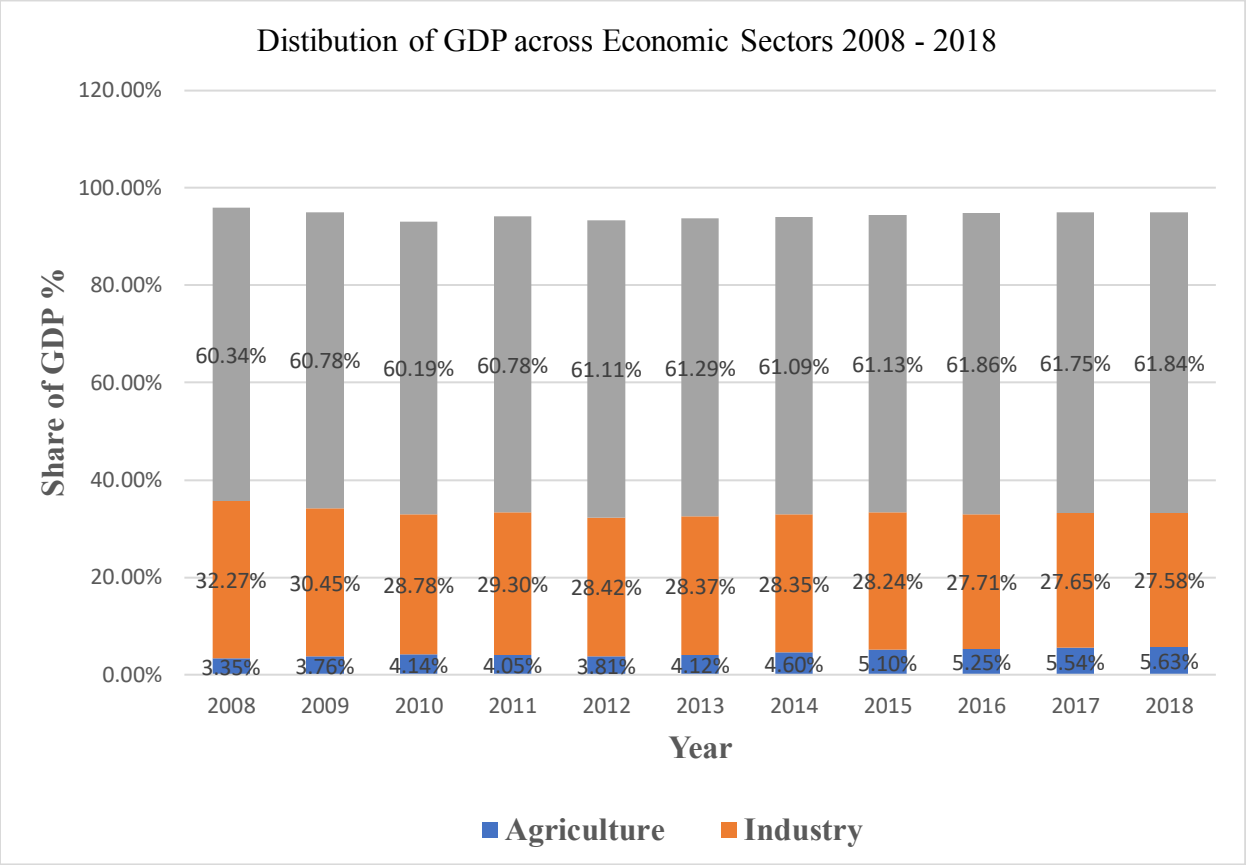
TABLE 1: Estimated Water Use In Jordan By Sectors For 2020 And 2040 In Mcm/Year[66]

	2020	**2040**
Total water demand	1602	2236
Domestic	670	1263
Industrial	130	170
Irrigation	802	803
Total water supply	1152	1549
Total water deficit	-451	-687

While the agricultural sector accounts for the largest water consumption in the country, agricultural production contributes only 5.63% towards Jordan's Gross Domestic Product (GDP) (see Figure 2). Nonetheless, there has been some changes in water consumption patterns in the agricultural sector due to various reasons such as technological advancements, drought and economic competition from neighbouring markets.[67] Despite this decrease, demand for food is still high and continues to rise as population grows; resulting in higher water use for irrigation.[68] In addition, according to Jordan's Department of Statistics, a trend is observed for overproduction of high-water consuming crops (mainly vegetables) through open canals and unlicensed wells.[69]

[66] Data retrieved from the *National Water Master Plan - Ministry of Water and Irrigation* 2007 **quoted in** Grover et al, *Integrated Water Resources Management in Jordan*, 2010.
[67] Ibid.
[68] Ibid.
[69] "Crops Statistics" (Department of Statistics, 2017).

FIGURE 2: Distribution Of Gross Domestic Product (GDP) Across Economic Sectors From 2008 To 2018 In Jordan[70]



There are external challenges that add to the pressure on the water systems and result in a full allocation of available water resources. Those challenges include climate change and regional stability, and they play a significant part in Jordan's water scarcity. As mentioned earlier, Jordan's climate is arid and dry, and as the Middle East region is one of the most vulnerable to the impacts of climate change, Jordan's water scarcity is expected to worsen. Jordan is predicted to become drier and according to Jordan's Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), the average temperature is projected to rise by around 1.7 degrees Celsius by 2050; resulting in desertification as water availability decreases and demand

70 Author's own interpretation of data retrieved from Statista. Statista, 2018. https://www.statista.com/statistics/385505/jordan-gdp-distribution-across-economic-sectors/

increases.[71] Rising temperature results in higher risks of evaporation and drought that also impact the soil and the water stored in the reservoirs.[72] In addition, the quality of water in rivers and groundwater is expected to worsen and climate change is anticipated to reduce freshwater availability by 15% by the end of 2020.[73] Furthermore, potential impacts of climate change on the water sector also include socioeconomic problems, including agriculture, employment, health and food security, etc, all of which will exacerbate local tensions (see Table 2 for potential impacts on water). Rural communities depend highly on climate sensitive resources for farming and trade, and when water supplies decline, this will affect agriculture and forces the government to decrease water allocations to the agricultural sector and refocus them towards drinking purposes; leaving thousands of famers out of jobs.[74] The impact of climate change observed on the water sector is deteriorating the water security in the country and leaving vulnerable communities in worse conditions and more responsibility on the water sector for better management of limited water resources.

Table 2: Some Potential Impacts Of Climate Change On Water[75]

Change	**Water**
Increasing average temperature	Effects on water resources relying on snow melt, effects on water supply
Increasing average precipitation	Increase in water availability in tropical areas, decrease in water availability in arid areas
Extreme rainfall	Negative effects on quality of surface and groundwater, contamination and disruption of water supply
Drought	Water shortages/stress
Heat/Cold waves	Increase in water demand
Rise in sea level	Decrease in freshwater availability/ saltwater intrusion

[71] "Jordan's Third National Communication on Climate Change" (The United Nations Framework Convention on Climate Change (UNFCCC), 2014), 123.
[72] "Water Governance in The Arab Region" (UNDP, 2013), 33.
[73] Sundeep Waslekar, "The Blue Peace: Rethinking Middle East Water" (Strategic Foresign Group, 2011), 92.
[74] Valerie, *Politics Matter*, 32.
[75] Author's own interpretation from research

Additionally, there is a regional context to Jordan's water problems that cannot be disregarded. There is an uncertain degree of supply from surface water and groundwater since its majority comes from shared and transboundary sources. There is a lack of effective regional transboundary agreements and are far from equitable. Due to the unequal distribution among riparian states and over extraction as a result of dams, the rivers' flow is lessening. For example, the Yarmouk River, situated in Northern Jordan, shares borders with Syria, the river's upstream riparian, and while Syria had agreed in the 1987 to supply an amount of 208 million m^3 per year, Jordan only receives about 50 million m^3 per year.[76] This is mainly due to the many dams and extraction that Syria does, which puts Jordan in a tremendous disadvantage despite the transboundary bilateral agreements. Despite the shared use of those resources, Jordan lacks strategic position against powerful neighbours and does not have bilateral agreements with Syria nor with Saudi Arabia on the joint management and conservation of these water sources, and hence, there is a lack of planned mechanisms for securing water in the future.

In addition, internal demand on water resources is exponentially growing in Jordan due to regional and external conflicts; adding more pressure and need for an effective governance structure that can meet the extra demand. Jordan has one of the highest population growth rates of 1.40%,[77] exacerbated by regional conflicts. Jordan has witnessed several influxes of refugees across the decades; firstly, with the Palestinian refugees in 1948, then the inflow of Iraqis into the country post the Iraqi War in 2003, the migration of other groups of refugees including Yemenis and Sudanese into Jordan, and most recently, the great influx of Syrian refugees starting in 2011 (see Table 3 for demography of Jordan over time). Those influxes of refugees have put extensive strains on Jordan's limited water, and the demand of water is far exceeding the supply.

[76] Ibid, 16.
[77] "Country Comparison: Population Growth Rate," Central Intelligence Agency.

TABLE 3: Population Of Jordan Over Time, With An Eye On Regional Political Events[78]

Year	Population of Jordan	Political Event
1922	225,000	Emirate of Transjordan founded in 1921
1947	473,200	One year before establishment of Israel
1952	586,200	Four years after the 1948 war with Israel
1970	1,508,200	Three years after the six-day war with Israel and the occupation of the WB by Israel
1989	3,144,000	One year before the Iraq-Kuwait war
1993	3,993,000	One year after the Iraq-Kuwait war
2002	5,098,000	One year before the Iraq-US war
2004	5,350,000	One year after the Iraq-US war
2010	6,113,000	One year before the Syrian Civil War
2012	6,388,000	One year after the start of the Syrian Civil War
2015	9,500,000	Three years after the start of the Syrian Civil War

In a news article in Jordan Times, the former minister of the MWI, Hazem Nasser, stated that the influx of the refugees has increased water demand in Jordan by 40% in the northern part of the Kingdom, 10% in the southern part, and by 20% on an average all in all in the country.[79] Furthermore, the former minister claimed that hosting the refugees has shifted Jordan's strategies into emergency plans.[80] For example, Jordan was working on operating a new project to transport water from the Disi aquifier from the borders with Saudi Arabia to Amman (the capital city of Jordan where water demand is highest); however, due to the influx of refugees and the establishment of the Zaatari camp (the 2nd largest Syrian refugee camp in the world), the Disi became over exploited, operating at 92% of its capacity at an earlier stage than anticipated, in order to meet the demands of the refugees.[81] As a result, tensions are also rising between local communities and refugees.

[78] Hussam Hussein, "Understanding Water Scarcity in Arid Regions: A Critical Discourse Analysis of Water Scarcity in the Case of Jordan," 2016, 207.
[79] Hana Namrouqa, "Jordan World's Second Water-Poorest Country," *Jordan Times*, October 22, 2014.
[80] Hana Namrouqa, "Jordan Seeks Self-Reliance in Water Sector — Ghezawi," *Jordan Times*, May 21, 2018.
[81] Hana Namrouqa, "'Jordan Needs $750m to Meet Water Demand over next Three Years,'" *Jordan Times*, January 7, 2014.

3.2 JORDAN'S WATER GOVERNANCE STRUCTURE

Jordan's water sector framework constitutes of highly centralized governance and politics, with institutions and agencies that lack communication and cohesiveness; leading to overlapping responsibilities and weak water management efforts. In addition, while the water sector relies deeply on private experts, including international actors; there is still a lack in strong involvement of the private sector in addressing water related issues that the government cannot address.

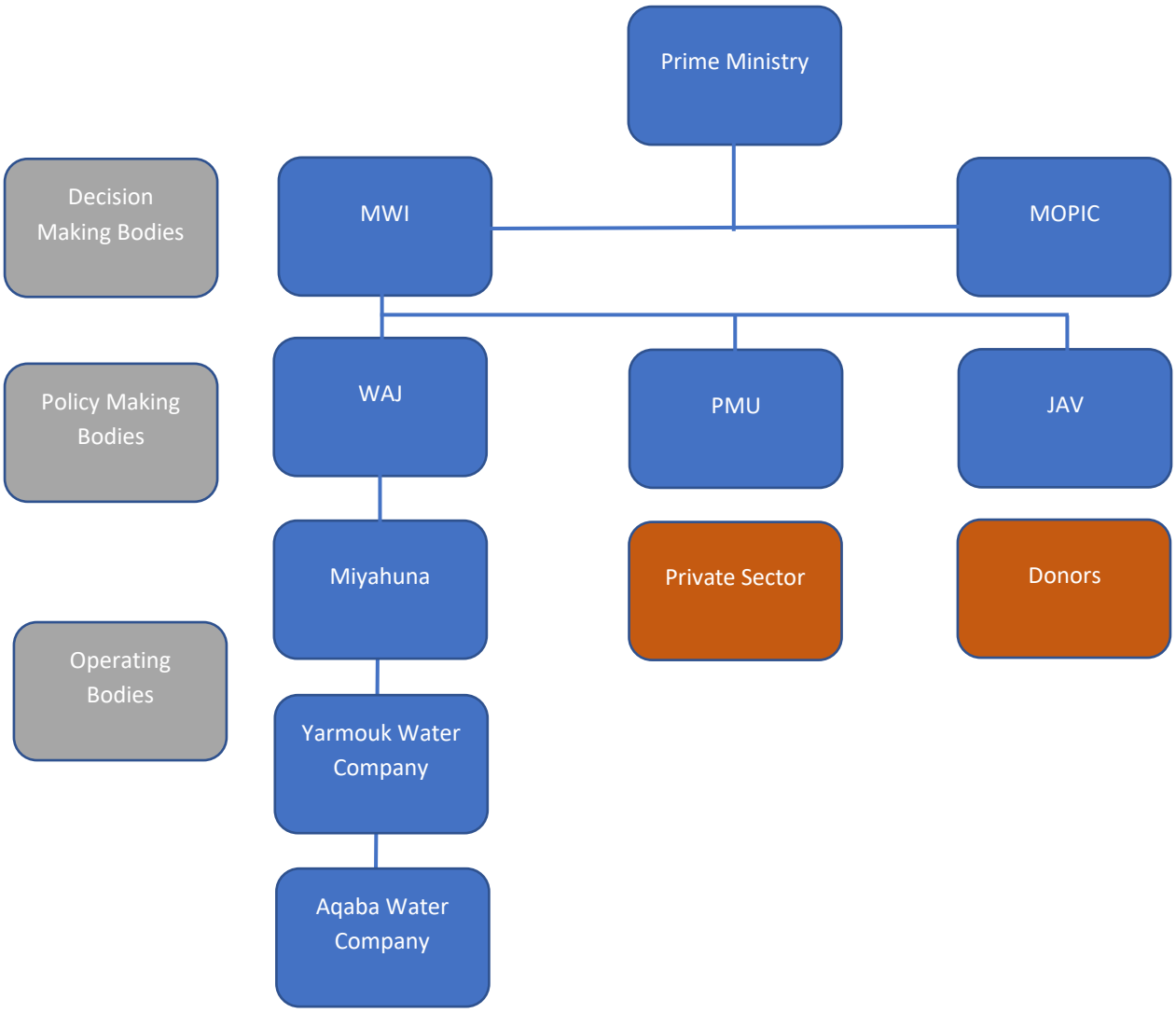
3.2.1 CENTRALIZED INSTITUTIONS

The Jordanian water sector holds various players from national to international and public to private (see Figure 3 for main institutions). The existence of many centralized institutions and organizations lead to a complex governance structure.[82] At the national level, the MWI established in 1988, is the main public water institution in Jordan. MWI is a regulatory body that is responsible for the general strategic and planning of water and sanitation, it develops laws, policies, and international and national partnerships with private sector and is responsible for the supervision and monitoring of programmes' implementation. Under the MWI operates the WAJ that is responsible for the organization of water supply and wastewater treatment, mainly in the highlands, and the operation of water resources. If groundwater resources become threatened at any point, WAJ has the authority to manage them by controlling the groundwater pumping licenses. The third national institute is the Jordan Valley Authority (JVA), which also operates under the MWI. JVA's main mandate is to protect the water resources in the Jordan Valley and to provide a plan for comprehensive development, including farming and industrial purposes. In addition to these main institutions, there is the Project Management Unit (PMU) that was established in 1990s under WAJ. PMU is responsible for the regulation of water supply and wastewater utilities, in addition, the encouragement and promotion of the private sector participation in the project planning and implementation in the water sector. As for the Ministry of Planning and International Cooperation (MOPIC), its role is in facilitating project proposals to donors and other donor-related activities in the water sector. There is a lack of integration in water management efforts as a result of the limited communication between the existing institutions, the lack of information available on each

[82] Information about main institutions and their roles was retrieved from the MWI webpage. http://www.mwi.gov.jo/Intro/Pages/default.aspx

institution's performance, and an overlap of accountabilities that constrain the agencies from implementing effective water governance.

FIGURE 3: Main Institutions In The Water Sector[83]



3.2.2 Lack of strong Private Sector Participation

Since the 1990s, there has been an ongoing programme to corporatize water operations through commercially run water companies.[84] There are three water utilities in Jordan that are accountable for providing water in Jordan. The first one is a state utility named Miyahuna, owned by WAJ and

[83] Author's own interpretation
[84] OCED, *Water Governance in OECD Countries: A Multi-Level Approach*, 22.

operates through commercial units, and is responsible for water distribution and wastewater in Amman, Zarqa, Balqa and Madaba.[85] Miyahuna operates mainly in an urbanized area with competent infrastructure and serves water to around 2.54 million residents and wastewater collection services to over 2 million residents.[86] The second utility is Yarmouk Water Company, it used to be maintained by a French company, Veolia, but became state-owned in 2010 and is also owned and managed by WAJ and covers water provision to Irbid, Jerash, Ajloun and Mafraq.[87] Yarmouk utility supplies around 250,000 customers, mostly in rural settings, and it is the most corporatized utility operating through commercial orientation.[88] The third utility is Aqaba Water Company, operating under WAJ and supplies water to Aqaba, Karak, Tafileh and Ma'an.[89] Those three utilities serve water to around 45% of the population and account for 70% of the total water supply, while WAJ is responsible for the other 30%.[90]

There is not much of space for utilities and other actors for decision-making, as most of the policy making takes place at the national level. WAJ exerts a large amount of influence on the operational and organizations activities of the utilities; for example, WAJ appoints the board members and the employees of the utilities.[91] In addition, Mihayuna and Yarmouk rely on donors and WAJ for capital investment, operation and maintenance.[92] According to USAID, the limited autonomy noted plays a significant role in the structural weakness and inefficiency of the utilities.[93] This leads to administrative gaps and sometimes overlapping of responsibilities. In Jordan's National Water Strategy for 2016 – 2025, there was a recognition of this centralized national power, nonetheless, some by-law changes aimed to strengthen MWI strategic leadership led to further deteriorated service provision at the local level.[94] To transform the utilities into truly commercialized and corporatized entities, more legal and managerial autonomy is needed.

85 MWI, *National Water Strategy (2016-2025)*, 18.
86 Ibid.
87 Ibid.
88 Ibid.
89 Ibid.
90 OECD, *Water Governance in OECD Countries: A Multi-Level Approach*, 23.
91 MWI, *National Water Strategy (2016-2025)*, 19.
92 Ibid
93 "Institutional Support and Strengthening Programme (ISSP) Institutional Assessment Report" (USAID, October 2011a), **quoted in** OECD, *Water Governance in OECD Countries: A Multi-Level Approach*, 25.
94 MWI, *National Water Strategy (2016-2025)*, 19.

3.2.3 Dependency on the International Community and Donors

For the past decades, donors have been providing a great amount of financial and technical support for the inception of activities held by the private sector in Jordan's water sector. For example, in 1999, to support the implementation of the Amman management contract,[95] the WB provided the MWI with a 5 million USD loan.[96] In addition, the German government supported the MWI and WAJ in enhancing the wastewater treatment plants' management by funding the Madaba management contract.[97] In addition, donors have been playing an essential role in attracting private investments. For example, there was a deal agreed upon between private sector, government and donors to contract a wastewater treatment plan company, As Samra Built-operate-transfer (BOT), which included 46% funding from USAID, 45% funding from the private sector, and 8% from the government of Jordan.[98] This project was acknowledged to be an innovative funding structure that has never been used before in the Middle East.[99]

In addition, while the refugee crisis added to the socioeconomic stress that is already present in Jordan, the use of refugee seems to also influence donor support. Every year from 2014 to 2018, Jordanian government asked for 240 million USD of support for the water sector as a result of the Syrian refugee crisis.[100] In 2015, the former Minister of Water, Hazem Al Nasser, stated at a national conference on water and sanitation organized with the United Nations Children's Fund (UNICEF) that "if the required funds ($750 million for 2015–2017) are not secured, there will be a negative impact on Syrian refugees' health, security and environment".[101] The refugee discourse also impacted water governance in the country by changing the initial priorities of projects being implemented in order to seek water security. For example, the focus of the Disi and the Red Sea – Dead Sea projects was changed to create a Jordan National Water Carrier and a desalination plant in Aqaba to meet the water demands of the Jordanian citizens and refugees in the country.[102] This

[95] Amman management was a public-private partnership between WAJ and a French company to manage water and wastewater in Amman and to strengthen the capability of the staff and the technical structure.
[96] OECD, *Water Governance in OECD Countries: A Multi-Level Approach*, 35.
[97] Ibid.
[98] Ibid, 27.
[99] "MIGA Backs Wastewater Treatment Plant in Jordan," *MIGA*, July 24, 2013.
[100] Hussam Hussein et al., "Syrian Refugees, Water Scarcity, and Dynamic Policies: How Do the New Refugee Discourses Impact Water Governance Debates in Lebanon and Jordan?," *Water* 12, no. 2 (January 22, 2020): 10.
[101] "Contracted Aid for Kingdom up in 2017, but Grants Directed to Support Budget Shrink," *Jordan Times*, February 21, 2018.
[102] Hussein et al., *Syrian Refugees, Water Scarcity, and Dynamic Policies*, 10.

switch in focus from a regional towards a national and local dimension attracts international donors' interest. Nonetheless, although many international NGOs and organizations have provided assistance, they withdrew before significant changes occurred in the water sector.[103]

There is a gap between the support required and the external assistance received. According to Miyahuna utility, there is a lack of understanding by NGOs on local context and their intervention, and so there is a need for more cultural understanding during strategic interventions by the international community.[104] However, providing initiatives that are both hard and soft measures such as installations and trainings adapted to the local context is sometimes difficult for NGOs as they have to also meet the donors' expectations.

3.2.4 WATER LOSS

In addition to the incohesive centralized governance structure, water losses and waste restrict water governance in Jordan. There is no adequate monitoring system that is essential for information and data gathering of available water for proper water resource management planning. This is mainly due to the lack of appropriate metering system that results in an overuse of water resources.[105] As a result, a culture of waste, especially in the agricultural sector, is observed as farmers and households pay water prices that are below the actual cost of the water being supplied.[106]

Additionally, big proportions of the water supplied is lost because of the old and weak infrastructure.[107] As Jordan's urban areas are situated significantly above the available water resources, there is a large distance between the water source and the urban areas; hence, as water gets transported, more water loss and leakages are detected. MWI notes that around 52% of the total water produced for municipal uses is unreported.[108] This loss of water is a result of various

[103] Loan Diep et al., "Water, Crises and Conflict in MENA: How Can Water Service Providers Improve Their Resilience?," *IIED*, October 2017, 47.7/31/2020 9:01:00 AM
[104] Ibid, 27.
[105] Grover et al., *Integrated Water Resources Management in Jordan*, 5.
[106] Ibid, 6.
[107] Mohamed El-Ashry et al., *Arab Environment: Water: Sustainable Management of a Scarce Resource* (Beirut: Arab Forum for Environment and Development, 2010), 92.
[108] MWI, *National Water Strategy (2016-2025)*, 15.

factors including illegal extraction, non-operational meters, weak law enforcement, lack of individual awareness for water waste, and poor quality of water pipes.

In addition to the weak infrastructure and water loss in the municipal sector, there is also mismanagement of water in the agricultural sector. According to the Food and Agriculture Organization (FAO), the water sector in Jordan allocates a high level of water to the agricultural sector due to the increase of irrigated land areas and rain-dependent crops, with agricultural water withdrawal of 53.13% as of total water withdrawal.[109] Most of the cultivatable land in Jordan lies beyond the appropriate area for rain-fed agriculture.[110] FAO also explains that the rain-fed agricultural land in the country is getting lost due to climate change impact on precipitation levels that leads to unpredictable production, and an urban expansion that uses rain-fed land for urban practices.[111] In addition, the irrigation methods used, such as the traditional flood irrigation systems, and leakage and evaporation during transport are also accountable for water loss.[112]

4. EMPIRICAL DISCUSSION

4.1 ANALYSIS

Based on the analysis done, there are some drawbacks, risks, and opportunities observed in Jordan's water governance:

- Drawbacks:
  - Lack of data availability on water
  - High leakages during water provision
  - Inadequate technical services and infrastructure
  - Lack of proper metering and monitoring systems
  - Lack of public participation and awareness
  - Centralized institutions
  - Overlap of responsibilities among authorities and utilities

[109] "AQUASTAT: Jordan," Food and Agriculture Organization of the United Nations (FAO), 2016.
[110] Ibid.
[111] Ibid.
[112] Grover et al., *Integrated Water Resources Management in Jordan*, 6.

- Risks:
  - Climate change
  - Regional instability
  - Tension between local community and refugee communities
  - Deteriorating water quality
  - Declining foreign aid

- Opportunities:
  - Increase private sector participation for more funding and expertise
  - Improved infrastructure
  - Better understanding of local context by the international community
  - Decentralized institutions for better coordination
  - Stronger engagement with the public and raising awareness on water use

The disadvantages, risks and opportunities observed can be translated into whether Jordan can address some of the distortions in the water sector into actions and build institutional capacity that is needed for an effective sustainable governance.

International organizations and experts have recognized that their technical and financial support towards the water sector is not enough because there is a lack of political will to prioritize policies and regulatory framework needed to create the optimal use of scarce water resources for a water-secure future in Jordan, and donor-funded projects highly influenced by politics. For example, according to USAID,

"*Most people agree they are over pumping. Most donors have tried to tackle the problem and with marginal success. Everybody agrees it's a problem, but nobody would take the next step."*[113]

[113] "Reuse Steps Up in Water-Poor Jordan," *EMWIS*, April 15, 2011.

Jordan is a vital strategic ally of Western powers as it provides "an oasis of moderation and stability in a tumultuous region" in the Middle East.[114] Located on the borders of Israel, Syria, Iraq and Saudi Arabia, Jordan is constantly politically and economically affected by regional instabilities. Nonetheless, despite the turbulences surrounding it, Jordan, through the leadership of His Majesty King Abdullah II, has been managing to pursue internal and external peace. Recognizing Jordan's strategic importance, the international community provides Jordan with financial support through loans and aid programmes. One of the strongest economic supports given to Jordan is dedicated towards the water sector.[115] Due to constant budget deficits, high debts, Jordan cannot fund rebuilding its own water infrastructure and developing the sector to the needed levels for economic growth. USAID has been the largest donor to the water sector, followed by Germany and Japan.[116] Despite the assistance received by the international community, there is a lack of collaboration between the water sector and the donors. Jordan has developed a dependency nature on international donors for large projects to meet water needs, instead of shifting from a supply-oriented attitude towards demand management of limited water resources.

Looking at the analysis made, this research argues that while external factors including climate change, population growth and lack of desirable agreements on shared water resources with neighbouring countries contribute to Jordan's water crisis, water scarcity is highly attributed to the weak governance structure. To cope with the water crisis that can endanger internal stability, there is a need for an effective water governance structure that implements needed policies to protect groundwater, pushes for sustainable water-secure future and adopts a coherent set of reforms needed for water demand management through a collaborative backed up approach by the private sector and the international donor community for technical and financial assistance.

Jordan has been trying to answer its water resource problem through water reforms and cooperation with donor agencies to strengthen the capacity of its institutional frameworks. For example, Jordan asked the WB's assistance in updating its Water Sector Review through a five-year plan that encourages private-sector participation to improve the performance level of service providers and

114 "Jordan Country Development Cooperation Strategy 2013 – 2017" (USAID, 2015), 1.
115 Valerie, *Politics Matter*, 36.
116 Ibid, 37.

the efficiency of the water sector.[117] However, the pictured benefits are not realized, and there is yet effective good governance to be achieved. Effective governance needs to be addressed from various principles (see Figure 4).

FIGURE 4: Effective Water Governance Structure[118]

There is a dire need for effective water governance in Jordan that enables inclusion, efficiency and sustainability. The social changes and the rapid growth rate Jordan is witnessing are negatively increasing pressure on water ecosystems and demand is far exceeding supply. There is also a challenge of meeting demand of good quality water and not all parts of the population can afford access to good water. The allocation of water is disrupted by political competition between sectors and stakeholders as water is essential for economic activity.

Effective governance helps in ensuring that water is divided in an equitable and reliable manner. One of the major problems Jordan faces in almost all its governmental sectors is lack of accountability; where personal gain is more attractive than the general well-being of the population. This is also evident in water governance where investments are discouraged, there is an unequal

[117] Rebhieh Suleiman, Lisa Van Well, and Jan-Erik Gustafsson, "Governance of the Amman Water Utility," *Development in Practice* 18, no. 1 (February 2008): 54.
[118] Author's own interpretation

distribution of water resources, exclusion of certain stakeholders in decision-making processes, and revenues used for other reasons instead of improving water services for the poor.

In addition, the centralized nature of the governance structure promotes exclusion and inefficiency. While on the other hand, participatory would allow a bottom up approach and inclusion of private sector and civil society organizations to take part in the decision-making. Such "bottom-up demand-driven"[119] approaches would give space for experience, transparency, and accountability. From a stakeholder perspective, water governance in Jordan's case also includes the donor community and the private sector. For example, as the WB provides the Jordanian water sector with investments and projects, it also has a role in influencing policies in the governance of water in Jordan.

There is also a need for transparency and accessibility for an effective governance. In 2002, there was 5% incremental increase in water tariffs that consumers neither knew about nor consulted with, and this has caused public distrust.[120] Lack of transparency results in further exclusion in the society and skepticism. Public involvement needs to be part of the governance process to promote efficiency and to be able to manage the limited water resources appropriately. All stakeholders need to be informed in the decision making, and all public representatives need to participate through a bottom up approach. Transparency also provides an opportunity for public awareness on water use and encourages water conservation.

There is low awareness among Jordanians on the dangers of water scarcity, and that is worrisome when looking at how water available resources per capita in Jordan is one of the lowest in the world. Hence, engaging with the public on water challenges is key. For example, with regards to the Disi project, the WB held public consultations in Amman and Aqaba (the two regions mostly affected by the project), in order to get an understanding of customers' opinions and expectations from the project to anticipate changes in water consumption patterns that might affect the potential

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[119] A bottom-up approach is a process where decision-making originates from the lower level and moves upward. The demand-driven approach is a strategy where the people themselves decide on initiatives and take responsibility for improving the situation, rather than depend on the government.
[120] Suleiman, *Governance of the Amman Water Utility,* 61.

benefits of the project.[121] Such action would allow securing political acceptability of private projects and consensus building, to avoid resistance and lack of trust. MWI and some NGOs have been working on water conversation and public awareness campaigns on water value, costs and benefits of water management and wastewater treatment plants.[122] Nonetheless, there is also a need for stronger engagement with the public on the different aspects of the water sector. According to WAJ, there are around 22 user associations that allow the public to participate in assessments and provide their feedback on new projects; however, consultation with the public has not been consistent.[123] Although the government recognizes the importance of customer engagement, there is no transparency being delivered to the public. For example, there is neither information available to the public on the performance of Miyahuna and Yarmouk utilities, nor access to customers' satisfaction surveys.[124] WAJ has a dedicated page on its website for customer complaints, but the results are not accessible online. All of this also leads to an increase in resentment by Jordanians towards government authorities.

4.2 SHORTCOMINGS IN JORDAN'S WATER GOVERNANCE POLICIES

There is a range of options available on the supply side to address Jordan's water scarcity; however, those options mostly suffer from political, financial and environmental costs that make them less feasible. The MWI focuses on large physical projects to improve the quality and availability of water; nonetheless, these projects they mostly lack money, integration and time.[125] In addition, these projects are not designed to provide sustainable supply of freshwater in the future, and there is a huge reliance on donors and lack of coordination between implementing agencies, which all affect the success of these projects.[126]

For example, there are the Disi Aquifier, the Red Sea – Dead Sea Canal, and the Desalination at Aqaba projects all which are considered to increase the supply of water but have multiple disadvantages. The Disi project is designed to provide around 100 million m^3 of water per year by

[121] OECD, *Water Governance in Jordan,* 41.
[122] Ibid, 43.
[123] Ibid, 40.
[124] Ibid.
[125] Denny, *Sustainable Water Strategies for Jordan,* 8.
[126] Ibid.

building a 325 km long pipeline from Jordan-Saudi Arabia border to the capital Amman, and is being built by a Turkish company who will be selling the water for 40 years before the government of Jordan takes ownership.[127] There are several disadvantages found around the exaction of this project. For example, the cost of this project is very high; it is estimated to cost 1.1 billion USD, in addition to other operational costs.[128] Also, the project's location across the borders with Saudi Arabia could lead to political sensitivity when it comes to exploitation. In addition, there are risks associated with leakages and pipeline deterioration. Another example is the Red Sea – Dead Sea Canal that aims to connect the two seas with a 180 km canal that provides 850 million m^3 per year of fresh water to Jordan, Palestine and Israel, and to provide hydroelectric power plants and desalination facilities.[129] However, while this canal project could provide an opportunity for regional cooperation and would save the Dead Sea from water loss, the cost of the project is extremely high with an estimate of 4 billion USD, [130] along with the political hurdles between the Arab States and Israel that could lead to unexpected obstacles for the project in the future.

In addition to the large projects, the MWI has tried to enhance water provision through updating the water network and increasing public-private partnerships. Nonetheless, there is still lack of efficient data available. For example, there is data suggested by MWI that indicates there is a 45% of water loss during transfer and so there is a need for major constructions to improve water network to avoid water loss.[131] However, there is no data available about the network to understand how much each company or service provider is losing or enhancing water provision. As for the public-private partnerships, the WAJ has been privatizing water services since 1999 and has tried to engage private partnerships in the management strategies to incorporate private knowledge and expertise into public projects; however, there is not much data on the benefits of public-private partnerships and how successful the projects have been.

[127] Wes Fry et al., "Human Rights Risk Assessment: Disi Water Conveyance Project Financial Sector Perspective," *NomoGaia*, October 28, 2015, 14.
[128] Ibid, 3.
[129] "Greater Amman," Water Technology, accessed June 10, 2020.
[130] Ibid.
[131] MWI, *National Water Strategy (2016-2025)*, 15.

While it is important to enhance water provision; there needs to be a larger focus on policy options from the demand-side to provide sustainable water management for the long-term. As mentioned in the earlier sections, the agricultural sector is the highest water consumer in Jordan and account for only a small percentage of the total GDP. In addition, for 1 cubic meter of water put in agriculture, agriculture gives back only 0.42 USD per cubic meter of water.[132] These patterns found in the sector suggest the need for reallocation of water away from agriculture by training technicians, improving the irrigation mechanisms, developing needed support for the long term capacity, and transition towards low-water high-return crops. This transition however could lead to political obstacles and pressure on farmers; hence, in the short term, farmers need to be provided with other sources of livelihood as they shift production to avoid unemployment. Such sources could include subsidies, removing tariffs on imported goods, and for the longer term, education and training.

To address water use issues and water loss from the demand side, there is an essential community-based work needed to promote water conservation projects and public awareness. Initiatives done at the local level, whether by the government or NGOs, help communities themselves choose what initiatives are most efficient for them in the long term. These projects could also foster cooperation between the government, NGOs and donors to provide solutions tailored to the needs of the local communities. In addition, as many individuals and households across various sectors lack overall knowledge regarding good water management, public awareness campaigns are a must to understand where water comes from and to reduce the demand of water. Furthermore, to minimize illegal extraction and drilling of water, there is a high need for stricter enforcement of regulations especially against water abusers for greater compliance.

To help in promoting local initiatives and promote water conservation, Jordan needs to enhance its institutional capacity for an efficient water governance. Jordan needs to develop comprehensive and strategic plan that is also accommodated to potential climate change impacts and regional instability. As a result, water needs to become a priority as an issue itself. In addition, the water sector needs to improve the access to accurate and complete water data for higher chances in

[132] Denny, *Sustainable Water Strategies for Jordan,* 11.

successful projects. The government can engage academic and research institutes for more resources. Moreover, there is a need for better communication between sectors for better coordination. There is usually some distrust towards the government and its ability to address peoples' concerns. Therefore, decentralization of water management by engaging the public in the planning from bottom-up approach and increase availability of information can improve the water governance structure.

Hence, water scarcity in Jordan is framed by internal policies that mostly focus on the supply side through implementing large costly water projects, instead on policies that focus more on demand management. There is a need for strategies that promote adaptive water governance, encourage societal engagement that involves the participation of all actors, private and public, and is not oppressed or constrained by centralized institutions.

5. CONCLUSION

Jordan, located the at heart of the Middle East in a turbulent region, is a middle-income country that is shaped by geopolitics and scarcity in natural resources. The country is characterized by its dry and arid climate and has been significantly affected by regional unrest in neighbouring countries, which led to influx of refugees that have further strained Jordan's scarce natural resources, particularly water. There have been large investments by the private sector, donors and the international community in the supply side of water in the past decades, however, water deficit continues to grow the gap between supply and demand.

The external threats imposed on Jordan's water scarcity are rather unpredictable, but to cope with the water challenge, internal issues with regards to governance need to be progressed. The centralized nature of the water sector has played a big role in delaying and resisting some reforms needed to strengthen the water-sector, enforcing legislation, improving management and involving the private sector. The PMU was established in the 2000s to monitor corporatized water companies and promote private sector involvement, however, as responsibilities among institutions, including the MWI, WAJ and JVA, are overlapped, it has been difficult to progress. There is a lot of political influence and traditional ties to the public sphere in the water institutions, leading to potential positive outcomes unfulfilled. There is also poor communication over services and a lack of

coordination towards cross-sector planning and implementation. As a result of the absence of a comprehensive approach for efficient governance, there are constant interruptions in operations. In addition, institutional weaknesses are intimately linked to governance and policy problems, some of which include lack of strong regulatory framework with definite penalties that prevent future illegal use of groundwater.

There are several gaps in the regulatory framework of the water sector. There is a lack of monitoring operators that are needed to promote cost efficiency and decent data collection. The data being collected from utilities and governorates is being done through various methods with no systemic coordination.[133] Despite the already existing external challenges on Jordan's water crisis, the government has failed to follow up on its commitment for a water-secure future through implementing policies that are needed to reduce water deficits and build necessary institutions and infrastructure to provide and manage scarce water sustainability in the country. The water sector lacks the capacity to manage competing demands by the various sectors and the populations in the country. Actors and utilities, including donors and private sector, are also constrained politically due to the centralized characteristics of water governance and instead they operate from a weak organizational structure, portrayed by inter-agency competition. All of this suggests that while there is a supply/demand challenge due to reasons such as climate change and an influx of refugees, water crisis is very much a governance problem.

This research paper argues that adopting an effective water governance holds the key to improve Jordan's water scarcity, by matching demand with sustainable supply. The research conducted in this paper reveals that there is an absence of good governance in Jordan's water sector; there is a lack of: transparency, inclusion of consumers and other informal stakeholders in the decision-making and consultation processes, public awareness on water uses, and accountability.

There is a need for investment in accurate metering and data collection, water conservation to raise public awareness on water use and loss, especially in the agricultural sector, lessen the dependency on nonrenewable ground water resources by diversifying water resources, investment in efficient

[133] OECD, *Water Governance in Jordan*, 34.

infrastructure for transportation and pipes to avoid leakages, and adoption of integrated water management systems that take into account the impact of climate change and population growth. In addition, decentralizing the water sector institutions is fundamental, to allow the private sector and international donors provide the technical and financial support needed to implement the required initiatives and steps for an efficient water governance. Efficient and good water governance can be approached by: increasing transparency and public awareness for trust, promoting participatory and decentralization for more opportunity, implementing accountability to fight corruption and encourage efficiency, and working on accessibility for equity among population.

This paper not only contributes to Jordan's water literature by providing an analysis on Jordan's water governance structure, but also provides an analysis that can be adopted by other countries in the MENA region where significant problems exist or are emerging concerning the scarcity of water resources, and where there is a lack of efficiency in water allocation. Arab countries suffer from weak water governance structure due to incompetent policies and institutions. To date, water has not always been a priority in institutional reforms; therefore, this paper hopes to advance water reform agenda and push for faster and urgent improvements in the water governance.

Potential future research could include specific water policies and strategies for an integrated approach to manage demand and supply. Special attention needs to be given to all stakeholders (including customers, NGOs and the private sector), institutional capacity and regulatory systems to improve water management and services. In addition, given the findings of this study and the disadvantages, risks and opportunities identified in the earlier section, future research could investigate the implications of other discourses, whether socioeconomic, environmental or political, on water governance debates.

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7. ANNEXURE 1

7.1 THESIS REPORT (ATTACHED)

Thesis Report

Central European University / Institut Barcelona d'Estudis Internacionals

Hydropolitics of the Middle East: *Water Scarcity and the Ongoing Civil Wars of Yemen and Syria*

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Table of Contents

1. Introduction 44
2. Literature Review 45
2.1 Hydropolitics and Water Scarcity and Insecurity 45
2.2 Draught and Reduction in Rainfall 48
2.3 Water Cooperation and Management 50
3. Theory and Hypotheses 52
3.1 General Theory 52
3.2 Hypotheses 52
A. Water shortage, due to reasons such as severe draught and reduction in rainfall, leads to grievances and stress. 52
B. Water management at the national level is essential to avoid violent competition over limited water resources. 57
C. Water cooperation at the national and international level is a necessary approach to control water resources and to bring people together to avoid tension and war. 59
4. Research Design 62
4.1 Empirical Strategy and Methodological Approach 62
5. Conclusion 64
6. Bibliography 65
7. Appendix 67

FIGURES

Figure 1: Wealth Corresponding To Water Supply 53
Figure 2: National Water Availability 54
Figure 3: Population In Syria From 1950 – 2013 56
Figure 4: Annual Average Flow Of The Euphrates River On Turkey–Syria Border. 61
Figure 5: Isis Presence On The Euphrates And Tigris River Basin. 62

MAPS

Map 1: Map Of Yemen 67
Map 2: Map Of Syria 67

TABLES

Table 1: Work Plan And Timetable For The Completion Of The Master Thesis 68

1. INTRODUCTION

For many developed countries, water is taken for granted; it comes from a tap and people use it for hygiene and food, even to fill a swimming pool. However, in the developing world, there i2.5 cms a clearer and a more literal link between water and life. In this world, millions of children die and get sick due to water diseases and not having access to clean drinking water. In addition, due to weak and improper water management, many pollute and extensively exploit groundwater. Unfortunately, many policies fail to address water issues and do not implement proper water management policies. The Middle East is an evident example of an area with water scarcity and poor water management. Furthermore, as the Middle East is a theatre for revolutions and risk of civil wars, there is a relationship between water and conflict, especially in the cases of Yemen and Syria where weaponization of water has become a key concept in their conflicts. For example, looking at the Syrian civil war, one can study the behavior of the Islamic State around access to water as it strategically tries to control the water parts in Syria. As for Yemen, according to the UN, 14 million people are going through "pre-famine" conditions, as rebels and government forces fight over Yemen's only port.[134]

The MENA region has become the most water-scarce region in the world with two-thirds of its population living in areas with no enough renewable water resources necessarily to maintain a sustainable life.[135] With the growth of population, environmental and climatic issues, and national and transboundary sociopolitical tensions, access to water has become a significant reason for the rise of armed conflict in the region.

There is already an extensive amount of scholarly work done on the three main river basins of the Middle East, the Jordan River, the Nile, and the Tigris-Euphrates, and its hydropolitics. However, not much is done on the hydropolitics of the Middle East during civil wars. This thesis aims at

134 Margaret Suter, "An Update on Yemen's Water Crisis and the Weaponization of Water," November 29, 2018, https://www.atlanticcouncil.org/blogs/menasource/an-update-on-yemen-s-water-crisis-and-the-weaponization-of-water.

135 Tareq Baconi, "Testing the Water: How Water Scarcity Could Destabilise the Middle East and North Africa," *European Council On Foreign Relations*, November 2018, pp. 2, https://www.ecfr.eu/publications/summary/how_water_scarcity_could_destabilise_the_middle_east_and_north_africa.

filling this research gap by addressing the following research question: how water resources and its scarcity lead to the onset of civil wars, with a focus on two cases: Syrian civil war and Yemeni civil war. Moreover, this report briefly touches on transboundary water cooperation, for the case of Syria, and the correlation between cooperation in water and peace, proving that water is not only essential for the development of a nation, but also for the security of its people.

This report covers the theoretical background of the thesis: 1. The first section includes literature review that defines hydropolitics of the Middle East, the relation between water and conflict, and water cooperation and management, 2. The second section addresses three possible hypotheses on the effect of water scarcity on the social economic life of the people, and the need for proper management and water cooperation. Under each hypothesis its own case analysis of water scarcity and conflict, 3. The third section is the research design that consists the methodology and case selection, 4. The last section includes a discussion and future work to be done.

When studying the scarcity of water resources and its impact on armed conflicts, one must also take into consideration other controlled variables such as the social political stability of the country, the land, food and so on. As a result, decision makers and scholars need to not only look for a technical solution for the water issues, but also study the relationship between all the above mentioned non-biophysical constraints and address the actual aspects of water scarcity.

1. LITERATURE REVIEW

When it comes to water conflict in the Middle East, the conflict revolves mainly around transboundary and national hydropolitics, water scarcity and insecurity, and water management and cooperation.

2.1 HYDROPOLITICS AND WATER SCARCITY AND INSECURITY

The term hydropolitics maintains few definitions revolving around conflict and cooperation among states, non-state actors and water resources. For example, according to Arun Elhance, hydropolitics

is an analysis of interstate conflict and international water.[136] As for Meissner, hydropolitics is a systematic study of interaction between states, non-state actors and other individuals with regards to allocation and use of international and national water resources.[137] Both scholars imply in their work a sense of sovereignty over the source of water. The term hydropolitics is a combination of two words: hydro and politics, meaning the politics of water. With respect to the concept hydropolitics, this report will look at the allocation of water in a society and how politics is affected by the availability of water and its resources.

Additionally, an overview definition of water scarcity includes the lack of an adequate number of renewable sources of water, while water insecurity means the level of water consumption is higher than what is available of water. [138] Hence, when a region is labeled as a water-scarce area, it can be water secured, but when a country with rich sources of water but uses water chaotically, it can be insecure.[139] As a result, countries such as Syria and Yemen, whose borders lay on a great amount of water, the Mediterranean Sea and the Gulf of Aden, are not water insecurity evitable.

With regards to hydropolitics and the Middle East, scholars look at the region's condition and water consumption. According to the United Nations World Water Development Report, the Arab region is the most water-stressed area in the world, with only 736 m^3 of renewable water resources per person.[140] Due to the increase of population growth and the effect of climate change, water scarcity per capita is also increasing.[141] As a result, water resources in the region are insufficient to support

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[136] Arun Elhance, "Conflict and co-operation over water in the Aral Sea basin. *Studies in Conflict and Terrorism*," 1997, pp. 218, **cited in** Bryan Lufkin, "Why 'hydro-Politics' Will Shape the 21st Century," *BBC*, June 16, 2017, http://www.bbc.com/future/story/20170615-why-hydro-politics-will-shape-the-21st-century.
[137] Richard Meissner, "Water as a source of political conflict and cooperation: A comparative analysis of the situation in the Middle East and Southern Africa," *Rand Afrikaans University*, 1999, pp. 4-5, **cited in** Anthony Turton and Roland Henwood, "Hydropolitics In The Developing World: A Southern African Perspective," *African Water Issues Research Unit*, 2002, pp. 15, https://www.internationalwaterlaw.org/bibliography/articles/hydropolitics_book.pdf
[138] ScienceDaily, "Water Scarcity," accessed July 25, 2019, https://www.sciencedaily.com/terms/water_scarcity.htm.
[139] Ibid.
[140] WWAP (UNESCO World Water Assessment Programme), "The United Nations World Water Development Report 2019: Leaving No One Behind," *Paris: UNESCO,* 2019, pp.129. https://unesdoc.unesco.org/in/documentViewer.xhtml?v=2.1.196&id=p::usmarcdef_0000367306&file=/in/rest/annotationSVC/DownloadWatermarkedAttachment/attach_import_77a13b04-19c4-4368-b0d0-8f9c6bf1349f%3F_%3D367306eng.pdf&updateUrl=updateUrl3564&ark=/ark:/48223/pf0000367306/PDF/367306eng.pdf.multi&fullScreen=true&locale=en#WWDR%202019%20EN%2011MAR.indd%3A.48248%3A1057.
[141] Ibid.

the livelihood of its population, and because of the vital role water plays in people's life, water scarcity is a major concern for the Arab region.

By observing the trends, one can notice there is a relation between water shortages and armed conflicts in the region. According to the World Bank report on water supply in the MENA region, an increase of competition over water resources heightens political and economic tensions, and by 2050, water scarcity will cost the region 14% of its GDP.[142] Scholars who had studied the hydropolitics of the Middle East in the 1990s had witnessed peace agreements over water conflict, such as the Jordan River peace agreement between Jordan and Israel. In his work, Greg Shapland notices how in the Arab region, riparian countries who have more power over water, such as Israel on the Jordan River, Egypt on the Nile and Turkey on the Tigris-Euphrates, do not show signs of approval and obedience to the 1997 UN International Law Convention on the uses of international water.[143]

Moreover, Tony Allan states that in order to understand water politics at the political level, one must study the importance of water for communities in the region.[144] In an interview conducted by Reveal, from the Center for Investigative Reporting, the reporter claims Yemen's war was not triggered by terrorism or foreign power, but rather by water.[145] According to some Wikileaks that were released in 2011, water shortages in Yemen has led people to take drastic measures,[146] and as stated by the former Yemeni Minister of Water and Environment, Abdulrahman al-Eryani, water shortage in Yemen is the biggest threat to social stability in the country.[147]

142 Katy Scott, "Can the Middle East Solve Its Water Problem?" *CNN*, March 22, 2019, https://edition.cnn.com/2018/07/11/middleeast/middle-east-water/index.html.
143 Greg Shapland, "Rivers of Discord: International Water Disputes in the Middle East," *London: Hurst & Company,* 1997, **cited in** Tony Allan, "Middle Eastern hydropolitics: interpreting constructed knowledge," *London: School of Oriental and African Studies*, 2007, https://www.soas.ac.uk/water/publications/papers/file38361.pdf
144 Tony Allan, 2007, pp.1.
145 Reveal, "Water wars," *The Center for Investigative Reporting*, January 14, 2017, https://www.revealnews.org/episodes/water-wars/.
146 Ibid.
147 Ibid.

2.2 DRAUGHT AND REDUCTION IN RAINFALL

In his article, Eric Keels talks about how drought conditions, with a focus on rainfall, could extend the duration of civil wars.[148] As rainfall decreases, resources for rebel groups and government forces become more limited. He explains that when food, recruits and other types of support for rebel groups reduce, it becomes more difficult to challenge and confront government forces, and vice versa; the government would also suffer during low rainfall seasons as it would need to find alternative limited resources to fight the rebels and at the same time provide for the civilians.[149]

Although some scholars claim there is no evident connection between drought and civil war,[150] other scholars suggest that environmental disasters weakens the national economy.[151] In addition, they argue that water scarcity increases individual grievances, which could lead to civil wars.[152] Taking the case of Syria as an example, in 2006, Syria had witnessed a five-year long drought, which this paper argues it had played an important role in increasing the social and political tensions that led eventually to the Syrian civil war. Another example includes how the significant shortfall of water in Sana'a, the capital of Yemen, forced people to plan their days depending on their access to water.[153] Other examples include Sudan, Somalia and Ethiopia who faced civil wars that had been aggravated due to drought conditions.

When observing the effect of water availability on development and stability, agriculture and labor play a significant role. With shortfalls in rainfall, cost of food increments as crop decreases, and farmers lose their jobs and migrate to urban areas looking for alternative works.[154] As the agriculture

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148 Eric Keels, "Praying for Rain Water Scarcity and the Duration and Outcomes of Civil Wars," *Defence and Peace Economics*, 2019, pp. 25-45, https://www.tandfonline.com/doi/full/10.1080/10242694.2017.1320184

149 Ibid, 28.

150 Ole Magnus Theisen, Helge Holtermann, and Halvard Buhaug, "Climate Wars: Assessing the Claim That Drought Breeds Conflict," *International Security,* 2011, 36 (3): 79–106, **cited in** Eric Keels, 2019, pp. 30.

151 Edward Miguel, Shanker Satyanath, and Ernest Sergenti, "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," *Journal of Political Economy,* 2004, 112 (4): 725–753, **cited in** Eric Keels, 2019, pp. 30.

152 Val Percival and Thomas Homer-Dixon, "Environmental Scarcity and Violent Conflict: The Case of Rwanda," *The Journal of Environmental & Development,* 1996, 5 (3): 270–291, **cited in** Eric Keels, 2019, pp. 30.

153 Reveal, 2017.

154 Cullen Hendrix and Idean Salehyan, "Climate Change, Rainfall, and Social Conflict in Africa," *Journal of Peace Research,* 2012, 49 (1): 35–50, https://pdfs.semanticscholar.org/422d/2cb375285c4eab243a99a3d64177fe6d27ae.pdf?_ga=2.39518627.1661620308.1565698399-1663341212.1565698399

sector gets vulnerable and the labor force shifts, dispute over land intensifies and demand for food and jobs increase. This stress over agriculture leads to strains on the national economy; hence, resources such as food and other revenues decrease for the government and rebels who rely highly on it in order to maintain their fighting.[155] Therefore, while the surface problem might seem economic, the pressure of shortage of water is the essence of the conflict.

In his work, Joshua Eastin explains when there are no climatic disasters, governments are capable to use more resources in fighting rebels, however, when there is water scarcity and limited access to water, there are fewer available resources to use in the fight against the rebels.[156] This argument explains how during economic decline, due to decrease of food for example, the government is forced to (if they wish to remain in power) direct its resources to areas affected by the shortage rather than towards fighting the rebels. Hence, shortage of water due to reduction of rainfall or drought plays a serious role in the dynamics of the ongoing civil wars. This argument is found in the work of Bruce Bueno de Mesquita et al who claim that governments during civil wars must fight on the ground against rebels and at the same time ensure the wellbeing of its citizens.[157]

There is a lack of literature work on how climatic disasters, specifically on water scarcity and drought, lead to the formation of civil wars. However, there is a growing debate on the argument that natural disasters foster armed conflict. For example, Percival and Homer-Dixon study how rainfall shortage develops grievances and competition among groups,[158] on the other hand, Idean Salehyan and Cullen Hendrix suggest that higher rainfall helps in nurturing a conflict because water increases ones wealth and capability to fight.[159] This report argues that rainfall has a causal effect on the onset and duration of civil wars, whether shortening or extending the duration of it.

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155 Ibid.
156 Joshua Eastin, "Fuel to the Fire: Natural Disasters and the Duration of Civil Conflict," *International Interactions,* 2016, 42 (2):
322–349.
157 Bruce Bueno de Mesquita, Bruce, Alastair Smith, Randolph M. Siverson, and James D. Morrow, "The Logic of Political Survival," *Cambridge: MIT University of Press,* 2003, **cited in** Eric Keels, 2019, pp. 30.
158 Val Percival and Thomas Homer-Dixon, 1996.
159 Idean Salehyan and Cullen Hendrix, "Climate Shocks and Political Violence," *Global Environmental Change,* 2014, 28: 239–250.

2.3 WATER COOPERATION AND MANAGEMENT

Water, as a basic element of life, is crucial for development and stability. Hence, having access to water is significant in order to avoid diseases, social and economic poverty, and conflict. In the Arab world, 51 million people (9% of the entire population) do not have access to basic drinking water service.[160] Anthony Turton argues that water conflict is not only limited to war, but also to conflict between different ethnic groups, famers and entrepreneurs.[161] For example, in the Middle East, Jordan River brushes along the borders of Jordan, Palestine ad Israel; a region where political tension between varying ethnics long stands. Another example includes Syria where conflict and violence among multiple sects within the civilians, rebels and government escalated and turned into a civil war due to control over water.

Furthermore, there are several water bodies in the Middle East that are shared by transboundary nations, such as the Jordan River and the Tigris and Euphrates. However, most countries reject the idea of cooperation in water. Although some treaties were signed, there is still a lack of political commitment to water cooperation.[162] There are 148 countries with trans-boundary water resources, and among those countries, 37 are on the edge of war because they lack an active and proper water cooperation with their neighbours.[163]

Often, water bodies help in shaping borders of nations, as a result, those nations end up sharing access to those bodies of water; such as the Nile river running through Egypt, Sudan, Ethiopia, Kenya, and Rwanda. When those bodies of water run through multiple countries, riparian water rights exist.[164] For example, with upstream rivers, countries where the river originates maintain more power than downstream countries,[165] and habitually in these cases tension exists. Due to this transboundary and national sharing of a water body, naturally hydropolitics evolve.[166] Moreover, water demand is expected to rise up to 55% in 2050; while freshwater supplies are drying up and

160 WWAP (UNESCO World Water Assessment Programme), 2019, pp. 129.
161 Anthony Turton and Roland Henwood, 2002, pp. 1.
162 Strategic Foresight Group, "WATER COOPERATION for a SECURE WORLD Focus on the Middle East," *Mumbai*: 2013, https://www.strategicforesight.com/publication_pdf/20795water-cooperature-sm.pdf.
163 Ibid, 1.
164 Bryan Lufkin, "Why 'hydro-Politics' Will Shape the 21st Century," *BBC*, June 16, 2017, http://www.bbc.com/future/story/20170615-why-hydro-politics-will-shape-the-21st-century.
165 Ibid.
166 Ibid.

climate change is altering water borders.[167] As a result, it is extremely critical to establish and maintain proper water management at the national and international level.[168]

A study done by Strategic Foresight Group shows that water cooperation means the commitment of riparian countries to certain activities and programs that are implemented or are ongoing based on joint management, joint investment and decision making on allocation of resources and environmental protection.[169] Furthermore, the study shows that a higher population of humans live in countries that do not engage in active water cooperation and who are thus at further risk of war than those who are engaged in water cooperation with their neighbouring countries.[170]

In their research and through looking at varying cases across the world, Strategic Foresight Group show that there is a strong correlation between water cooperation and peace, and risk of war and absence of cooperation. For example, they observe that Turkey and Georgia who enjoy water cooperation agreement have a friendly relationship, on the other hand, Turkey does not have water cooperation agreement with Syria nor with Iraq and are constantly at tension and conflict.[171] Furthermore, Turkey, Syria and Iraq share the water of the Tigris- Euphrates Basin and due to various interests and usages, the conflict over the Tigris-Euphrates Basin persists and entails strategical power dynamics that are tied to the access of the two rivers.[172] Another example includes Israel and Jordan who have a relative peace treaty and water cooperation agreement on water flaw from Lake Tiberias and the Jordan River. Oppositely, Israel does not cooperate with Syria nor Lebanon and often engage in violent political discourses.[173]

The lack of water cooperation in the region continues to affect the availability of water, which has a negative impact on the security of the people in the Middle East and the stability of region itself.

167 Ibid.
168 Ibid.
169 Strategic Foresight Group, 2013, pp. 4.
170 Ibid, 25.
171 Ibid.
172 Ibid.
173 Ibid.

2. THEORY AND HYPOTHESES

3.1 GENERAL THEORY

In line with the research question, the goal of the report is to theorize that water has become a powerful weapon in the Middle East and a critical catalyst for starting civil wars. In studies and conferences, water is usually looked at as a political tool; however, this report looks at water as a trigger for violent conflict. For example, in 1953, there were disagreements over water between Israel and Arab states, including Jordan and Syria. Israel attempted to pump water from the Jordan River to the Sea of Galilee through the National Water Carrier, which was a major reason for the onset of the Six Day War in 1967.[174]

3.2 HYPOTHESES

To examine the abovementioned theory, this paper provides three hypotheses:

A. WATER SHORTAGE, DUE TO REASONS SUCH AS SEVERE DRAUGHT AND REDUCTION IN RAINFALL, LEADS TO GRIEVANCES AND STRESS.

According to a study done by Haim Malka on water scarcity, around 400 million people in the Middle East will be living in the urban area by 2050.[175] With the rise of this urban population, stress on water resources increments, and the quality of life falls. As a result of this economic and social stress, grievances among the population builds up.

In the Middle East region, agriculture is a huge contributor to the regional economy. Nonetheless, the agriculture sector is the biggest freshwater consumer since farmers tend to grow highly water dependent crops, and unfortunately, more freshwater is being withdrawn than is being replenished.[176] According to a report done by the World Bank, agriculture in the MENA region accounts for 80% of water usage.[177] While there are more enhanced industrial means that could

174 Lisdey E. Pedraza and Markus Heinrich, "Water Scarcity: Cooperation or Conflict in the Middle East and North Africa?" *Foreign Policy Journal*, September 2, 2016, https://www.foreignpolicyjournal.com/2016/09/02/water-scarcity-cooperation-or-conflict-in-the-middle-east-and-north-africa/.

175 Haim Malka, "Water Pressure: Water, Protest and State Legitimacy in the Maghreb," *Center for Strategic and International Studies,* June 2018, https://www.csis.org/analysis/water-pressure-water-protest-and-state-legitimacy-maghreb-0

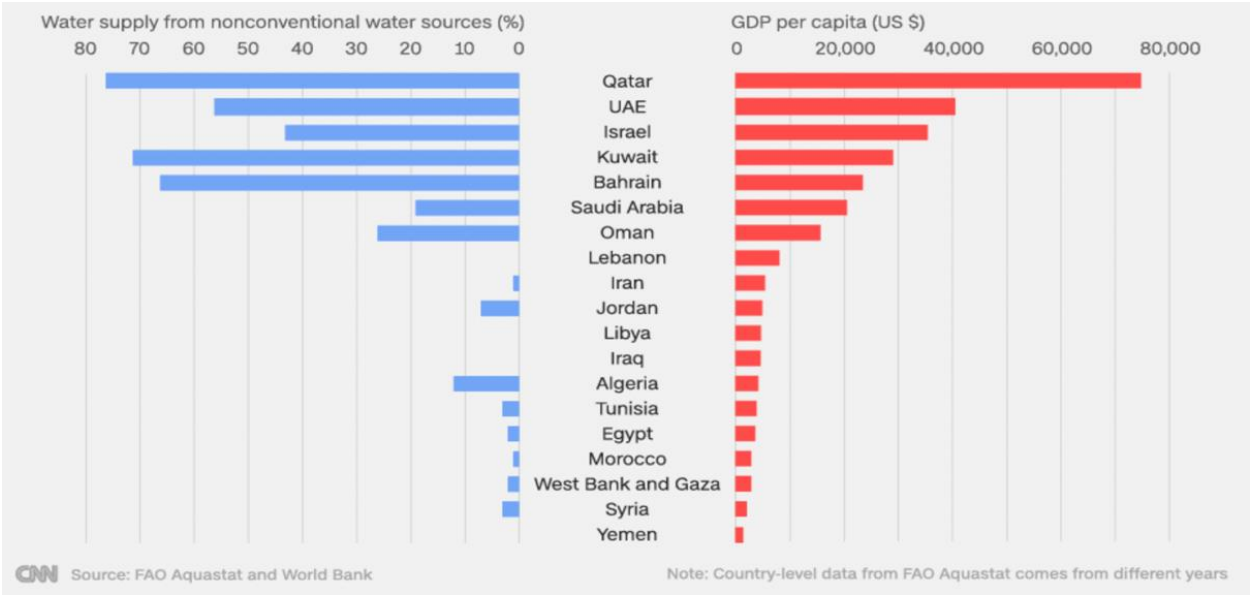
176 "Beyond Scarcity: Water Security in the Middle East and North Africa" (World Bank Group, 2018), https://openknowledge.worldbank.org/handle/10986/27659.

177 World Bank Group, 2018, pp.72.

reduce water withdrawal for agriculture, it remains very expensive to most of the Middle East region.[178] As noticed in Figure 5, for the cases of Syria and Yemen it is the most expensive, opposite to the case of the Gulf region, to desalinate water in order to reduce the pressure on the available water resources.

In addition to the population growth and the heavy depletion of freshwater in the region, varying climatic issues, such as droughts and decline in rainfall, also play a significant role in water scarcity in the region.[179] As seen in Figure 6, 13 countries in the MENA region are marked at absolute scarcity;[180] water scarcity is when the annual water supply is less than 500 cubic meter per capita.[181]

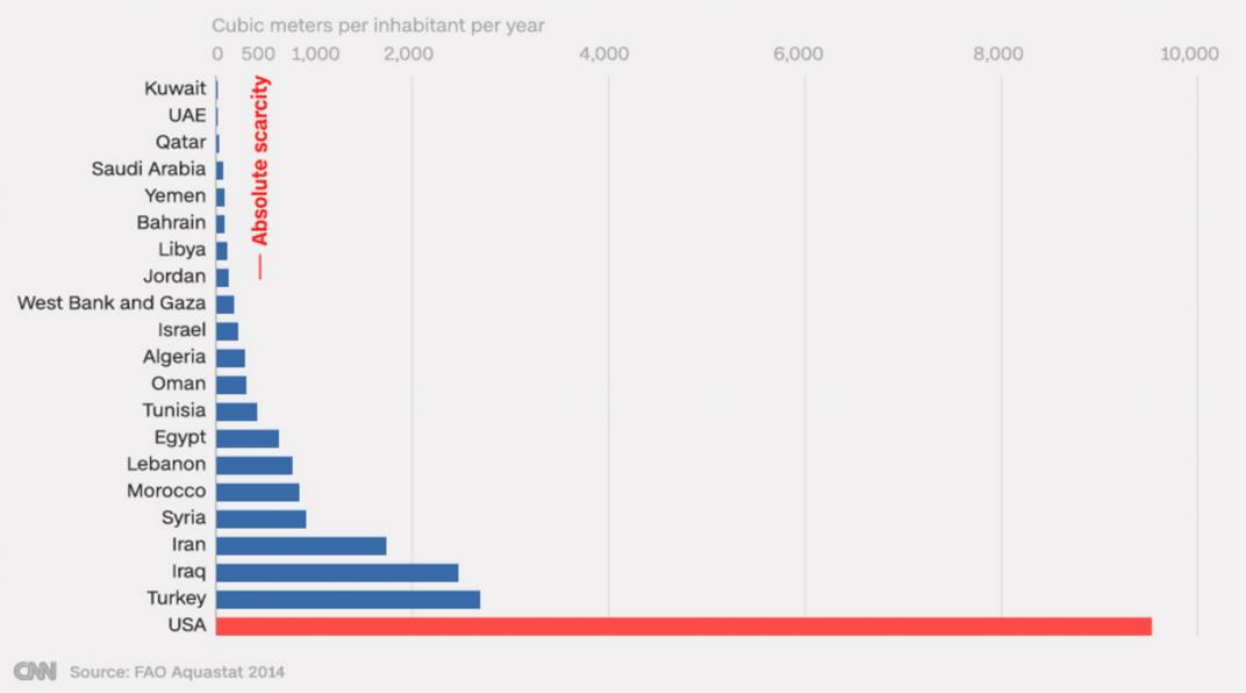
FIGURE 5: Wealth Corresponding To Water Supply



Source: CNN "Can the Middle East Solve Its Water Problem?" 2019.

178 Tareq Baconi, 2012, pp. 6.
179 Scott, "Can the Middle East Solve Its Water Problem?"
180 Ibid.
181 Ibid.

FIGURE 6: National Water Availability



Source: CNN "Can the Middle East Solve Its Water Problem?" 2019.

CASE STUDY 1: YEMEN

In an interview with Reveal, the former Minister of Water, Abdulrahman al-Eryani, commented that Yemen was known around the globe for its agriculture, especially for its port of Mocha and well-known coffee, and Yemen had monopoly over the port.[182] Ages ago, Yemeni farmers created a system for rain water that helped them in their farming and gaining large profits, and due to their wealth and success, people from across the world used to come to the port to work.[183] However, later in the 1990s, water began to decline and tension started to augment among the population in the region as there was no enough water for the people to drink nor for the farmers to harvest.[184] As a result, people started drilling more groundwater, at some point it reached 700 meters, and water riots started taking place in the capital city Sana'a.[185] As for the current situation, water stopped coming out of people's tap, and Yemen has fallen into one of the world's worst

[182] Reveal, 2017.
[183] Ibid.
[184] Ibid.
[185] Ibid.

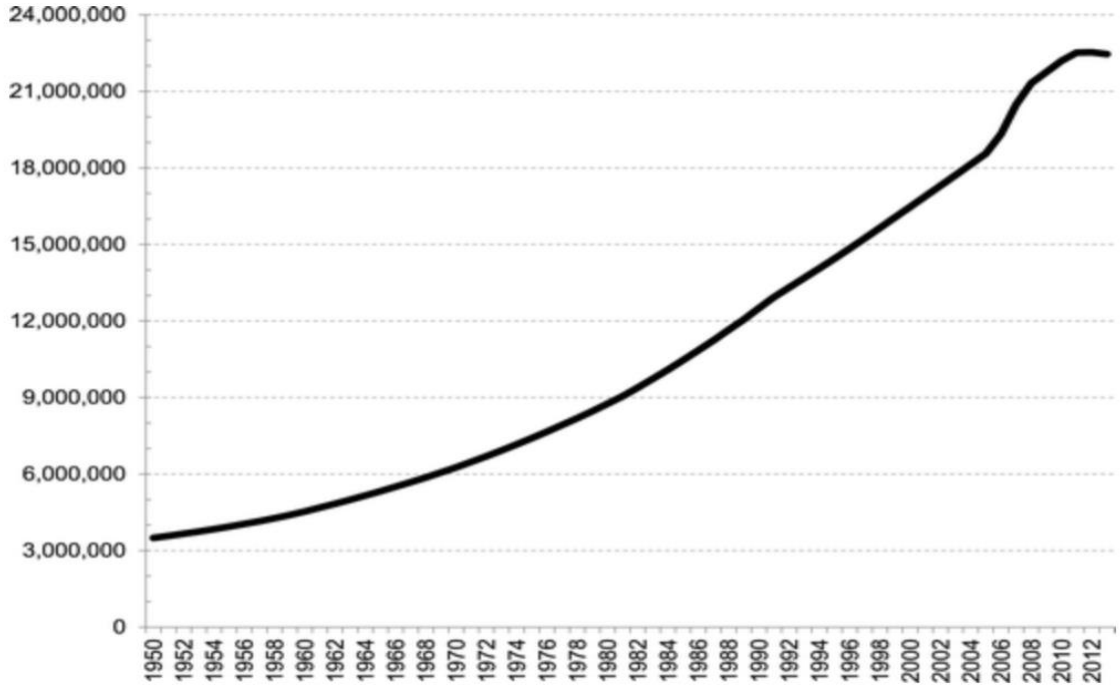
humanitarian crisis. There is not enough food as farmers lack sufficient water to grow their fields, and according to the UN, one out of five people in Yemen are starving.[186]

CASE STUDY 2: SYRIA

As for Syria, its area consists of 185,180 km^2 with a population of 21.13 million and goes through varying water resource seasons.[187] Over the years, the annual rainfall in Syria started declining from 900 mm to 60 mm at the coast.[188] As a result, 60% of the country ended up receiving less than 250mm/year; resulting in water scarcity.[189] For more than 25 years, Syrian water resources have been facing pressure, and according to the Food and Agriculture Organization of the United Nations (FAO), 60% of the total renewable water availability in Syria (which is around 16.8 $km^3\ yr^{-1}$) comes from outside of Syria's borders.[190] In addition to the decline of annual rainfall, the growth observed in the population dynamics has also had a significant impact on the hydrologic vulnerability of the country. As observed in Figure 7 the population has expanded from 3 million in 1950 to 22 million in 2010; resulting in a decrease in the total renewable water availability per capita from 5500 m^3 per capita to 760 m^3 per capita.[191]

186 Ibid.
187 Dursun Yıldız, "ISIS Has Turned the 'Middle East Hydro-Politics' Upside Down," *World Scientific News*, 2015, http://psjd.icm.edu.pl/psjd/element/bwmeta1.element.psjd-4a30e57f-5d7d-462b-9a1e-7b7fe17e6c87/c/WSN_19__2015__16-31.pdf.
188 Ibid.
189 Ibid.
190 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria," *Pacific Institute*, July 1, 2014, https://journals.ametsoc.org/doi/full/10.1175/WCAS-D-13-00059.1.
191 Ibid.

FIGURE 7: Population In Syria From 1950 – 2013.



Source: U.S. Department of Commerce, 2013 **cited in** Peter H. Gleick, 2014.

Moreover, the region had been going through significant periods of droughts with a rainfall season of one-third of the normal.[192] The last drought started in 2006 had lasted until 2011, which led to agricultural catastrophes and economic and population displacements (around 1.5 million people, mostly farmers, moved to urban areas and camps)[193]; eventually resulting in social unrest. As a result of the drought, 1.3 million people were affected and 800000 of these inhabitants had lost their food supports during the first season of drought; as agricultural water use became unsustainable.[194] As for the second season of drought, according to the UN, around 3 million people were affected, most of which diverted towards food insecurity.[195] Similar to the case of Yemen, there were cables exchanged between the U.S. Embassy in Damascus and the State Department in Washington D.C. in 2008, released on Wikileaks, expressing concerns and warning against the possible consequences of the severe drought. The cables also contained briefings by FAO Syrian

192 Ibid.
193 Ibid.
194 Ibid.
195 Ibid.

Representative Abdullah bin Yehia who described the drought as the "perfect storm."[196] Moreover, the Syrian Minister of Agriculture, Adel Safar, declared that the social and economic outcome that resulted from the drought was "beyond our capacity as a country to deal with."[197]

B. WATER MANAGEMENT AT THE NATIONAL LEVEL IS ESSENTIAL TO AVOID VIOLENT COMPETITION OVER LIMITED WATER RESOURCES.

As water becomes scarce due to climatic issues, and insecure with a faster rate of consumption than renewing, it generates tension. This burden can be domestic, regional and international as competition among actors over insecure-water resources expands.

CASE STUDY 1: YEMEN

Before the escalation of water crisis and the beginning of the civil war, the government implemented policies that encouraged water depletion and funded irrigation for heavy-water dependent crops, and there was lack of proper planning and infrastructure; resulting in contamination. According to the US Ambassador to Yemen in 2007 – 2010, Steve Seche, coffee and other crops were replaced by qat, a flowering tree that requires a lot of water and gives a mild high to consumers.[198] He explained that only wealthy farmers were able to grow qat because it requires a lot of expensive water drilling.[199] Furthermore, as the former Minister of Water argued "water shortage and water mismanagement will create social instability and economic and political instability and fighting,"[200] this is what happened; due to poor water management, there was more unrestricted water drilling with 900 unregulated drilling rigs and no legislation for it.[201] While rich people looked for profits, especially from qat, ground water continued to decrease and 14 out of 16 aquifers were depleted.[202] On the other hand, the poor, which constituted the majority of the Yemeni population, were suffering from the consequences. For example, due to mismanagement of water resources and poor water infrastructure, farmers in Sadaa, a Houthi-controlled area, were

196 Wikileaks, "2008 UN Drought Appeal For Syria," November 26, 2008, https://wikileaks.org/plusd/cables/08DAMASCUS847_a.html
197 Ibid.
198 Reveal, 2017.
199 Ibid.
200 Ibid.
201 Ibid.
202 Ibid.

not able to export pomegranate, which was a core fruit for exporting and profit to the region,[203] and as a result; they migrated to the city. According to the Minister of Water in 2010, Houthi rebels came from the farms to the north and started a civil war.[204] Due to the grievances that the poor and farmers felt from the lack of water to grow their corps, rebels in Yemen took drastic measures and found profit in war. Hence, from the case of Yemen, it is evident that proper water management, such as regulating drill rigs, is essential to avoid conflict.

CASE STUDY 2: SYRIA

Prior and during the Syrian crisis, the country has witnessed poor water management decisions and policy errors under the Bashar al-Assad regime and the non-state actors, mainly the Islamic State, which had worsened the social economic and political conditions of the Syrian population. Similar to the Yemeni case with growing heavy-water dependent crops, throughout the Assad regime, large subsidies were provided for water-intensive crops, including cotton and wheat, leading to privatization of agriculture.[205] Moreover, the Syrian agriculture sector lacks a modernized irrigation system, with only one-fifth of the irrigated area using modern sprinkles.[206] In addition, half of the irrigation in Syria depends on groundwater systems, and 78% of all groundwater in Syria is over pumped.[207] According to Suzanne Saleeby, the regime's failure to impose proper economic policies to reduce the drastic consequences of the drought was a main factor in the mobilization of the population.[208] Peter H. Gleick also notes that the extensive exploitation of groundwater leads to drop in water level, contamination and worsens the lifestyle of locals; which could lead to civil unrest.[209]

The combination of poor water resource management and the negative impact on the growth of crops due to the droughts, political and social unrest started happening; starting in Dara'a; a town that received a greater number of farmers and unemployed youth who were displaced due to crop

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203 Margaret Suter, 2018.
204 Reveal, 2017.
205 Peter H. Gleick, 2014.
206 Ibid.
207 Ibid.
208 SUZANNE SALEEBY, "SOWING THE SEEDS OF DISSENT: ECONOMIC GRIEVANCES AND THE SYRIAN SOCIAL CONTRACT'S UNRAVELING," *JADALIYA*, 2012, HTTP://WWW.JADALIYYA.COM/PAGES/INDEX/4383/SOWING-THE-SEEDS-OF-DISSENT_ECONOMIC-GRIEVANCES-AN
209 Peter H. Gleick, 2014.

failures.[210] The escalating pressure on urban areas due to internal migration increased food insecurity and unemployment in Syria, which aggravated grievances and local tension.

C. WATER COOPERATION AT THE NATIONAL AND INTERNATIONAL LEVEL IS A NECESSARY APPROACH TO CONTROL WATER RESOURCES AND TO BRING PEOPLE TOGETHER TO AVOID TENSION AND WAR.

As argued earlier, water scarcity does not necessarily mean water insecurity, and while a country is categorized as water-scarce, it does not indicate it is involved in an armed conflict. However, when water scarcity develops into water insecurity, a country that lacks water management and water cooperation internally and externally could face a threat from having its water crisis evolving into a violent conflict. In the case of the Middle East, a region that is characterized for intense local, regional and international relations, and a region that is classified among the poorest in water resources, water cooperation is very critical and has proven to be an important approach to avoid conflict. For example, water agreement between Israel and Jordan over the shared water resource Jordan river helps in avoiding hydrological poverty and armed riparian war. Furthermore, on the national level, a country that is water-scarce, negotiations and collaboration between varying groups of a country's population can encourage the nation to come closer together, rather than heating tension.

CASE STUDY 1: YEMEN

One factor in the prolonging of this civil war that this paper does not touch on is the role of the Saudi-led coalition, including Saudi Arabia and the United Arab Emirates. The Saudi-led coalition dedicates a huge part of its operations in an attempt to destroy and move the Houthi rebels out of the only port city of Yemen, Hodeidah. The port city Hodeidah holds a key strategic interest and importance due to its access to water, fertile land and trade.[211] In June 2018, clashes between the Yemeni forces and the Saudi-led coalition with the Houthi rebels destroyed a passage between Hodeidah and the rest of the country, which was responsible for the transportation of 70% of the food and other humanitarian goods to the citizens.[212]

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[210] Ibid.
[211] BBC, "YEMEN WAR: WHY THE BATTLE FOR HUDAYDAH MATTERS," 2018, HTTPS://WWW.BBC.COM/NEWS/WORLD-MIDDLE-EAST-44471977
[212] Ibid.

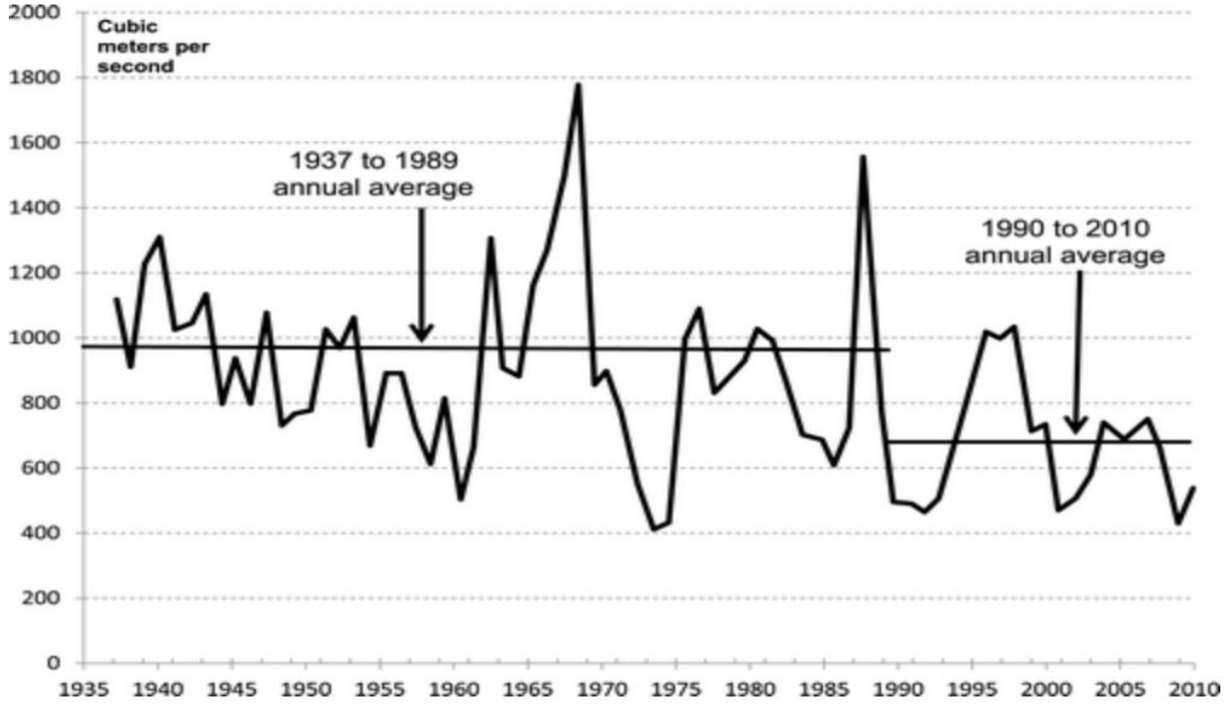
In addition to the fight over Hodeidah city, water has been weaponized through restricting access to water by controlling certain areas such as Taiz, a city near the port city of Mocha on the Red Sea; leading to food insecurity.[213] The UN and other aid agencies have constantly been calling for a ceasefire in the Hodeidah city between the armed forces and the rebels, in order to be able to deliver its supplies for the rest of the citizens in the country and avoid a mass famine throughout the country. Without water cooperation over the port of Hodeidah in the country between national and international actors, Yemen continues to face the worst health epidemics, and clean water prices have been drastically elevating; leaving 19.3 million citizens with no access to drinkable water.[214]

CASE STUDY 2: SYRIA

When affected by climate change, transboundary waters play an important role in shaping the future of the countries. There are 21 rivers in Syria, 12 of which are shared with neighbouring countries.[215] As for the major rivers, Tigris-Euphrates (T&E), Orontes, and Yarmouk, they are all shared with neighbouring countries whom do not engage in water cooperation with Syria.[216] Since 1990s, tension between Jordan and Syria has been existing over the operation of the Syrian dams along the Yarmouk river.[217] In addition, and most evidently, tension between Syria and Turkey has been worsening over the past decades, especially due to the decline in precipitation (as can be seen in Figure 8) and Turkey's construction of the Ataturk Dam.[218] T&E, which originates from Turkey and crosses through Syria and Iraq, is a historically significant water source. However, with the majority of power laying with Turkey's hands and the dams being built as part of the Southeast Anatolia Project, Iraq and Syria's access to the river has been declining, with 40% less water flow to Syria.[219]

213 Margaret Suter, 2018.
214 Ibid.
215 Peter H. Gleick, 2014.
216 Ibid.
217 Ibid.
218 Ibid.
219 Ibid.

FIGURE 8: Annual Average Flow Of The Euphrates River On Turkey–Syria Border From 1937 To 2010.



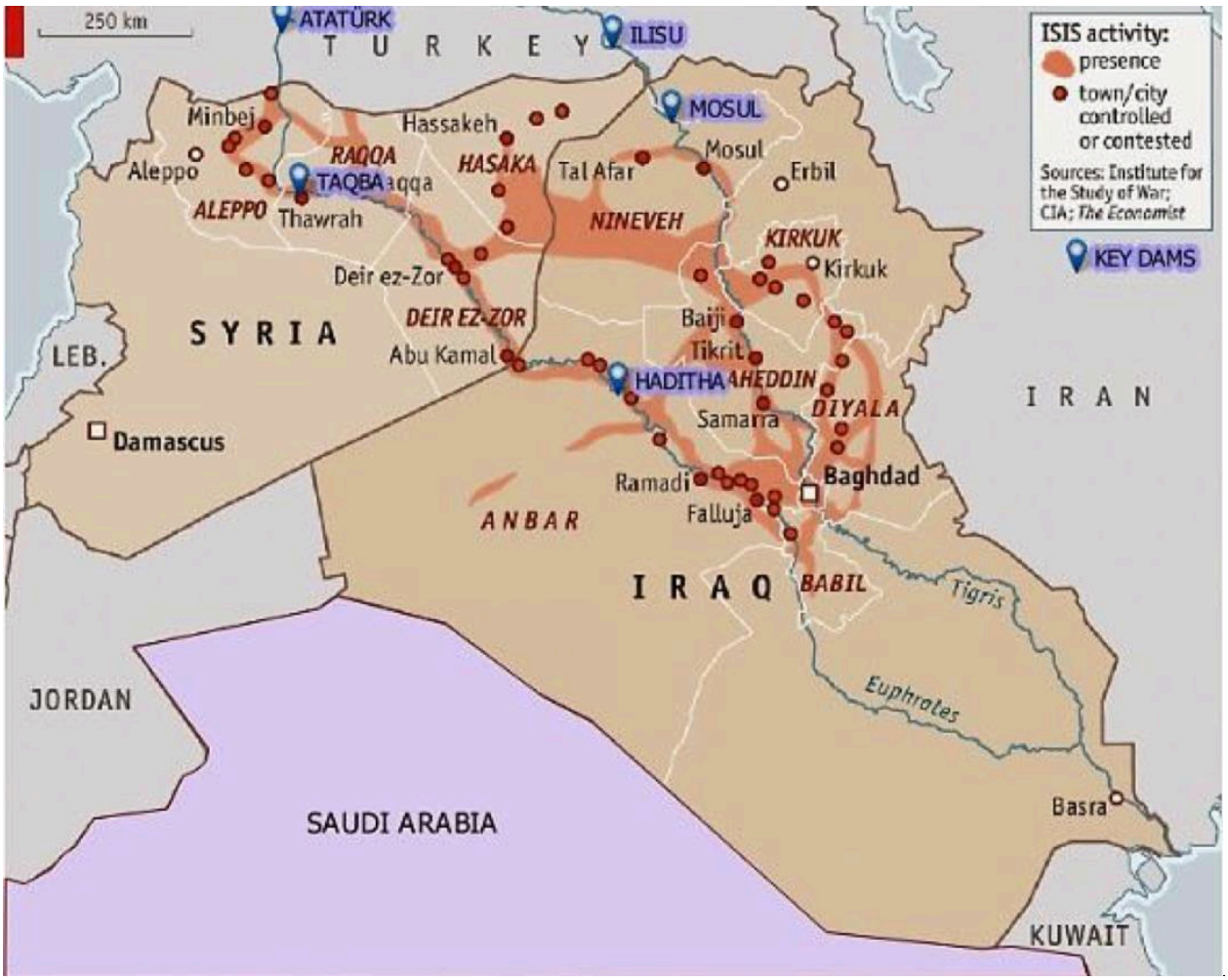
Source: U.S. Department of Commerce, 2013 **cited in** Peter H. Gleick, 2014.

In addition, as the fighting started taking place in Syria, a major pipeline that delivers water to the city of Aleppo was damaged in 2012.[220] As a result, 3 million people suffered shortage of drinking water.[221] Later in the same year, anti-regime rebels managed to capture the Tishrin hydroelectric dam on the Euphrates River; a dam that supplies many areas in the country with electricity.[222] Furthermore, the Islamic State members have used water as a weapon in their fight in Syria, as hydrological control became a strategy of creating a caliphate for ISIS. In addition to controlling access to water, ISIS has used water for its own food and electricity and winning the support of the population. In 2014, ISIS fighters managed to control the majority of the Tigrin-Euphrates river basin as can be seen in Figure 5.[223]

220 Ibid.
221 Ibid.
222 Ibid.
223 Yıldız, "ISIS Has Turned the 'Middle East Hydro-Politics' Upside Down," pp. 24.

From the two cases observed in Yemen and Syria, this report argue that water is used as a strategic tool by state and non-state actors, including regional and international powers, to fulfill certain political and socioeconomic motives. Therefore, it is very critical to study the cooperation between all actors involved in order to supply deprived people with water.

FIGURE 9: Isis Presence On The Euphrates And Tigris River Basin.



Source: Dursun Yıldız, 2015.

3. RESEARCH DESIGN

4.1 EMPIRICAL STRATEGY AND METHODOLOGICAL APPROACH

This research paper provides the readers a chance to understand the importance of the presence of certain variables related to water and their impact on social unrest and the political endurance of

regimes during crises in the MENA region. Many scholars and policy makers would argue that the civil wars in Yemen and Syria are not directly related to conflict over water, while this report argues that the impact of water crisis must be studied in order to understand how climatic and environmental issues could be the main factor in the onset of civil wars.

This paper examines the role of water as it becomes scarce and insecure in starting a civil war. Two separate cases, the Yemeni civil war and the Syrian civil war, are used in the report in order to study water scarcity challenge in the MENA region.

It is very essential to make balanced comparisons in order to avoid selection bias and choose cases that are actually comparable. Hence, this report uses the method of structured focused comparison with 'most similar cases' that share comparable theories and help explain the hypotheses studied. The empirical cases of Yemen and Syria help examine the theories' consistency and the connection between water scarcity and the onset of civil wars.

In this research, there are many parallel variables that reveal how water scarcity leads to potential armed conflict, including agriculture, poor management of water infrastructure, pathetic economic response to environmental issues, and lack of local and transboundary cooperation, which cause epidemic health challenges, grievances among the population, and instability that leads to potential armed conflict. The main differences between the two cases (the independent variables) include the type and number of water resources available in each of the two countries examined, and the dynamics of the civil war (including actors involved). The methodology used in the report and the variables looked at will be further examined in the longer version of this thesis.

One possible limitation to the research is that it was not possible to conduct discussions with expertise or complete fieldwork in Yemen or Syria due to the existing danger in the countries. Nonetheless, the data obtained in the report comes from several regional and international sources, mainly from the World Bank Report 'Beyond Scarcity: Water Security in the Middle East and North Africa,' the United National World Water Development Report 2019 'Leaving No One Behind,' the World Water Council (WWC) 'the 8th World Water Forum,' and two confidential cables that were released on Wikileaks and sent out before the beginning of both the Yemeni civil

war and the Syrian civil war: 1st is 'Water Resources Fall as Water Scarcity Rises on National Agenda' and the 2nd is '2008 UN Drought Appeal for Syria'. Both cables provide firsthand evidence on the concerns that were revolving around water scarcity and the potential of a rising war.

Furthermore, as this report is an annex to the actual thesis to be written, it focuses on the theoretical approach to hydropolitics in the Middle East. Nonetheless, interviews with expertise and strategic recommendations for local and international actors to address the problem will be added to the final thesis (as seen in the appendix).

4. CONCLUSION

This thesis report provides the theoretical ground for the thesis that will be written in the following year. The paper contributes to the literature on hydropolitics of the Middle East and discusses the correlation between water scarcity and the onset of civil wars. Though traditional factors of conflict remain significant in their role, natural resources are becoming increasingly vital in causing wars. Climatic issues in combination with vast population growth have heavily added pressure on water availability in the MENA region, resulting in an additional source of tension.

Prior to both civil wars, draughts and drop in rainfall in Yemen and Syria weren't getting much attention. Farmers' fields were stripped of crops, people became hungry, thirsty and angry. Once water riots took place in the streets and water scarcity catalyzed the ongoing civil wars in Yemen and Syria, local, regional and international concerns about water availability augmented. This report argues that water scarcity destabilized the two countries, Yemen and Syria, and helped in flickering two wars that were and continue to be the reason behind the displacement of millions of citizens.

Yemen and Syria's water situations are not necessarily unique but may perhaps serve as a scenario case for similarly water-scarce countries in the MENA region.

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6. APPENDIX

MAP 2: Map of Yemen

Source: Geology.com

MAP 3: Map Of Syria

Source: Geology.com

TABLE 4: Work plan and timetable for the completion of the Master thesis

Deadline	**Work to be completed**
31, August, 2019	Submit thesis report
September - November, 2019	Collect data, find experts on the Middle East in natural resources and national security and collect contact information, reach out to potential interviewees
October - December, 2019	Attain skills on the use of content and text analysis from Thesis Workshop classes and other courses at IBEI, finalize literature review section, organize and review data
January - February, 2020	Finalize methodology section, and submit drafts of the literature and methodology
March - April, 2020	Complete results analysis and submit draft of analysis
May - June, 2020	Review sections and finalize thesis with supervisor
20, June, 2020	Format thesis according to guidelines and submit first full draft of thesis
8, July, 2020	Submit thesis
9, September, 2010	Give oral defense of thesis

Declaration of authorship

I, the undersigned Noor Masannat hereby declare that I am the sole author of this thesis report. To the best of my knowledge this thesis contains no material previously published by any other person except where due acknowledgement has been made. This thesis report contains no material which has been accepted as part of the requirements of any other academic degree or non-degree program, in English or in any other language. This is a true copy of the thesis report, including final revisions.

Date: 24/August/2019

Name: Noor Masannat

Signature: