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Lund University Master of Science in
International Development and Management

May 2020

“Sabotage” of the Disi Water Conveyance in Rural Southeast Jordan

An Investigation of the Mechanisms Constructing the Phenomenon
through the Morphogenetic “Water” Justice Cycle

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Abstract

In opposition to most hydrological studies in Jordan, this study examines water from an interdisciplinary perspective with a particular focus on the social component. This qualitative case study was conducted over 9 weeks from December 2019 to February 2020. Extensive data was collected from various sources, while intensive data was collected through semi-structured interviews, focus groups, and observations. A new model the morphogenetic “water” justice cycle was constructed to enable a holistic analysis and discussion of the collected data. It assisted in demonstrating how the phenomenon of “sabotage” in Jordan entails more than damage to the Disi Water Conveyance (DWC) as it is also a political instrument that enables the government to blame the communities in the Southeast when mismanagement of the pipeline occurs. Meanwhile, it removes the focus from the neglect of rural Ma'an, which triggered the rural unauthorized informal water distribution from the DWC manholes in the first place. In this sense “sabotage” acts as a crucial component of the clientelist social contract between the monarchy, the government, and the tribal communities as it allows redirection of attention away from national and local mismanagement of water.

Keywords: “sabotage”, water scarcity, hydro-politics, climate change, water governance, Jordan, non-revenue water, water justice, hydro-social cycle, morphogenesis process, morphogenetic “water” justice cycle, tribalism, clientelism, unauthorized water provision, rural water informality

Word count: 14975

Acknowledgment

There is an extensive amount of people and organizations who were of invaluable support for this thesis. Without their help, this thesis would not have been a possibility.

First of all, thank you Lund University Master of Science in International Development and Management for selecting me amongst 1200 applicants and for providing the opportunity to conduct fieldwork. The past two years have expanded my conception of the world and myself and provided me with friendships that will stay with me forever. A special thank you should be given to my supervisor, Christopher Mathieu, for his support, insights, and inputs for the research and the thesis.

My sincerest gratitude goes to the people I have come across during my semester abroad. I would like to thank UN Environment West Asia for expanding my knowledge on environmental issues and climate change in 12 different countries, including Jordan. My gratitude should be given especially to my previous supervisor, Mohammed Angawi, for allowing me to flourish during my internship. It should be noted that this thesis is completely unaffiliated with the agency and the research was conducted after the end of the internship.

I cannot express how valuable special individuals have been to the research, including Ali Abu Alhial, Osama Hzain, and Khalil Aqidi. I am honored and grateful for your friendships, translations, and cars. I also want to thank Eng. Suzan Kilani, Madina Olomi, Siobhán Coskeran, Alina Zalewski, and Lara Frisch for being invaluable gatekeepers and support. My deepest gratitude goes to every single informant and respondent for sharing their valuable knowledge. This study would not have been possible without every single one of you. أنا ممتنة لكم جميعاً

I would like to extend my gratitude to Augustinus Fonden and Knud Højgaards Fonden for providing me with grants to financially support my semester abroad including the research.

Last but not least, thank you to my family, friends, and boyfriend for their patience and emotional support throughout every single moment.

Helena Wisbech Frid

May 2020

”Each day more than 800 million acre-feet of water rains onto the earth. There is, even today, enough to go around. The difficulty is in ensuring that water is always where we need it, when we need it, and in a suitable state – for all 7.3 billion of us”

(Pearce, 2018: 264)

List of abbreviations

Abbreviations	Full description
AANWCP	Aqaba-Amman National Water Conveyance Project
BGR	Federal Institute for Geosciences and Natural Resources
BMZ	Federal Ministry of Economic Cooperation and Development (Germany)
BOT	Build-Operate-Transfer
CBM	Cubic meter
CDC	Centers for Disease Control and Prevention
CR	Critical realism
DFID	Department for International Development (UK)
DIWACO	Disi Water Company
DWC	Disi Water Conveyance
EIA	Environment Impact Assessment
GDP	Gross domestic product
GE	General Electric
GGGI	Global Green Growth Institute
GIZ	German governmental organization
IHP	International Hydrological Programme
ILO	International Labor Organization
IMF	International Monetary Fund
INGO	International non-governmental organization
JD	Jordanian Dinar
KSA	Kingdom of Saudi Arabia
MCM	Million cubic meter
MWI	Ministry of Water and Irrigation
NEPCO	National Electric Power Company
NGO	Non-governmental organization
NRW	Non-revenue water
NWMP	National Water Master Plan
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
US	United States
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme
WHO	World Health Organization

Table of Contents

ABSTRACT	I
ACKNOWLEDGMENT	II
LIST OF ABBREVIATIONS	IV
1. INTRODUCTION.....	1
1.1 <i>Research Purpose and Questions</i>	1
2. THE COMPLEX WATER SITUATION OF THE HASHEMITE KINGDOM OF JORDAN	2
2.1 <i>Jordanian Hydro-politics and Governance</i>	3
2.2 <i>Tribal Clientelism in Jordan</i>	5
2.3 <i>Rural Water Informality</i>	8
3. THEORETICAL BACKGROUND AND FRAMEWORK	10
3.1 <i>Theory of Science</i>	10
3.2 <i>Hydrosocial Cycle</i>	10
3.3 <i>Water Justice and Deviance</i>	11
3.3.1 <i>Water Justice Trinity</i>	11
3.3.2 <i>Deviance and Discipline</i>	12
3.4 <i>Morphogenesis Process</i>	14
4. METHODOLOGY	15
4.1. <i>Research Sites: Urban Amman and Rural Ma'an</i>	15
4.2 <i>Research design</i>	15
4.3 <i>Sampling</i>	16
4.4 <i>Data Collection</i>	17
4.4.1 <i>Extensive</i>	17
4.4.2 <i>Intensive</i>	17
4.5 <i>Ethical Considerations and Positionality</i>	19
4.6 <i>Credibility, Validity and Method of Analysis</i>	20
4.7 <i>Limitations and Generalizability</i>	21
5. ANALYSIS.....	21
5.1 <i>Infrastructure as a Morphogenetic Element of Justice</i>	22
5.1.1 <i>The Emergence and Impacts of the Disi Water Conveyance (DWC)</i>	22
5.1.2 <i>Rural Water Distribution in the Ma'an Governorate</i>	24
5.2 <i>H₂O as a Morphogenetic Element of Justice</i>	27
5.2.1 <i>The Best Unpredictable Disi Water</i>	27
5.2.2 <i>Local Sources as “Water of Diseases”</i>	29
5.3 <i>Social Power as a Morphogenetic Element of Justice</i>	31
5.3.1 <i>Popular Illegalities: The Tale of “Sabotage”</i>	31
5.3.2 <i>The Northern Bias and the Politicization of Water</i>	34
6. CONCLUSION.....	38
7. RESOURCES	40
8. APPENDICES	50

1. Introduction

Water, the single most important element for life in all forms. It can determine livelihoods and disturb the development and stability of countries and regions. Although water has long been treated as a separate entity, it intertwines with various aspects of our social world. While the natural world affects the social, the Anthropocene also witnesses the capacity of the social to impact nature. The Hashemite Kingdom of Jordan has experienced firsthand both natural and social impacts on and of its water availability. It is regarded as one of the most water-stressed countries in the world, which inevitably limits its economic and social development (WRI, 2019; Hatamleh and Shawaqfah, 2018; MWI, 2016a). Yet, it experienced 61 alleged incidences of “sabotage” in the first 6 months of 2019 on one of its most vital water infrastructures, namely the Disi Water Conveyance (DWC). The DWC carries fossil groundwater from Southeast Jordan 340 km to the capital providing it with 55% of its total water resources. One major “sabotage” of the pipeline occurred in August 2019 and resulted in a weeklong water cut.

“Sabotage” is defined by the Oxford Dictionary as “the act of doing deliberate damage to equipment, transport, machines, etc. to prevent an enemy from using them, or to protest about something.” As the DWC is considered a strategic infrastructure and one of the stabilizing veins of the powerful capital, conclusions along these lines could easily be drawn. While parallels exist, the Jordanian water “sabotage” should be regarded within its own complexity due to the vitality of the resource, tribalism, clientelism, semi-rentier state, informality, and marginalization. As this study will expand the definition of the phenomenon, the word is written with quotation marks, “sabotage”, to illustrate that it will go beyond its classic definition. This phenomenon is not only interesting empirically, but also theoretically. Since it encompasses aspects not included in its original definition, this paper proposes a new theoretical framework that combines the hydrosocial cycle, justice theory, and the morphogenesis process in a model termed the morphogenetic “water” justice cycle. The model allows a holistic examination of the case of “sabotage” in Southeast Jordan while providing a model to be used for similar cases beyond this research.

1.1 Research Purpose and Questions

Southeast Jordan is generally understudied as the majority of water scarcity studies in Jordan focus on the North. Furthermore, the water resource literature of Jordanian academia mainly approaches the issue from hydrogeological and engineering perspectives, while political and social studies are

nearly absent (Hussein, 2018). By exploring the phenomenon of “sabotage” in the Southeast rural Ma'an, this study aims to shed light on the socio-political mechanisms behind water management in Jordan. The study will expose the consequences of Northern prioritizations on some of Jordan's most marginalized communities. The issue is increasingly important as Jordan launched the next major South-to-North engineering project in February 2020, the Aqaba-Amman National Water Conveyance Project (AANWCP), which will combine desalination and groundwater extraction. AANWCP is a bigger and more complex version of DWC, thus this paper holds the potential for improved equity considerations in the project planning process, which recently entered its first phase. To pursue such contribution, the paper aims to answer the principal research question:

What mechanisms construct the phenomenon of “sabotage” on Disi Water Conveyance in Southeast Jordan?

In order to nuance this, various aspects are examined through three sub-questions, which follow the morphogenetic “water” justice cycle to holistically answer the principal question:

1. In what way did the formal *infrastructure*, Disi Water Conveyance, impact the livelihoods in the capital and the North and the informality of the local communities living aside the pipeline?
2. How is the natural and perceived materiality of the H_2O of Disi and the local sources related to the phenomenon of “sabotage”?
3. Why is the phenomenon of “sabotage” linked to *social power* structures of the clientelist and semi-rentier Jordan?

This paper proceeds to examine the Jordanian water situation by presenting and identifying gaps in the literature on water availability factors and narratives, tribalism, and rural water informality in Chapter 2. In Chapter 3, the three theories are discussed individually to illustrate how they can be morphed into the morphogenetic “water” justice cycle. Afterward follows a discussion of the chosen methodology for data collection and analysis in Chapter 4. In Chapter 5 the model of the morphogenetic “water” justice cycle is applied to the empirical data. Chapter 6 will conclude with a summary of the definition of the phenomenon of “sabotage” in the Jordanian context, this study's contributions, as well as further research.

2. The Complex Water Situation of the Hashemite Kingdom of Jordan

This chapter first discusses the factors causing water stress in Jordan and how they are framed by different actors. It will proceed with an overview of the interlinkage between rural development

policies, tribalism, clientelism, and water governance. This will create an initial understanding of how and why rural water informality is relevant to the study.

2.1 Jordanian Hydro-politics and Governance

Jordan has experienced a significant decrease in its water availability per capita from 3600 m³/year in 1946 to 135 m³/year in 2017 (Rajsekhar and Gorelick, 2017). This is combined with an expanding gap between the total supply of 972 MCM and the demand of 1400 MCM projected to increase by 25% in 2025 (Yorke, 2016; MWI, 2016a; USAID, 2012). But what causes this deepening water crisis?

According to Hussein (2018; 2020), Yorke (2016), and Bonn (2013), it depends on whom you ask. Whereas the donor organizations primarily perceive it as a *water mismanagement* issue, the government, elite, and Royal House view it as a *water insufficiency* problem (see Figure 1). Over time the Ministry of Water and Irrigation (MWI) has adopted the donors' narrative, yet it still emphasizes supply-side solutions over demand-side (Hussein, 2018).

The government's water insufficiency narrative entails four causes of the deepening water crisis (Bonn, 2013; Hussein, 2018). First, the Middle East and North Africa region is anticipated to experience severe climate change effects with a decrease in water levels by 15% from 1960 levels by 2025 (Greenwood, 2014; Yorke, 2016; UNDP, 2018). In Jordan, it means a 30-60% reduction of groundwater basin recharge, which will especially impact vulnerable and arid areas in the South (Margane, Borgstedt, and Subah, 2008; Oroud, 2008).

Second, Jordan hosts one of the highest rates of refugees in the world, which puts pressure on the water resources, not only in Amman and the Northern governorates that host the most refugees, but also the rest of the country from which the water is transferred (UNHCR, 2019) (see Appendix 1).

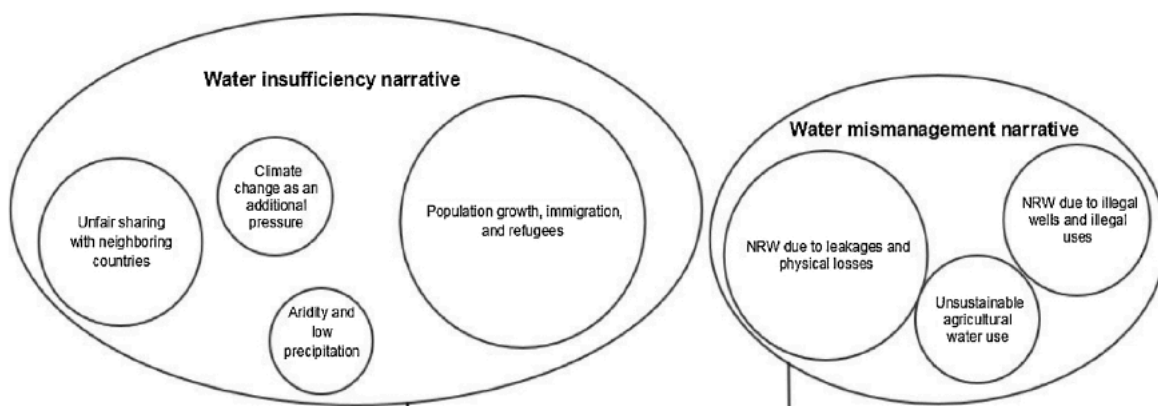


Figure 1: Narratives and their relationship to related discourses (Hussein, 2018: 386)

Third, Jordan was previously landlocked until the land exchange agreement with the Kingdom of Saudi Arabia (KSA) in 1965 which changed the borders originally drawn by the British and French imperialists (Agreement on the delimitation, 1965). Under the agreement, Jordan gained access to the Red Sea and KSA was provided with 80% of the Disi groundwater basin (See Figures 2 and 3). Moreover, Jordan shares 6 out of 12 aquifers with 13 other countries, whereas only 3 transboundary agreements are in place, which according to the government are not upheld by its counterparties (ESCWA and BGR, 2013; SIWI, 2019; Hussein, 2020). On top of this, all its sources are downstream, which further fosters a lack of power over its water resource.

Last, Jordan's geographical location also holds part of the blame as it is the country in the Levant region with the lowest precipitation; only 7% of Jordan receives more than 200 mm per year, whereas Lebanon has 90% and Syria 45% (MWI, 2014; Greenwood, 2014). Jordan also experiences internal disparity as the Southern governorates are the most arid. The four presented sub-narratives led the government to view the issue largely as naturally caused; thus, concluding that the main solutions would be to expand the supply. The Disi Water Conveyance (DWC) is an example of such. According to Bonn (2013) and Hussein (2018), this narrative is an attempt by the government to direct the funds and focus away from internal mismanagement issues and power structures, which the donors deem a major cause of the water situation.

This discursive strategy is vital as Jordan is a semi-*rentier* state, in which: "attracting financial support is an inherent part of foreign policy and an important pillar used to stabilize the position of the Royal House within the elite structures of domestic policy" (Bonn, 2013: 730). In 2019, grants and soft loans from donor countries and financial institutions stood at \$US 2.6 billion, which is 6.5% of Jordan's GDP (Jordan Times, 2019a). The majority is provided by the USAID, the European

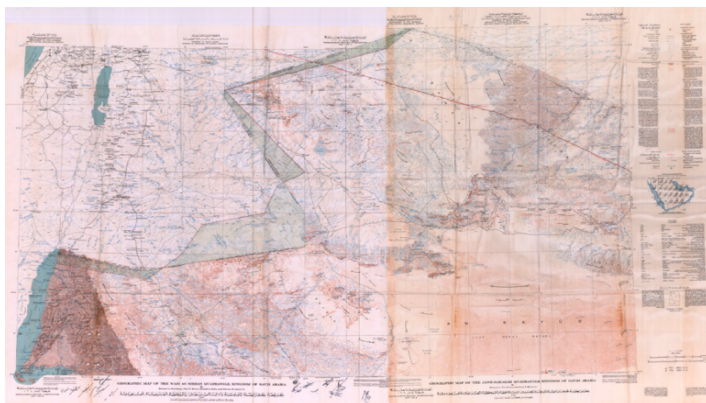


Figure 2: Official map of Saudi Arabia-Jordan Land Exchange. (Retrieved from UNTC, 2015)

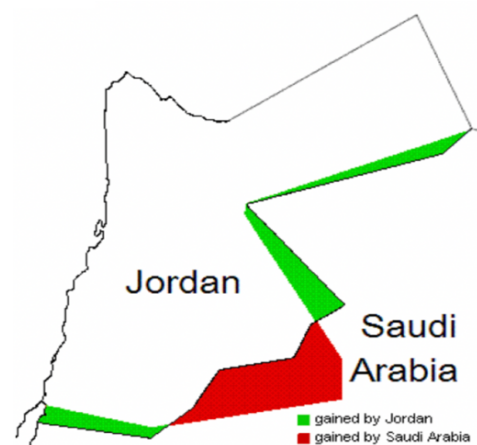


Figure 3: Visualization of Land Exchange (Wikipedia, 2010)

Union, World Bank, and German donor agencies. This means that the Jordanian government is forced to address the donors' reluctance to invest in new major supply solutions due to their opposing narratives. Some donor agencies have reportedly expressed that it is not reasonable to, for example, transport Disi groundwater across the country if roughly half is "lost" as non-revenue water (NRW) (Hussein, 2018).

The intermittent network and lack of maintenance are challenges faced by powerful donors, such as GIZ and USAID, in diminishing the physical losses related to NRW. It is even harder to address the administrative aspect of NRW, which includes illegal drilling, unbilled water, "sabotage", and other illegal uses. These were first publicly addressed by the MWI in 2013 as the former minister, Hazim Al Nasser, initiated a campaign against illegal drilling (MWI, 2014). As the issue is linked to the tribal support and overall stability of the country it is complicated for MWI and donors to tackle. In 2014, MWI proposed a goal of reducing overall NRW from 52% to 25% by 2025, however, as my findings indicate, the gap between de jure and de facto in hydro-politics in Jordan is as big as the demand and supply.

According to employees in donor organizations and ministries, the official water strategies are often merely "advertisement booklets" and are often made to satisfy the wishes of the donor organizations as they adopt prevailing narratives of international donors translated into their own dicta (Bonn, 2013; Hussein, 2019). This is an example of the semi-rentier discursive strategy in which the government aims to allow a consistent inflow of donations without risking destabilization of the Hashemite Kingdom. Figure 4 illustrates how the two internally and externally focused narratives lead to problematic communication and inefficient partnerships between the two.

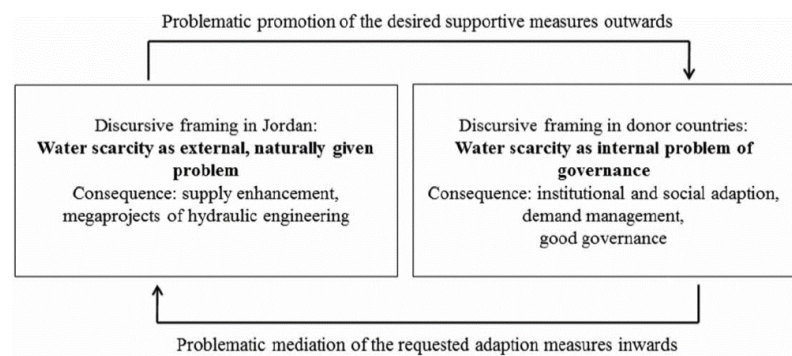


Figure 4: Two different framings of the reasons for Jordan's water scarcity (Bonn, 2013: 732)

2.2 Tribal Clientelism in Jordan

The abovementioned relationship between the government and the organizations is further complicated by the fact that; "the Hashemite rule has been underpinned by parallel informal neo-patrimonial structures, which bind military and civilian elites into a web of support, and by a costly

'social contract' between Throne and people" (Yorke 2016: 233). An important contract subtype in the Jordanian context is the *authoritarian pact*, which consists of three core elements: the monarchy as the custodian of stability and economic security; society as a passive political actor and beneficiary of the clientelist state; the tribes as essential intermediate component (Melián, 2019: 214). To understand the creation and interlinkage of these elements, a brief historical overview of the state formation is provided.

Jordan's founding myth goes back to its independence from the Ottoman Empire in 1918 after the Great Arab Revolt, which consisted of a coalition of tribes headed by the Hashemite family, who originated from Mecca in today's KSA (Alon, 2009). Due to their gained legitimacy as well as the British disinterest and failure to govern the arid land full of nomads and semi-nomads, the colonial rulers appointed Abdullah I of the Hashemite family as the first King (Bocco, 2006; Abu Jaber and Gharaibeh, 1981; Alon, 2009). The appointment of him as the "king of kings" (*shaykh ash-shuyukh*) by the tribal leaders was a requirement and led him to become a *primus inter pares* dependent on tribal support (Melián, 2019). This support was upheld through "wasta" (connections), subsidies, and land awards. Eventually, as water became scarcer, it too became a political instrument (Yorke, 2016). This constellation is regarded as the first step towards the system of clientelism, which endures today.

This system has since been challenged, first in the 1980s during the financial recession, where the IMF provided economic assistance in exchange for structural adjustment programs to enhance privatization and withdraw subsidies (Hourani, 2014; Yom, 2014). The neoliberal reforms diminished the Kingdom's foundation of the "social contract", namely its distributive and clientelist capacity, which created tribal frustrations (Melián, 2019). These frustrations since fueled the protestors during the Arab Spring in 2011, which further strained the relationship between the tribes and regime as greater democratization processes were demanded but never met. In fact, in 2012 freedom of expression was limited through the amendment of the Press and Publications Law (Susser, 2013; Mendel, 2016).

Not all Bedouin tribes hold equal power or access to resources, which has created disputes amongst them (Melián, 2019: 215; Hussein, 2018). Even within important tribes, some members are still marginalized due to internal unjust distribution of resources (Melián, 2019: 215; Hussein, 2018). There are several Qabilas or confederations of tribes and within these are Ashaer, also known as tribes, including the influential Al-Fayez tribe which has had several prime ministers (Hussein, 2018). These Bedouin tribes were originally nomads, but uptake many of the public sector and agricultural activities today. This change occurred as part of British sedentarization policies in 1935 and later the

government in the 1950s as agriculture was promoted as a rural development strategy in order to gain control over the nomads. Agricultural projects in the middle of the desert in the South, such as in Al Jafer and Disi/Muddawara, were installed for sedentarization purposes as well as for the sake of food sovereignty based on UNDP and WFP recommendations (Bocco, 2006; Greenwood, 2014). When the Water Authority of Jordan (WAJ) started issuing water limit licenses, they were not enforced since it would provoke influential individuals or groups, which the monarchy is reliant on and officials affiliated with (Greenwood, 2014). For example, farmers were able to lobby for amendments in the Groundwater Control Bylaw no. 85 in 2002 making it inefficient as many were exempt from it (Pitman, 2004).

This has led some scholars to conclude that the “shadow state” based on tribal patrimonial clientelism restricts the success of water strategies, as policies against the interest of the monarchy are not implemented (Greenwood, 2014, Yorke, 2016; Hussein, 2018). However, only limited studies have been conducted on these aspects and the literature mainly consider illegal drilling for irrigation, not “sabotage”. Yet, the literature does illustrate how water is linked to the stability in the Kingdom as it is used as a tool for tribal support by providing the clients with accessibility. According to Bonn (2013), these clientelist structures and the diverging discourses constructed an *institutional isolation* of donors to tackle mismanagement issues due to their limited ability to influence relevant actors. On the other hand, the government is also constrained by its obligation to the monarchy in which it must avoid threatening its power-political position (Bonn, 2013: 733). This could explain the “rendering technical” strategy of both the donors and government regarding the NRW as it allows them to tackle technical aspects of the issue (Li, 2007).

It is noteworthy that the hydro-political issues in Jordan are primarily covered by non-Jordanians. This could raise questions of the credibility of their conclusion or it could underpin the persistent sensitivity of the topic. Especially since the literature is based on empirical firsthand data of Jordanian officials, ministers, non-governmental organizations (NGOs), political scientists, donors, academics, and journalists supplemented by governmental publications and media sources. Another critical point is the sole focus on water quantity as the water quality aspect is ignored although they are closely interlinked. The natural process of groundwater depletion leads to increased contamination risks, which further decreases the quantity available (De Stefano and Lopez-Gunn, 2012). Third, aspects of equity and allocation of water resources for marginalized groups within Jordan needs further emphasis both in the literature and in the governmental publications (Hussein, 2019). Last, the literature, as well as the general discussion on water resources, are biased towards

Northern Jordan, which could be because officials, donors, and academia generally view the Southeast as inaccessible for research and project purposes (see analysis). This paper aims to include the aspect of quality and its explicit connection to issues of equity in the rural area of the Southeast Ma'an governorate to fill out such *holes* in current literature.

2.3 Rural Water Informality

Clientelist systems have historically created holes that have been filled by informal activities around the globe (Hart, 1973; Alsayyad, 2004; Hirvi and Whitfield, 2015). Since the 1970s the phenomenon has been debated by various schools of thoughts including the dualist (Hart, 1973; Sethuraman, 1977; Tokman, 1978), structuralist (Moser, 1978; Castells and Portes, 1989), neoliberalist (Soto, 2001), and voluntarist (Chen, 2012). In short, the dualist school views informal work as marginal activities, which substitutes wage employment for the poor that were denied access (Hart, 1973). For the structuralist, informality is an expression of the uneven nature of capitalist development as informality acts to increase competitiveness (Rakowski, 1994). The neoliberal approach views informality as a result of excessive state regulations where the informal sector consists of micro-entrepreneurs trying to avoid such (Soto, 2001). Last, the voluntarist condemns the informal sector the most as it merely focuses on individualistic and utilitarian aspects (Chen, 2012). Chen (2012) suggests space for all approaches since the field of informality contains great heterogeneity.

Such heterogeneity also exists on a thematic basis, including housing (Dutta, 2018), water (Meehan, 2012; Finewood and Holifield, 2015; Wutich, Beresford and Carvajal, 2016; Mitlin and Walnycki, 2020), electricity (Singh, 2014; Watt, 2020), health, (Sudhinaraset et al., 2013; Das et al., 2016) and food (Crush and Battersby, 2016; Matinga et al., 2018). While all of these are intertwined within the informal economy, the main focus of this paper will be water informalities. Under the theme of water informality various practices exist, these include, but are not restricted to; public practices distorted by bribery, water vending through tankers or machines, private wells selling via buckets, trucks, or bicycles, rainwater harvesting, water theft, water gifts, illegal pumping, and private pipelines (Adriana, Dávila and Hofmann, 2004; Meehan, 2012; Katomero and Georgiadou, 2018).

These belong to the NRW, which consists of a technical component; leakage due to poor infrastructure, and an administrative which includes the aforementioned informalities and “sabotage”. In Jordan, the majority of NRW is administrative (MWI, 2016a). This paper will focus on “sabotage” and its link to informal water vending services. This is the first time an academic paper is addressing water informality in the Middle East. A region that is both deprived of water and studies on

informality in general as the majority of the current literature is situated in Latin America or Africa. Although parallels to previous literature require cultural reflexivity, reporting on similar activities in the Middle East, and specifically Jordan will be a unique contribution to the water informality literature.

The literature on informality in general and water informality specifically is biased towards urban contexts. This is arguably due to the trend of rapid urbanizations around the globe, which resulted in an almost nonexistence of studies on the rural informal water sector (Katomero and Georgiadou, 2018: 2; Dutta, 2018). Only a few scholars have noticed the rural informalities (Katomero and Georgiadou, 2018; Dutta, 2018; Hilson, 2013), while Katomero and Georgiadou (2018) are the first to open the floor for rural water informality. They further suggest that informality and formality should not be viewed as binary, but in a dualistic way to shift from “Either-Or” to “Both-And” (Katomero and Georgiadou, 2018). They illustrate how the informal sector can be linked to the formal sector by complementing, accommodating, substituting, or competing with it. Moreover, they criticize how development partners still frame interventions in the rural water sector in formalistic ways (Katomero and Georgiadou, 2018: 18). While small-scale and community-run systems are often considered inefficient, backward, and associated with developing countries, formal pipes, large-scale, and utility-run systems are attributed to efficiency and modernity of developed countries (*ibid*) (see Figure 5). This paper will illustrate how the formalization of the Disi water created the informal water sector in the rural Southeast Jordan. Thus, this paper elucidates a new aspect of the Jordanian water sector, while also contributing to the newly established literature on the rural water informality in the Middle East. Summing up, this chapter has provided an overview of the two competing narratives which are founded in the semi-rentier and patrimonial clientelist nature of Jordan. The analysis chapter will discuss how it leaves water distribution holes to be filled by informal activities.

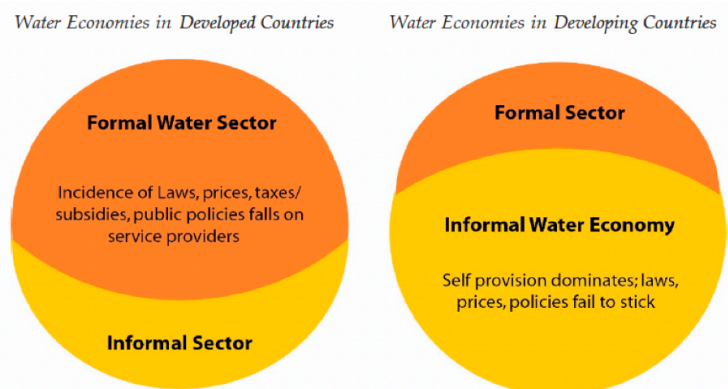


Figure 5: An 'either-or' view of (in)formality and development (Katomero and Georgiadou, 2018: 3)

3. Theoretical Background and Framework

The sparse literature on water “sabotage” and the rural informal water sector opens the possibility for the development of a new theoretical model. Three theories are morphed together into one; the hydrosocial cycle, water justice and deviance, and morphogenesis process. The former provides a framework to examine the macro-level structures involved in the creation of the concept of “water”. The second offers an opportunity to examine the micro-level acts of justice through deviance. As these two theories do not match individually, the morphogenesis process brings them together into a new synched model. To fully comprehend the interlinkages of the following, the theory of science is clarified. Critical realism inspired both the theoretical framework and the methodology, and thus serves as a thread weaving the coming chapters together.

3.1 Theory of Science

Critical realism (CR) combines the disputed positivism and hermeneutics (Archer et al., 1998). This means that CR accepts the existence of a world independent of the knowledge of human beings, yet when looking at the “real” world, individuals apply socially constructed understandings (Sayer, 2000). As this stratification of ontology implies, it is hard to judge what the “truth” is, therefore epistemological closure is sought through retroductive research and discussion, which subsequently leads to broadened analysis and theory development (Easton, 2010). Thus, CR research and analysis seek to look beyond the empirical level by identifying and explaining the “actual” and “real” through causal mechanisms, which are ultimately social products that cannot be understood in separation of the human ideas and actions (Bhaskar, 1978). CR is frequently used for reports of empirical studies to inform policy and/or explain social issues through causality and explanatory critique, thus highly applicable to the research topic (Fletcher, 2016).

3.2 Hydrosocial Cycle

The hydrosocial cycle aims to advance the hydrological cycle by integrating the social and political components (Linton and Budds, 2014). It acknowledges that to fully grasp the water situation one must look beyond the technical aspects. The old water paradigm was characterized by a view of water as a resource to exploit through engineer solutions alone (Gleick, 2000). Since then the Integrated Water Resources Management approach and water governance have become the new dominant paradigms (Linton and Budds, 2014). Linton and Budds (2014) argue that although both focus on the

integration of the social, they assume that the social is separate from the water. Instead, the hydrosocial cycle views water and society as internally integrated through processes of making and remaking one another. For example, anthropogenic alterations, river regulation, water pollution, and overexploitation mean that strictly all water in material terms is imprinted by human

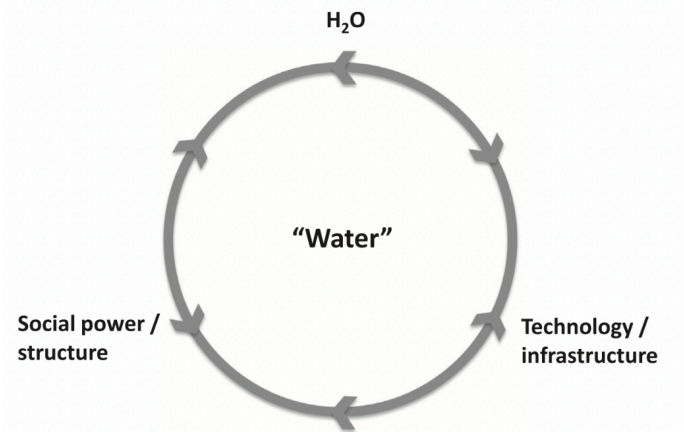


Figure 6: *The hydrosocial cycle* (Linton and Budds, 2014: 176)

behaviors (Linton and Budds, 2014: 172). Thus, the circulation of water becomes a physical and social process. This matches the realist ontology and interpretivist epistemology of critical realism as it acknowledges the material reality of water as well as the social construction of it (Easton, 2010).

The hydrosocial cycle follows the causal nature of CR as it provides a cyclical interlinkage of the material, social, and infrastructural aspects constituting the concept of “water” (see Figure 6). Thus, “water” is defined through the type, representations, construction, and discourse of H₂O, which depend on the specific historical, hydrological, political, and infrastructural circumstances (Linton and Budds, 2014: 177). This cycle also illuminates the multi-scale processes producing water over different times and spaces. Furthermore, Meehan (2014: 222) present the idea of infrastructure as *tool-power* instead of *power-tool* as she argues that such tools intended to extend state power, sometimes unexpectedly limit the state’s scope and thus generate its own power. Thus, this theory will not only assist in deepening the understanding of how and why the Jordanian government came to construct the infrastructure of Disi Water Conveyance, but also how this infrastructure itself influences the clientelist power structure and the availability of water in different areas of Jordan.

3.3 Water Justice and Deviance

3.3.1 Water Justice Trinity

In alignment with the hydrosocial cycle, the water justice approach recognizes that water stress is never solely about H₂O. It influences and is influenced by various aspects including social, political, institutional, economic, cultural, spiritual, and ecological (Sultana, 2018). While the hydrosocial cycle covers the structural aspects of the concept of “water”, water justice focuses on the agent level as well. Although the classic theory of justice focuses on fair distribution for individuals, Schlosberg (2007) suggests including groups. Groups can act as enabling or disabling environments for

individuals' capability to thrive. For example, cultural, or social norms direct goods towards more powerful individuals within the group. Groups are also viewed as entities, who can experience injustice as a whole. By such both individuals and groups are granted agency.

Classic justice theory also focuses on justice from solely a *distributive* perspective. John Rawls (1971) defines justice as “a standard whereby the distributive aspects of the basic structure of society are to be assessed” (9-10), as the goal is to achieve an appropriate division of social advantages. This was challenged by Nancy Fraser and Iris Young in the 1990s as they suggested adding *recognition* to the definition of justice. Injustice in this term can be expressed through the degradation of individuals or communities, which can lead to oppression of such on political and cultural levels (Schlosberg, 2007). Young (1990) argues that recognition adds the social context to distributive justice, an aspect which could explain some of the causes of unjust distribution. Lack of recognition or misrepresentation is constructed through communication, interpretation, and perception of individuals and/or communities. A state can distribute recognition by implementing affirmative measurements, however, recognition reaches beyond the institutional and state level in terms of social recognition by powerful groups (Rawls, 1971; Schlosberg, 2007).

The last addition to the justice trinity is the *procedure* aspect, which examines the institutional processes of the state (Young, 1990). More specifically, it investigates the economic norms and political rules that govern the availability and allocation of water (Wutich, Beresford, and Carvajal, 2016: 15). Thus, it is tied to just recognition and distribution. Fair participation can lead to greater recognition and thus more just distribution and vice versa. This results in the holistic and pluralistic water justice trinity to examine the injustices in terms of distribution, recognition, and procedure on an individual and community level (see Figure 7).

3.3.2 Deviance and Discipline

While the justice trinity focuses on the processes of justice, it does not cover the potential reactions to experiences of injustice. Moore (1978) assesses the social and cultural processes, which either leads to acceptance or rejection of injustices. Acts of rejection can be expressed through crimes and deviance from formal and informal laws, which “document the stirring of the illiterate, voiceless, and

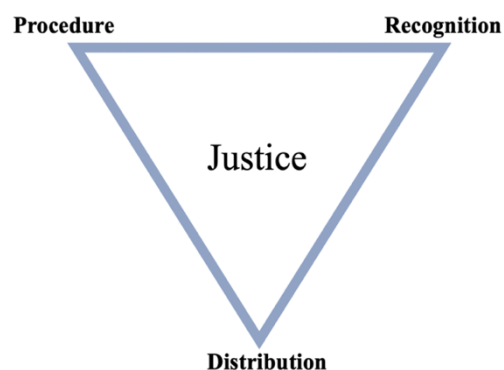


Figure 7: Justice Trinity (Helena Wisbech Frid, 2020)

dominated, outlining patterns of communal opposition to the State and its masters” (Downes, Rock, and McLaughlin, 2016: 8).

The intentions behind these acts are not the only interesting aspects, the definition of what is considered deviant in society also exposes the underlying morality and power structures. The social system of morality defines what is considered right or wrong over time and space. Power dictates this system as certain behaviors are defined as deviant or non-deviant based on whether they sustain or challenge social and political power. Thus, the mechanisms behind the very definition of specific deviances can expose some of the underlying power structures in society.

Foucault (1977; 2000a; 2000b; 2000c), examines the state reaction or non-reaction to such acts as he terms it *popular illegalities*, which is the tacit toleration of non-enforcement of the law. He illustrates how modern penal systems are not intended to eliminate small scale crimes like theft of water, but to distinguish between right and wrong types and assign differing punishments (Meehan, 2013). Boelens (2009: 310) points out that the politics behind denying or recognizing water by including all water users in a uniform framework plays an important role in modern and neoliberal policies to discipline unruliness. Water illegalities can serve as a direct action against perceived social injustices and thus reveal the paradox of water consumers as both subjects of human rights and as criminals (Morgan, 2008; Meehan, 2013). In this way, “water theft constitutes a form of double exploitation: first exclusion and failure by one arm of the state, then intimidation and violence from another” (Meehan, 2013: 332). She shows that resource theft can act in alignment with the state operations as some are unable to provide vital resources to marginalized citizens, which transfers the burden to self-managed systems (Meehan, 2013). For example, the Mexican state is unable to provide water for all segments of society and thus relies on informal and illegal water supply systems. This deliberate misalignment of de jure and de facto institutions oftentimes result in a political struggle as it is in sharp contrast to neoliberal discourses of weak or absent state, which are for instance described in World Bank's reports on water theft (González de Asís et al, 2009; Kingdom et al, 2006; Bonn, 2013). This has led the postmodern school to criticize the very act of defining certain behaviors as illegal as it sustains cultural oppression and delegitimizes suffering minorities (Ben-Yehuda, 2019). This is not to argue for illegal acts, but to illustrate that although water theft, unauthorized water provision, and “sabotage” are frequently rendered technical under the NRW hypernym, it involves many other mechanisms.

3.4 Morphogenesis Process

The prior theories provide different angles to analyze the data collected in the current research. The hydrosocial cycle presents a structural account of the creation of the concept of “water”, while the justice and deviance theory offers an opportunity to examine the agent level. Whereas the two are crucial in representing the complexity of the data, they do not synchronize theoretically.

Margaret Archer offers a theoretical approach that can assist in merging the two theories, namely the morphogenesis process. It combines structure and action as it views them as intertwined components that influence and develop one another (Archer, 1982). To analyze the interaction of the two, *analytical dualism* was developed as a tool to allow treating them as separate entities (Newman, 2018). This analytical process differs from Giddens’s structuration theory as it includes a subsequent cycle of structural conditioning. It examines the causal influence of structure and culture exhibit on the agent, its interactions, and how such reproduce and/or transform the structure and culture over time (Archer, 2010; Archer, 1995). Newman (2018) suggests a modification of the morphogenetic theory as he points out the absent incorporation of the physical and natural world within the causal chain of structure-culture-agency; “from nature emerges agency, from nature and agency emerges culture, and from nature, agency and culture emerges structure.” (Newman, 2018: 118).

Thus, the morphogenesis approach offers an ability to analyze how the “water” concept is generated by the hydrosocial cycle, which consequently influences and is influenced by the individuals or communities experiencing justice or injustices. In this sense, communities could alter the concept of “water” by interfering with the structure and culture constructing it through defined acts of deviance (Durkheim, 1933). Morphogenesis thus clarifies these interactions by allowing analytical separation and ontological interlinkage. Simultaneously, the hydrosocial cycle and the water justice and deviance theory exemplify Newman’s addition to morphogenesis as the physical properties of water are crucial to the causal chain. Figure 8 illustrates how the theories are morphed into one model, the morphogenetic “water” justice cycle, which will examine the concept of water “sabotage”.

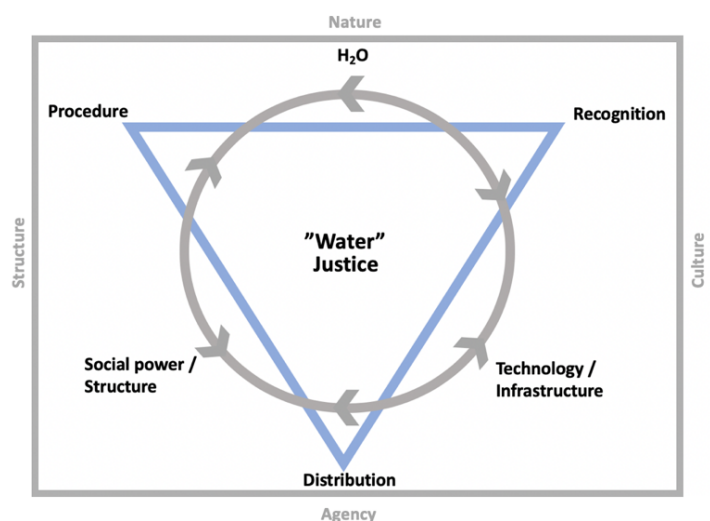


Figure 8: The morphogenetic “water” justice cycle (Helena Wisbech Frid, 2020)

4. Methodology

This chapter discusses the methodological choices of this qualitative investigation on the “sabotage” phenomenon in alignment with critical realism (CR). A brief description of the two research sites is followed by a discussion of the research design, sampling, and data collection methods. Subsequently, considerations of ethics, credibility, generalizability, and limitations are presented.

4.1. Research Sites: Urban Amman and Rural Ma'an

The key informant interviews were conducted in Amman, the capital of Jordan, while the respondent focus groups took place in two villages in the rural Southeastern Ma'an governorate. Villages 1 and 2 were chosen based on their location and reputation. The exact location is anonymized, but they are located within 3 km to the DWC (see Figure 9) and has been directly or indirectly accused by the media and key informants from Amman for the “sabotage”. Ma'an is the largest of the 12 governorates in terms of geographical size but its population accounts for only 1,5% of the total population by 2015 (Knoema, 2018; World Bank, 2018). Ma'an hosts the poorest population who are subject to some of the highest rates of unemployment, not only in Jordan but in the Arab region (NC3, 2014; OECD, 2017; UNICEF, 2020a). While some tribal members of the Qabilas Bani Hamida and Howeitat have settled in the touristic urban towns near Petra, others endure rural nomadic and semi-nomadic lifestyles. The latter lifestyle puts constraints on the modern and formal water provision methods due to their constant or seasonal movements.

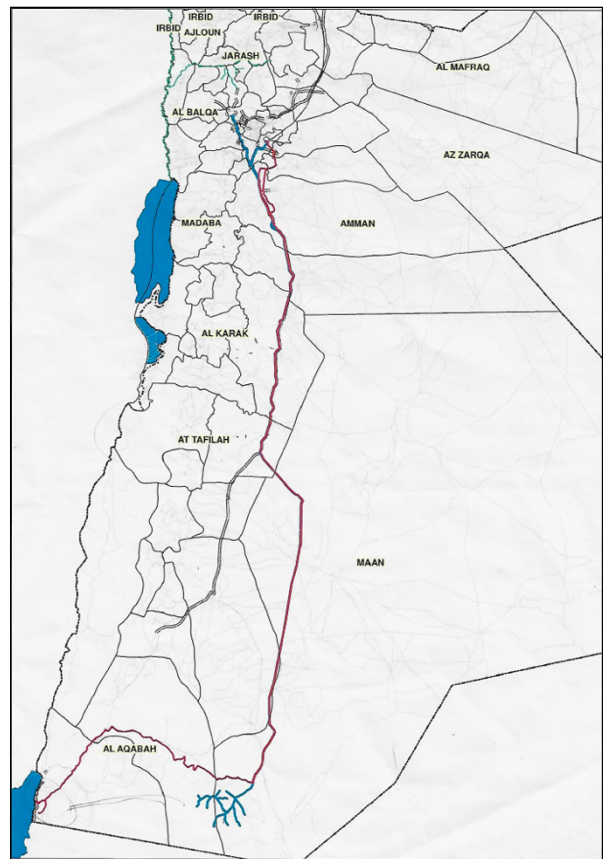


Figure 9: Map of Disi pipeline provided by MWI. Blue lines in the bottom is the source of the pipeline. The red line from the Red-Sea to the Disi pipe conveys desalinated water for the future of AANWCP. (MWI, 2020)

4.2 Research design

According to Easton (2010), qualitative case studies are compatible with CR as they provide in-depth research of underlying mechanisms. Furthermore, the iterative nature of case research fits the

retroductive approach of CR, which involves constant movements between a phenomenon of interest to conceptions of underlying mechanisms (Lawson, 1997: 236). Easton (2010) suggests that most phenomena are explained by a combination of specific and general explanations. To identify generalizable aspects, the case study detects deep processes for the development of causal explanations, which can potentially be applied in other contexts (ibid.) Therefore, the application of the morphogenetic “water” justice cycle is crucial for the generalizability.

4.3 Sampling

Both CR and case studies seek holistic descriptions through a collection of multiple sources of data (Easton, 2010). Purposive sampling method allowed a strategic selection of individuals or groups based on their knowledge of the research topic (Bernard, 2011; Hussein et al., 2020). To achieve a maximum variation of sources to identify common crosscutting patterns, it was coupled with the heterogeneity sampling method (Patton, 2014). 12 key informants from different groupings such as government, academia, international agencies, and a diplomat, were involved in the study with a range of experience within the field from 5 to 38 years (see Appendix 2). Answers were crosschecked with 28 respondents from Ma'an, whereas 13 were located in village 1 and 18 in village 2 (see Appendix 3). Table 1 provides an overview.

Data collection method	Types	Title	Quantity
Semi-structured interviews	Key interviews	Academic	2
		Official	3
		INGO, NGO and Donor organization	6
		International water diplomat	1
Focus groups	Respondents	Family member in Village 1	11
		Teacher/principal in Village 1	2
		Family member in Village 2	11
		Teacher/principal in Village 2	4
TOTAL SUM			40

Table 1: Overview of sample

A risk assessment department under a UN agency informed me that the locations could be dangerous considering my gender and appearance, a white female with blond hair and blue eyes. Furthermore, the direct or indirect involvement with the “sabotages” classified the respondents as *hard-to-study*, thus network sampling was utilized (Bernard, 2011). The same UN agency initiated the contact with the school principals in the villages, who acted as gatekeepers as they introduced me to the other respondents. Two local male friends from Amman volunteered to join the field tour to

the South, their contribution was invaluable as they eased the task of engaging with a patriarchal society. However, this resulted in an unequal gender representation as only 3 out of 28 voices were female. This skews the information towards a male-dominated perspective. However, as the activities concerning water distribution are mainly carried out by male figures, it is a minor limitation of the data collection.

4.4 Data Collection

The retroductive approach calls for establishment of initial hypotheses, but rather than using traditional theory, key informant interviews and publications formed the foundation for the relevant questions to explore the phenomenon in Southeast Jordan (Fletcher, 2016). The hypotheses remained flexible to enable continuous movements from abstract to specific and back to the theoretical through the analytical process aided by both extensive and intensive data (Bhaskar, 1978).

4.4.1 Extensive

The extensive data consists of three categories; national strategies, secondary statistical data, and satellite images. Currently, the most important published long-term water strategies in Jordan is “Water for Life 2008-2022” and the “National Water Strategy 2016-2025” (Hussein, 2019). Although the most recent Jordan Response Platform for the Syria Crisis includes a water component, it is specifically focused on WASH and wastewater treatment in relation to Syrian refugees and thus less relevant. Another crucial water strategy is the “National Water Master Plan” of the Ministry of Water and Irrigation (MWI). It is currently being formulated in collaboration with the German governmental organization, GIZ, with Dr. Margane, a key informant, as the component manager. The planning process will take 5 years total and has been underway for 11 months at the time of the research. However, Dr. Margane provided insight into the components of the plan, while a PowerPoint of the plan from November 2019 was shared by MWI to provide statistical insight into the current and future water situation in Jordan. This data is supported by secondary statistical data from various sources and organizations. Last, historical satellite images provide an overview of the evolvement of agricultural projects on both the Jordanian and Saudi Arabian side.

4.4.2 Intensive

As extensive data is limited and lacks detailed information on the water “sabotage”, intensive data collection was crucial. Especially considering the sensitivity of the topic, which was reflected

throughout the interviews as many preferred to remain anonymous when the topic was brought up. Thus, it is unlikely to find in-depth information in governmental strategies, meanwhile, no public studies investigate this issue.

Semi-structured Interviews

To access this sensitive information, semi-structured interviews were employed. This method allowed flexibility to explore different paths emerging from the interview guideline through open-ended questions (see Appendix 4). The interviews had a conversational and situational format to allow rapport to form throughout and during follow-up interviews (Hussein et al., 2020). The semi-structured interviews were applied for the 12 key informants and were conducted in English by me in locations chosen by the interviewees to construct a relaxed environment and thus hopefully reduce reactivity (Bernard, 2011). Thus, all interviews were conducted in offices and a handful of follow-ups took place in homes.

Focus Groups

The 8 focus groups consisted of pre-existing groups made up of households with three to seven members and with an additional school worker or two. Although it is low numbers for a focus group, it was easier to manage and offered a space for open discussions and inclusion of all members, which, according to Liamputtong (2011) and Munday (2006), can be more interesting and efficient than bigger groups. The number of focus groups was determined based on *theoretical saturation* that was reached after six sessions, whereas the latter two were merely confirming the prior (Rowlands, Waddell and McKenna, 2015). The focus groups and observations offered triangulation of the semi-structured interviews, confirmation of specific information, and additional information that some respondents would otherwise not share without a synergistic effect (Liamputtong, 2011; Stewart et al. 2007). This effect motivated informants to respond to and build on other members' inputs and reveal points of conflict, agreements, and uncertainty through the interactions (Liamputtong, 2011). It revealed the villages' hierarchies and everyday conversations. As the participants were familiar with each other, it created a comfortable setting for sharing sensitive information about illegal activities, which participants of more heterogeneous backgrounds could have restricted such (Rubin, 2004). Yet, there was heterogeneity of status, which played a great role in determining who could say what and when.

Observations and Informal Interviews

While interviews and focus groups provide tangible results as they are voice-recorded and follow more structured paths, observations and informal interviews hold intangible yet colorful data (Creswell and Poth, 2018). This includes engaging in informal conversations, immersing in the field, exploring new environments, and inspecting water infrastructures and water quality laboratories. It was crucial to gain a comprehensive understanding of the field of study in Ma'an before entering due to the potential unsafety of the field. Through informal interviews with locals in Amman, I learned that the field was based on tribal rules and had been a prior recruitment area for the terrorist group ISIS (Abdallat and Al-Zareer, 2019). Informal interviews also provided honest accounts of the perception of the Ma'an governorate, which people from Amman rarely visit. Observations also increased my knowledge of technicalities related to the topic by observing infrastructure such as local water pumps, the Disi Water Conveyance (DWC), and water quality laboratories of the Water Authority of Jordan (WAJ) (see Appendix 5). This makes it easier to comprehend some of the technicalities of the topic of study. All observations were noted in my electronic field notebook after each activity.

4.5 Ethical Considerations and Positionality

Throughout the whole process, Lund University's ethical guidelines were followed, while other ethical concerns were added to remain culturally sensitive (Bryman, 2012). The mediators assisted in the ethical considerations, which was crucial in explaining cultural customs and identifying points of improvement (Hammett, Twyman and Graham, 2014). They identified the fact that an emphasis should be put on the independence of the study to ensure the respondents that the voice-recordings would not be shared with anyone beyond the research. This both comforted the respondents and made me a more neutral listener, who could receive information that is normally not shared with officials and other organizational workers (Patton, 2014). It was strongly emphasized that informants and respondents could always withdraw any statements to avoid feelings of regret. Although anonymity was offered for especially vulnerable informants during the consent process, the research also allowed informants to *own their own stories* by displaying names and associations of those who preferred (Patton, 2014). The informants were thus given the agency to decide whether they wanted pseudonyms or not (see Appendix 2 and 3).

Another ethical challenge was my position towards the illegal component of water "sabotaging". On one hand, I could abstain from informing authorities about individuals engaged

with such and potentially indirectly participate in its continuation. On the other hand, “do no harm” is a primary ethical obligation of researchers according to CODEX. Furthermore, the minor offenses are tolerated by the authorities and the Disi water company (DIWACO) (see analysis). While I considered submitting the concern to the Ethical Review Board of Lund University, the chance to go to the villages emerged spontaneously and my supervisor advised me to go ahead. Thus, to deal with such concerns, respondents were asked to abstain from informing names and were granted full anonymity and concealment of the villages' names. This arose another ethical question as water contamination was reported in the villages. In a later interview with an academic, I was requested to inform the person about the village name for testing purposes. Once again, “do no harm” triumphed, but it left me with doubt afterward. I was later informed by WAJ that regular testing is conducted. Moreover, additional reports of the water quality will hopefully lead to further technical investigations.

4.6 Credibility, Validity and Method of Analysis

This section will focus on how credibility has been ensured throughout the data collection and analytical process. Triangulation is based on the logic that no single method will fully cover the complexities of rivaling explanations (Patton, 2014). The data collection was triangulated across and within different data sources. This means that interviews of various sources were compared with different documents and observations of several settings (Patton, 2014). This includes comparing perspectives of informants and respondents from different backgrounds and associations while checking statements against national strategies, secondary data, and satellite images.

For the analytical process, all interviews were transcribed and coded using Nvivo12 in accordance with the theoretical framework. Triangulation was applied as the data were considered through various theoretical lenses (Patton, 2014). Theoretical perspectives lead to different interpretations of the data; thus, the CR concept of *judgmental rationality* was applied to identify the interpretation with the best fit for the case study. This means that the conclusion of the analysis and the claims about reality can be publicly discussed and comparatively evaluated (Archer, Collier and Porpora, 2004). This type of reflexivity is crucial to CR and the validity process as it reflects upon the underlying understandings and processes of the reached conclusions.

4.7 Limitations and Generalizability

While limitations have been discussed throughout the whole chapter, further considerations must be made. Although language and cultural differences limited the possibilities for me to directly interact with the informants in the villages, my local male mediators were able to balance both that and the gender differences while communicating in a culturally appropriate way throughout the respondent interviews (Hammersley and Atkinson, 2007). They were informally recruited as they offered their help with the fieldwork due to my limited financial capacity to hire a professional. On the other hand, using untrained mediators might have biased the phrasing of the questions, which sometimes resulted in leading questions. To uncover biases, interviews were translated and transcribed by mediators, who were not conducting them. This had a disadvantage as meanings of the interview context could be misunderstood as some expressions of the rural Ma'an dialect were tough for my mediators to translate into English (van Nes et al., 2010).

As previously mentioned, purposive sampling was applied to collect diverse angles within a limited timeframe of two months from arrival until departure. However, if more time would have been allocated, I would have spoken to DIWACO, NEPCO, the Ministry of Health, the phosphate company, and the Ministry of Environment. This would have provided perspectives and insights that are not directly represented in the current data set, but entities had to be prioritized due to the restricted timeframe. Case study holds generalization limitations as interviews with heterogeneous individuals do not provide a statistically representative sample (Bernard, 2011). Instead, the study aims to provide analytical generalization by identifying deep processes and causal explanations through the new model presented.

5. Analysis

The morphogenetic “water” justice cycle will be applied to the collected data in this chapter (see Figure 8). The three sections follow the research questions and therefore the principles of the hydrosocial cycle across the national and local levels. First, the section on infrastructure will illustrate how water is monopolized by the capital and the Northern governorates and the consequential emergence of water informality in the Southeast. Second, the H₂O section will examine what is distributed in terms of the natural and perceived materiality of the Disi water and the water from the local sources. Third, the section on social power will discuss the phenomenon of “sabotage” and its linkage to the political system and the misrepresentation and exclusion of the Southeast.

5.1 Infrastructure as a Morphogenetic Element of Justice

This section illustrates the distributional differences between Amman/the North and the Southeast, as well as between and within the villages. First, it explains why and how the Disi Water Conveyance (DWC) emerged. Second, it discusses the local distribution, which emerged from the DWC. In this way it aims to answer the sub-question; “In what way did the formal infrastructure, Disi Water Conveyance, impact the livelihoods in the capital and the North and the informality of the local communities living aside the pipeline?”.

5.1.1 The Emergence and Impacts of the Disi Water Conveyance (DWC)

The history of the Disi pipeline was as if a dying person got a heart, a new heart. It was literally as if a person who has a problem with his heart was considered to be on the edge of collapsing. And then suddenly a new heart was found for them. (WE4, 2020)

Until 1950s Amman was mainly supplied by internal water resources, but with continuous population growth, the capital started to use water from the Northern city, Azraq, monopolizing a quarter of its water resources in the 1990s (Darmame, 2013). In 2007, 40-50% of the capital's water arrived from the transboundary Yarmouk-Jordan river, however, due to climate change and political issues with Syria and Israel it soon became insufficient (Demilecamps, 2013; WE4, 2020). Thus, to close the expanding demand-supply gap, the Disi Water Conveyance (DWC) was built as a strategic pipeline until the planned Red-Dead desalination project¹ could replace it. However, as Red-Dead is currently paused, another mega-project was launched in February 2020, namely the Aqaba-Amman National Water Conveyance Project (AANWCP) (MWI, 2016; Harake, 2019; Namrouqa, 2020; Novo, 2020).

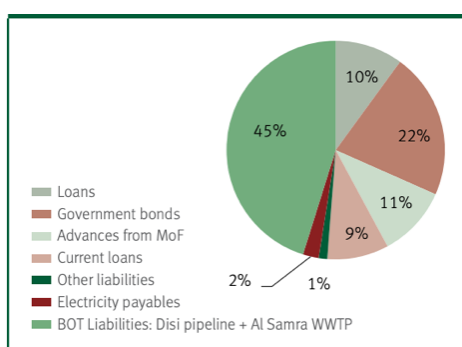
The Disi water has been utilized since the 1980s for industrial and domestic purposes in the Southwest coastal city, Aqaba, and agricultural projects in the Southeast Muddawara (Yorke, 2016). The latter was closed to shift the



Figure 10: Picture of relief valves (Helena Wisbech Frid, 2020)

¹ Red Sea–Dead Sea Water Conveyance is a transboundary project between Israel, Palestine, and Jordan. The plan was to transport desalinated water from the Red Sea to the three countries. The brackish waste would be transported to the highly saline Dead Sea. Currently the project is paused due to economic and politic reasons.

100 MCM from agriculture in the South to domestic use in Amman and the Northern governorates. This was justified by the refugee influx, population growth, and the transboundary Disi-Saq agreement with KSA². The DWC extracts water from 55 wells from the Southeast and pumps water into one steel line that moves the water 340 km across the country to a blending reservoir, where the water is blended with treated wastewater before it is distributed to the citizens in Amman and the Northern governorates (see Appendix 6). Along the pipeline relief valves are placed to control or limit the pressure in the piping system. They are covered by concrete “manholes” [تنقيسة] (see Figure 10) to protect the iron valve from being stolen or destroyed by communities along the pipeline (Kilani, 2020).



Source: WAJ audited financial statements.

Figure 11: Current status and future investment potential in renewable energy in Jordan (Harake, 2019: 25; WAJ, 2017)

The establishment of the DWC was no easy task as its cost of US\$ 944 million surpassed the financial capacity of the indebted state (Information and Water Public Awareness Department, 2014). Therefore, a Build-Operate-Transfer (BOT) scheme was employed, a concession contract between the Jordanian government and a company called GAMA Energy, a joint venture between a Turkish Gama Holding and American G.E. and their subcontractor Disi Water Company (DIWACO) (Pianta and Ozozan, 2009). Also called the “Turkish company” amongst the communities. The funding was split between US\$ 190 million from Gama Holding, US\$ 300 million from MWI, and the remaining as soft loans from Western funds. DIWACO constructed the pipeline and is currently operating it for 25 years in total after which it will be transferred to the Jordanian government.

As the water is pumped uphill to the mountainous capital and further toward the North, it increased the WAJ debt. Meanwhile, WAJ is continuously pressured to cover other liabilities (see Figure 11), and consequently owns US\$ 118 million in unpaid invoices for electricity for pumping (Abu-Rumman, Khdair, and Khdair, 2020; MEMR, 2017). Simultaneously, the water sector cannot benefit from new renewable energy projects due to the low capacity of the electricity grid. Its expansion is constantly delayed due to the debt of US\$ 7.8 billion within the National Electric Power Company (NEPCO) (Abu Dyak, Abu-Lehyeh, and Kiwan, 2017; Abu-Rumman, Khdair, and Khdair, 2020; Rawashdeh, 2020). This led NEPCO to freeze all large-scale renewable projects, which

² A buffer zone was created to close all agricultural projects within 10 km from the Jordan-Saudi border. Officially it was in an attempt to preserve the fossil groundwater resource, however as exemplified in Appendix 7, it was inefficient.

consequently sustain the water sector's dependency on oil and gas import and its volatile prices (Jordan Times, 2019b; MWI, 2016b). As water is heavily subsidized and the subsidies for electricity are decreased by the privatized NEPCO, these costs are consequently shifted to citizens through increasing electricity bills.

Besides this negative side-effect, the government solely emphasized the positive impacts of DWC, also in the Southeast in terms of improved infrastructure, job opportunities, and more water for the villages (Ferragina and Greco, 2008; Gama Energy, 2008). According to the respondents, jobs were provided, however, after the construction period no other benefits were offered. As put by Dr. Al-Sharif (2020):

I don't know what the planner was thinking, but if we look at the outcome, they [communities] are not enjoying a lot of benefits out of the system. For a simple reason, that this has to be associated with more comprehensive programs for development and economic prosperity.

Although five turnout points were constructed along the pipeline, they were only intended for emergency usages (MWI, 2004; Gama Energy, 2008). Eng. Kilani (2020) explains that water cannot be provided over a prolonged period to the villages due to the radiation level present in Disi water. When asked about local blending opportunities, she explained that there is not a sufficient amount of local water. Meanwhile, she states it is unnecessary due to the "good" quality of water in the Southeast (Kilani, 2020; WE1, 2020).

5.1.2 Rural Water Distribution in the Ma'an Governorate

The local villages do not have authorized formal access to the DWC that passes through the area. Instead, the water distribution options are formal pipelines from a local source, informal water vending from a local authorized source or unauthorized DWC, and commercial purchase of water bottles from stores. However, the two villages do not have equal means of provision or sources (see Figure 12). Furthermore, inequalities also exist within the villages in terms of accessibility between providers and receivers (see Table 2).

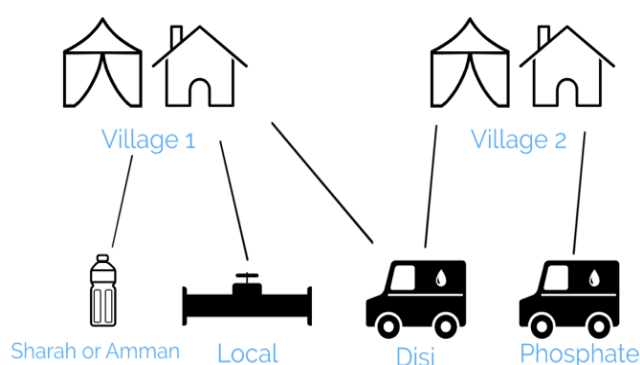


Figure 12: Water provision and sources in Village 1 and Village 2. (Helena Wisbech Frid via Logomakr.com, 2020)

Village 1 was provided a new local well and pipelines by the Water Authority of Jordan (WAJ) as part of a water improvement program in the Southeast during the launch of DWC in 2014 (F6, 2020; D1, 2020). The piping system replaced the previous formal vending system (F5, 2020). The water runs through the pipes twice per week into water tanks installed near houses or tents. Besides the water quality, the families expressed satisfaction about the piping network as the previous trucks were expensive, costing around JD 25-30 for a full truck and the piped water is reportedly unbilled. Although water meters were installed in 2016, none of the families have received any water bills. According to T1, F5, and F6, there is only a regular billing system for electricity, while water bills arrive every 5-6 years in an accumulated amount of around JD 300-400, which is difficult for families to pay.

This contrasts statements of academics, officials and donor organizations, who report that people in the South simply do not want to pay either due to tribal issues, beliefs that water should be free, or that it is given by God:

They said that the water should be given free for them. Water, electricity is thought that should be given to them for free. (WAJ, 2020)

While I cannot disprove that this might be the case in other parts of the Southeast, such statements were not made by any of the respondents. Families in Village 2 stated that they would like to pay for water if formal distribution services were provided. This could of course merely be a social desirability bias. People in this village only have access to informal water vending from two different sources; authorized from the phosphate company's wells and/or unauthorized from manholes of the DWC. Both water sources are trucked by families, who have the financial capacity to rent a truck or pickup to fill up people's water tanks which the poorest can purchase (see Table 2). To gain access to the Disi water, the water is taken from the concrete manholes as the lid is lifted off and the valve is opened. A specialized pump infuses the water into the water trucks' tank which can hold either 6 or 12 m³ depending on the size of the truck. The Disi water is sold for JD 25-30 per tank, while the water from the phosphate company's wells costs half. Therefore, the latter is consumed by the poorest families, like families 1 and 2, who cannot afford the cleaner yet radiated Disi water.

Besides the lack of formal water access in Village 2, there are no shops nearby and the nearest

Family	Village	Main Water Source	Distribution
1	2	Phosphate company's wells	Receivers
2	2	Phosphate company's wells	Receivers
3	2	Disi	Providers
4	1	Local well	Receivers
5	1	Local well & Disi	Receivers
6	1	Local well & Disi	Receivers
7	2	Disi	Providers
8	2	Disi	Providers

Table 2: Overview of families of respondents

ones are in Village 1 where wealthier families can purchase bottled water. Bottled water is consumed as a “cure” for health issues related to municipal water, exemplified in the next section, and is an increasing practice in the Arab world according to UNDP (2013). Interestingly, two of the most popular private bottled companies in Jordan are the American Nestlé and the Jordanian Sama. While Sama extracts its water from wells near Amman, Nestlé extracts water from the Sahrah Mountains which is of very high quality as “you can put it in the glass and drink it” (Kilani, 2020). The latter is in the same region as the villages. However, due to the high public debt in Jordan, investing in pipelines from this source is outside financial reach and prioritization, instead, it is privatized, commercialized, and sold to the population in plastic bottles. This creates water customers and eliminates the opportunity of citizens to claim their right to water from the government (Linton and Budds, 2013).

This mix of authorized and unauthorized provision of formal, informal, and commercial water, is not exclusive to Southeast Jordan. It is also reported in countries like Mexico, Ecuador, India, Indonesia, Lagos, and Nigeria (Meehan, 2010; Agoi, 2020). Furthermore, the purchase of bottled water is also reported by low- and medium-income residents in Northern Jordan as water runs out at the end of the month (Benedict and Hussein, 2019). This mix is mirrored in the informality literature as the state fails to provide water of proper quality to all segments of the population; water informality emerges to fill out such holes.

The two sections above illustrate how DWC was created to relieve the capital and the North from a soaring supply-demand gap. Scientific instruments, reports such as the EIA of both Gama and MWI, as well as water strategies such as “Water for Life” were used to render the Disi water legible to administrate (Meehan, 2014: 216). Although it provided the capital and North with water as intended, it also generated negative impacts such as increased costs of livelihoods through increasing electricity prices. Meanwhile, it also provoked communities living along the pipeline to generate informal water provision structures. Table 3 illustrates the relations of the two sections to the morphogenetic “water” justice cycle. The dotted line between structure and agency illustrates the analytical separation of the morphogenesis and the interrelation of the two. In this case, the DWC is a physical (infra)structure towards which the agency of the communities reacts, meanwhile their agency transforms the original purpose of the same (infra)structure and makes it a *tool-power*.

Overview of sections	Hydrosocial cycle	Justice trinity	Morphogenesis process	
5.1.1 Disi Water Conveyance	Infrastructure	Distributional	Structure	Agency
5.1.2 Formal pipelines, informal water vending from a local authorized source or unauthorized DWC, and commercial water bottles				

Table 3: Overview of the connection to the morphogenetic “water” justice cycle

5.2 H₂O as a Morphogenetic Element of Justice

While the previous section illustrated the infrastructure in place for water distribution, this section analyzes what is distributed to better understand why unauthorized water provision from DWC or “sabotage” is triggered. Therefore, this section will explore the sub-question; “How is the natural and perceived materiality of the H₂O of Disi and the local sources related to the phenomenon of ‘sabotage’?”. First, the perceived and natural materiality of the Disi water is examined to illustrate how its narrative was generated. Second, the reported water-related health issues from the local sources are reported as it becomes clear why communities seek the Disi water. Before reading this section, a disclaimer must be made. I do not hold a medical degree; I just report the statements on health issues related to water consumption and the political decisions made in relation to such.

5.2.1 The Best Unpredictable Disi Water

Numerous estimates of the Disi water’s durability have been published varying from 50 to 200 years (Ferragina and Greco, 2008). “Nobody really knows how long Disi will last” said Dr. Margane (2020), a senior hydrogeologist with 36 years’ experience, who proceeded to explain that what is known is the 4-meter annual water level decrease. Meanwhile the current Disi Project Director, Eng. Bataineh (2020) estimates that there are only 5 years left and continues “but we don't want to talk about it”. This public unpredictability and sensitivity around the quantity of H₂O also impact the local level as respondents are unaware of the availability. As SS3 (2020) states:

The Disi is connected to the water, my son, it is like a flowing river underground. The experts talked about that, I have not seen it myself, but the experts said that it is like a swamp, a pond. And this one [Disi], it is suitable for drinking, like filtered water.

The mentioned expert could refer to officials and water experts alike Eng. Kilani, who visited villages in Southeast Jordan to explain the water situation. The quality aspect of the above echoes the Ministry of Water and Irrigation (MWI):

Its [Disi's] quality exceeds the quality of many bottled water because of the lack of salinity that does not exceed 300 ppm and the lack of elements that cause hard water such as calcium (Information and Water Public Awareness Department, 2014)

Although this document serves to inform the public about DWC, it overlooks the natural radiation present in the water and the leakage risk from the above saline Khreim layer (Salameh, Shteivi, and Al Raggad, 2018). This is besides the fact that Dr. Armin Margane prepared a memo for BMZ, who works closely with MWI, when the controversial study by Vengosh et al. (2009) was released regarding the radioactivity content. The study was criticized for being biased due to the Israeli origin of the scientists and the samples taken at shallow depth (Greenwood, 2011; Upson, 2009). Eng. Kilani, who was in charge of water quality during the DWC planning phase, stated that the millisieverts per year ($\text{mSv}^{\text{y}^{-1}}$) of radiation fluctuates between 0.65 and 2.8, but the average is 0.7. While WHO recommends a maximum of 0.1 $\text{mSv}^{\text{y}^{-1}}$, it allowed Jordan to set a standard of 0.5 in 2008 due to a lack of better sources of water: “health benefits of the provision of adequate water outweigh the potential health risks due to radionuclide content in water.” (WHO, 2018: 82).

To reduce the level of radiation to 0.5 $\text{mSv}^{\text{y}^{-1}}$, Disi water is blended with two other sources in Amman, namely Zara Ma'en and Zai treatment plants (see Appendix 6). Citizens in Aqaba have consumed the water purely for at least 20 years, but according to Eng. Kilani, there have been no evident health impacts. However, an accredited study suggests that it is currently not possible to quantify health risks in human populations exposed to doses below 10 $\text{mSv}^{\text{y}^{-1}}$ over a prolonged period of time and states that such inability “[...] does not, however, imply that the corresponding societal risks are necessarily negligible; a very small risk, if applied to a large number of individuals, can result in a significant public health problem” (Brenner et al., 2003: 13765). Yet, USAID (2012: 24) recommended the government to “correct negative associations” with radioactivity and contamination (Salameh, Shteivi and Al Raggad, 2018; WHO, 2018). This has supported the narrative of Disi water as the best water, mentioned by officials, donors, and the respondents. While the officials and donors are aware of the radioactivity issue from drinking it purely, the respondents were not aware of such. In which, one states: “mostly we use the Disi water because it's healthy water” (F3, 2020). The respondents merely evaluate the water-based on color and taste in comparison to the local sources in the area. As radiation is not detectable via human senses, it leads the

communities to believe that there are no potential long-term health impacts from drinking the Disi water over a prolonged period of time.

5.2.2 Local Sources as “Water of Diseases”

“We only get the water with the diseases” (D1, 2020). As previously explained respondents from Village 2 reportedly can collect authorized water for free from a private mining company that produces phosphoric acid and sulphuric acid, called the “phosphate company”. Dr. Margane (2020) confirms that the company owns the wells near the village but believes that it is not domestically used as it is affected by the phosphate mining process. WellJet, an American company in charge of revitalizing seven wells at the minefield in 2017, reported that some of the unused wells had been “sabotaged” and pieces of pumps, pipes, and junk were found inside (Strawn, 2017). They also reported that most of the wells contained residual drilling fluid. The previous dean of the German Jordanian University, Dr. Al-Sharif, Eng. Kilani and Dr. Margane all state that phosphate mining generates issues of uranium mobility and increased amounts of minerals from residuals of mineralization processes.

While there is a lack of research on the consumption of phosphoric acid through water, a study examining its presence in soda indicates that it causes kidney stones, an organ that is also affected negatively by uranium (Saldana et al., 2007; CDC, 2016). High levels of minerals are also associated with similar diseases, for example, intake of calcium phosphate is associated with phosphate industrial production that can lead to calcium phosphate kidney stones (Hanusa, 2020; Parks et al., 2004). This corresponds to the respondents’ statements, as members of the families 1 and 2 who regularly consume the water from the phosphate company stated that “everyone” has kidney issues. “It's not drinkable the water, but we drink from it” (F2, 2020) because they cannot afford the water from the DWC. They reported health impacts from both the water and their meat intake as their livestock consume the same water, and they claim to have found swollen kidneys inside the animals. They call it “phosphate halal”³ (F2, 2020). Members of family 3, 7, and 8 also reported kidney issues caused by previous consumption of the same source, which disappeared after drinking Disi water:

We had the sediments/minerals in the kidney [pre-stage of kidney stones]. Some people died because of the polluted water. It's a desert and we didn't have any other choice but this water. When they installed the [Disi] pipeline, we started drinking good water (F7, 2020)

³ Halal refers to an Islamic form of slaughtering animals

Similar statements are conveyed in Village 1 from members of families 4, 5, and 6 and two teachers. They receive the formal piped water from a government-owned well. However, the kidney issues were reportedly associated with high salinity instead. F6 and T4 stated that a 5-year-old was diagnosed with kidney stones after prolonged consumption of the water. When T4 also had kidney stones the doctor recommended her to consume bottled water to dissolve the stones, which she stated helped. This recommendation is echoed by Eng. Kilani (2020): “So it's not harmful if you take it, the salinity in our standard is not harmful in the long term. Unless you have people with kidney problems, special cases, then they can go to bottled water.”

These health issues are also reported in a study from 2006 from Village 1, which reports kidney issues as well as miscarriages, diarrhea, and problems for teeth and gums related to the water consumption of local sources (DFID, 2006). WE3, a senior water expert, further confirms that some communities in the Southeastern desert are accessing boreholes, which are saline. Dr. Al-Uleimat, the current Assistant Secretary-General for Laboratories and Quality Affairs in WAJ, also stated that deterioration of the quality of groundwater due to increasing salinity as a result of overpumping is a soaring issue in Jordan. However, he also ensured me that no water would be provided by the government that exceeds the Jordanian Standard 286 from 2015, as the Ministry of Health would restrain it. But families accessing Disi water or bottled water in Village 1 reported that they only use the local water for cleaning due to its low quality. T1 and F6 also reported that the US Army at the King Faisal Air Base close to the village had been testing the water in 2004 and refused to use the water even for laundry. However, it must be noted that a new well has reportedly been drilled since 2006, thus the quality might have improved although it is from the same aquifer and still does not receive treatment but just a small amount of chlorine “just to be on the safe side” (Kilani, 2020). Furthermore, the water levels of the local sources are decreasing around 6 meters annually and are expected to turn brackish by 2040, which will require investment in energy-intensive desalination (Margane, 2020; GIZ, 2020).

The two sub-sections clarified the natural and perceived materiality of the H₂O distributed from various sources in the Southeast and the DWC. As the local communities have had short-term health impacts from local sources, they seek alternative sources. As Disi water has been promoted by especially the government as the best and most pure water, it is taken by the communities from the manholes. However, the respondents are simultaneously unaware of the potential long-term health impacts from drinking the radiated Disi water unblended over a prolonged period of time as the public information regarding the Disi has been unclear. Table 4 summarizes the linkage to the model as H₂O

Table 4: Overview of the connection to the morphogenetic “water” justice cycle

is the materiality of the “water” itself, however, in this context the actual and perceived nature of the water differ. This in return impacts the way the H₂O is distributed where nature influences the agents' actions while the agents' actions also influence the hydrological cycle's natural distribution.

Overview of sections	Hydrosocial cycle	Justice trinity	Morphogenesis process	
5.2.1 Blended Disi water	H ₂ O	Distributional	Nature	Agency
5.2.2 Polluted local source and/or unblended Disi water				

5.3 Social Power as a Morphogenetic Element of Justice

The previous two sections discussed the distributional differences between Amman/Northern governorates and the Southeast in terms of infrastructure and H₂O. This section will analyze and discuss the social power behind the distribution choices as it will examine justice in terms of recognition and procedure. In this way, it aims to answer the sub-question: “Why is the phenomenon of “sabotage” linked to social power structures of the clientelist and semi-rentier Jordan?”. The first sub-section reflects on the clientelist aspect, while the second examines the semi-rentier impacts.

5.3.1 Popular Illegality: The Tale of “Sabotage”

While the media agreed that the damage on DWC in August was caused deliberately by Southeastern communities, disagreements arose about the location and object damaged. On 21 August 2019, Jordan Times reported a “sabotage” on a manhole that occurred in Muddawara at the source of the pipeline (Namrouqa, 2019). Meanwhile, Roya News (2019a) reported that it occurred in Al-Jafer, 160 km away from Muddawara, with attached images and videos illustrating the damage⁴. By 27 August, Roya News (2019b) changed its explanation, stating that the incidence occurred in Mudawarra at the storage facility instead. However, the Al-Jafer story was the one echoed by key informants. Frustrations, protests, boredom, tribalism, and prospects of being employed as guards of the pipeline were all reasons the interviewees came up with. Such definitions are thus aligned with the original definition of “sabotage” as a political act of protest.

⁴ See link for images and videos: <https://royanews.tv/news/188977>

These assumptions feed into the notion that the DWC is viewed negatively by the Southeastern “vandalists”. While only one respondent expressed frustrations about the fact that the water is taken from the Southeast to Amman and the North (F4, 2020), the answers of other families unable to access the Disi water, went along these lines:

F2: It didn't affect us, but it didn't help us either.

A1: But it did cause you any harm?

F2: The only thing that harms us is the lack of water. If they only would have provided a pipe to us to give us drinking water.

The remaining respondents, who were able to access Disi (see Table 2) viewed the DWC positively as it provides them with direct access to the best and healthy water. This could then lead to conclusions that those who do not have access to DWC thus “sabotage” in an act of resistance. However, as described in the Roya News (2019a) article, it requires advanced technological equipment to damage the pipeline to the extent reported in August. As families unable to access Disi water are constrained by their financial situation and lack of connections (wasta) this seems unfeasible.

Members of family 6 expressed a different kind of frustration related to the bad reputation the Southeast gained after the region was blamed for “sabotage”; “it made us look like thugs” (F6, 2020). All the families report that the “sabotage” was actually a malfunction of a valve in a manhole [تنفيسة] caused by DIWACO engineers. Furthermore, the following points were made by several families:

Why would they sabotage it when it has been here for a long time and people are taking water from it? (P1, 2020)

It's false publicity that people from Al Jafer is sabotaging, no one is sabotaging, why would they sabotage something they're drinking from? and when the rubber was torn, they reported it, that the rubber is torn and it's leaking. (F5, 2020)

Moreover, members of families 7 and 8 report that the manholes are kept open by the Turkish company, DIWACO, to allow the communities to access it:

Even sometimes when we're at the manhole, the Turkish or the people who are in charge of the Disi they pass by us so they will say to us, 'drink and then close it afterward, don't sabotage'. There's no sabotaging. (F7, 2020)

They further stated that the manhole they access has been kept open for as long as they remember. This is further confirmed by an official who wanted to be anonymized for this particular quote:

Official: They keep a stream of water coming to feed... for the animals to drink. And people see it and they don't mind, they say it is in a tiny amount. If they are happy, we're happy.

Frid: DIWACO or?

Official: Of course, the company, the project company. They can't go after each manhole to repair so they let that small stream of water. If they lose 1 million [CBM], 2 million per year it's nothing for them.

Eng. Kilani explains that the WAJ compensates for the water lost due to the daily “sabotage”:

By contract, they [DIWACO] are delivering the 100 million [CBM], any losses on the way, it's due to the sabotage and sabotage is our responsibility as a country. (Kilani, 2020)

This either reflects how “sabotage” acts as clientelist compensation or provision of better water to communities in poor conditions because if the distribution would be just, such acts would not occur. Or an expression of how such illegal acts become the responsibility of the legal authority, not the company. Another explanation could be that the phenomenon of “sabotage” is used as a scapegoat by both DIWACO and the government. Two of my interviewees, one senior official, and one water expert, stated that the water cut in August actually was due to governmental mismanagement as the contract with DIWACO was not renewed, which led the company to cut the water until renewal. This could further explain why the unauthorized provision of water from DWC is classified as “sabotage” as it conceals the water mismanagement on national and local levels.

In any case, it witnesses about *popular illegalities* in which the state tolerates small acts of deviance to sustain the stability within certain areas of the country. In case the government would disallow the unauthorized informal water provision from DWC, it could stir up the otherwise voiceless tribes in the Southeast, who also initiated the Arab Spring in Jordan. It illustrates how the clientelist relations work between the monarchy and government in which the Kingdom tacitly tolerate certain acts of *clients* in exchange for peace, while the client tribes accept being used as a scapegoat for the powerful North to sustain their access to the DWC. This unspoken social contract between the tribes and the government enables the indirect provision of vital resources to marginalized communities by transferring the burden to informal water vending services (Meehan, 2013). As Kilani (2020) puts it “tribal influences are high there, so somehow you have to deal with them the delicate way.” This is not to sugarcoat the situation and the clientelist relation, as reported, not all families have access to the Disi water, and all families have requested pipelines to be extended from the DWC. Furthermore, as described previously; “water theft constitutes a form of double

exploitation: first exclusion and failure by one arm of the state, then intimidation and violence from another” (Meehan, 2013: 332). This does not only apply to water resources but also in general.

5.3.2 The Northern Bias and the Politicization of Water

“You cannot focus on one place and forget the other. I mean, we're focusing on Amman, but we're forgetting other parts. It [development] has to be widespread all over the country” (Al-Sharif, 2020). This urban bias is not unique to Jordan and was first presented by Lipton (1977) who claimed that the most important class conflicts remain between the rural and urban:

The rural sector contains most of the poverty, and most of the low cost sources of potential advance, but the urban sector contains most of the articulateness, organization and power. So the urban classes have been able to ‘win’ most of the rounds of the struggle with the countryside; but in doing so they have made the development process slow and unfair (Lipton, 1977: 13)

In Jordan, the water resources are crucial for its general and regional development. But currently the best Disi water is monopolized by Amman, while the remnants are provided to Northern governorates due to the pressure from refugee influxes (MWI, 2016a; WE4, 2020). Meanwhile, the Southeast is left without authorized access to the Disi water. This reflects, what I term, the “Northern bias” in Jordan. According to UN-Habitat (2014) and Greenwood (2014), this bias causes the marginalization of rural populations, which consequently increases internal migrations exerting pressure on the urban livelihoods. Without engaging in a full discussion of the trolley dilemma, some would argue that such a distribution strategy is just as it focuses on 74% of the population (UN-Habitat, 2014). But such an argument dismisses underlying power structures that produced status quo.

According to Young (1990) and Fraser (1997) unjust recognition influences distribution structures as certain groups are viewed as more worthy of the resources. Besides the historical division between the Northern and the Southern tribes, the persistent misrepresentation of the Southeast acts as a barrier for investment in the region. In the interviews, officials described the Southern Bedouins as “difficult people” who mismanage the water due to tribal ways of thinking (Kilani, 2020; WAJ, 2020). This was echoed by experts and donor organizations: “So, basically because the government cannot really control these areas, you know, the type of.. the community that we have is sort of tribal, when you go outside Amman, it is tribal” (Al Amra, 2020). This autonomy is reported by Bonn (2013) as tribal areas inhabited by kinship-based groups in Jordan live under a de facto rule which differs from de jure water laws.

The narrative of this region as *difficult* and *out of control and reach* acts as a tool to justify the infrastructural neglect of Southeastern people as both the government and donors remain focused on the North. Donors, INGOs, and NGOs were attracted to Jordan during the Syrian crisis as masses of people fled to the Kingdom through the Northern borders (UNICEF, 2020b). According to a senior water manager at a donor organization, a strategic decision was made by the top management to refrain from water projects in Ma'an. On consideration of inclusion, the interviewee replied;

No. Yes. But it's very complicated there. Of course, and as always, they [the government] wanted to force us to be there. But this needs also a different kinds of safety measures for the employees. This is a general decision in our office. Do you want to take the risk to send people there? It is not so danger-... I mean, I don't want to... I don't want to exaggerate to you. I'm not killed there. But that is a different mentality there. (WE2, 2020)

The interviewee continues to explain that it would make the person uncomfortable to take responsibility for an operation there. In this way, the Northern bias is reproduced and reinforced by the organizations. Due to the semi-rentier nature of Jordan, it holds great legitimacy within the government and further justifies the neglect of the rural Southeast (Bonn, 2013; Hussein, 2019). The negative perceptions of the region reinforce itself as few or no operations are initiated to disprove such.

However, one of the interviewed international organization informed me that a water initiative was introduced in the Southeast;

I think there's now a recognition that some of these areas in the South have been neglected and not being served. So, in the last five years, the focus has been overwhelmingly in the North, on the Syrian. But it's hidden from you, the greater vulnerabilities in Jordan. While Jordan is an upper-middle-income country, there are elements of extreme poverty, which are not addressed. (WE3, 2020)

However, when it became apparent that water was used by some for livestock purposes concerns arose:

Is it worth investing significant sums of money to promote an unsustainable lifestyle in some of these areas, compared to investing the same amount of funds in some way with more 'bang for bucks', so to speak? (WE3, 2020).

Shepherding is a traditional practice of tribal Bedouins and is the sole income reported for the majority of the respondents. The families did report consumption between 400-800 liters/day per household, which is almost double the consumption in Amman of 480 liters/per day assuming the household consist of 4 members (Salameh, Shteiwi and Al Raggad, 2018; Tirth, 2018). While it can

be perceived as unsustainable, one must consider the importance for the livelihoods of the families. For example, when the Muddawara agrobusiness closed after the launch of the DWC, farmworkers were left with few other options but to herd. In fact, Village 2 was created the same year as the Disi launch as housing units and a school were constructed to attract the newly unemployed. A strategy emulating historical sedentarization projects. However, no employment opportunities were presented;

Every time we go there [to “job center”], they say there are no job opportunities currently and we end up going back home. (F1, 2020)

People over there are the ones who are literate; here we are illiterate. If you're literate, your voice is heard, they are getting the priority. Illiterate, you don't get a job, literate, they promise you. Life goes to waste. (F2, 2020)

A mosque construction was initiated by sponsors from the Gulf to attract religious tourists as the village is located on the highway of the Hajj pilgrims (P1, 2020). However, mid-construction the project was canceled without informing the community. Thus, as no economic development and jobs are provided, it leaves the families with the herding and the blame. Meanwhile, Disi water is provided for industrial and touristic purposes in the “Free Zone” of Aqaba because “Those pay good money for the water.” (Kilani, 2020).

Awhile vulnerable populations in Ma'an are not receiving investments from the organizations, the government also seems to show a degree of disinterest in addressing the Non-Revenue Water (NRW) issue especially in the Southeast. According to Dr. Margane from GIZ physical losses from DWC are not calculated from extraction to reservoir, only from the reservoir to households. This means that an extensive amount of the NRW is not reported. This could be a governmental strategy to lure the donor organizations away from the Southeast due to the fragile clientelist relationship with the communities described in the previous section. As described by Boelsen (2009), neoliberal reforms act to place all water consumers within a uniform framework and informal water provision is perceived as a symptom of a *weak* state according to the World Bank. Thus, the involvement of donors could threaten the “delicate” social contract between the state and Southeastern tribes similarly as the previous IMF policies did in the 1980s. Consequently, this results in the development of water strategies and goals that are not executed (Bonn, 2013). This is reflected in the NRW, which has been stable for the past 20 years despite numerous milestones and goals set by the government. It expands the discrepancy of de jure and de facto while further isolating the donor organizations from the field (Bonn, 2013).

This results in complaints about mismanagement, loudly echoed in every single key interview. Eng. Kilani (2020) states that during her 5 years as an advisor of the ministers of MWI, 4 ministers have been in place:

Each minister when he comes, he knows that his strategy will take five years to see results, for example, and when he knows that he's leaving after two, three months, he would focus on the quick wins, things that will show that he was a good minister in his period. (Kilani, 2020)

Two water experts mentioned how this acts as a strategy to cope with dissatisfaction among the population:

The minister, is, for example, pushing for a tariff increase, after he pushes for it, he retires. So, the next one can start with this uncomfortable decision, because this minister could not stay for so long. There would be demonstrations and so on. And the international donors are supporting this is... I have the feeling. (WE2, 2020)

WE2 continues to explain how the international community intentionally sustain status quo both in terms of development and stability. Jordan holds a historically strategic position in the Middle East, as a buffer country between Israel, Saudi Arabia, Syria, and Iraq, which also absorbs large amounts of refugees that would otherwise seek refuge in other countries (Yorke, 2016; Ecopeace, 2020). Thus, in case Jordan gains greater autonomy it would exceed the interest of the donors. Hence “water” develops beyond its materiality as it intertwines with the security and stability of the Kingdom and its allies, causing a politicization of the resource nationally and internationally.

In sum, the water monopolization of Amman and the Northern governorate was installed both by the prioritization of the donor organizations to accommodate the refugees as well as the regime's prioritization to sustain stability in the power center of the country in the urban sphere. It has been justified through the narrative of the Southeast as difficult, unruly, and unsustainable, and thus unworthy of investments from both the state and the donors. While the NRW issue is rendered technical by the donor organizations, the government and media render the administrative losses political as informal water provision from the DWC is classified as mischievous “sabotage” against the state. The divide-and-rule strategy to blame the marginalized Southeast prevents the creation of a united opposition of Northern and Southern tribes while keeping the donors and the public's eyes away (Melián, 2019: 218; Hussein, 2018). Table 5 illustrates the interplay of the “sabotage” and Northern bias by linking it to the morphogenetic “water” justice cycle. While it is clear that the hydrosocial cycle and justice trinity is reflected in the interlinkage between social power and just recognition and participation, the morphogenesis reflects the continuous process of structure, culture, and agency. The cultural stigmatization of the Southeast pushes the agents in the communities to

develop informal water structures, which in turn influence the original intention of the DWC water structure. Meanwhile, it also impacts the cultural perceptions as the “sabotages” have shed a minor light on the neglect of the distributional structures in the country.

Overview of sections	Hydrosocial cycle	Justice trinity	Morphogenesis process	
5.3.1 “Sabotage”	Social power	Procedure	Structure	Agency
5.3.2 Northern bias		Recognition	Culture	

Table 5: Overview of the connection to the morphogenetic “water” justice cycle

6. Conclusion

In exploring the mechanisms of the phenomenon of “sabotage”, the social component was a crucial addition to the “water” equation as illustrated through the application of the morphogenetic “water” justice cycle (see Table 6). Defining acts as deviant, illegal, or “sabotage” is a subjective process in which underlying power structures are in play. Hence addressing such through technical approaches is nearly impossible as exemplified by the unchanging amount of NRW in Jordan. The phenomenon of “sabotage” in Jordan entails much more than damages of the DWC as it is also an instrument that enables the government to blame the unruly Southeast whenever mismanagement of the DWC occurs. Meanwhile, it removes the focus from the neglect of the rural Ma'an, which triggered the rural unauthorized informal water distribution from the DWC manholes in the first place. Therefore, it is an important component of the social contract that sustain the stability of the neglected rural Southeastern tribes and the powerful urban North.

Several contributions have been made through this study of “sabotage” of DWC in Jordan. First, by examining an understudied phenomenon, this research creates a potential starting point for future studies on this matter. Second, it illustrates the applicability of the newly developed model of the morphogenetic “water” justice cycle (see Figure 8), which can be valuable for future studies of similar cases. Third, it contributes to the scarce socio-political studies of the Jordanian water situation. Fourth, it adds the Middle East and Jordan to the informality literature and more specifically to the rural water informality. Fifth, as it highlights the understudied rural Ma'an, it assists in providing a voice for a marginalized population. Last, this enhanced understanding of the region can contribute to better and more inclusive water projects in the future, including the upcoming Aqaba-Amman

National Water Conveyance Project (AANWCP) as well as donor invested projects in NRW in the Southeast of Jordan.

However, due to the persistent lack of studies, it is highly encouraged that future studies within an interdisciplinary field examine the water situation and the “sabotage” phenomenon in the rural Ma'an. Furthermore, independent medical and technical studies of the water quality in the Southeast should be conducted to investigate the reported health issues and clarify the statements provided in the analysis. It would also be interesting for future studies to discuss the matter from indigenous rights and climate adaptation perspectives. Feministic studies are also encouraged to examine the gender aspects of the phenomenon. Further investigations and discussions are also needed on the privatization of water through bottling as well as the indirect impacts on the urban areas in the North from the neglect of the Southeast. Last and most importantly, this study will hopefully inspire local academics, organizations, and the government to further study, understand, and acknowledge the needs of the communities living along the DWC to increase their livelihood through improved water management and development policies.

Overview of sections	Hydrosocial cycle	Justice trinity	Morphogenesis process
5.1.1 Disi Water Conveyance (DWC)	Infrastructure	Distributional	Structure
5.1.2 Formal pipelines, informal water vending from a local authorized source or unauthorized DWC, and commercial water bottles			
5.2.1 Blended Disi water	H2O		Nature
5.2.2 Polluted local source and/or unblended Disi water			
5.3.1 “Sabotage”	Social power	Procedure	Culture
5.3.2 Northern bias		Recognition	

Table 6: Overview of the connection to the morphogenetic “water” justice cycle for all the sections

7. Resources

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8. Appendices

Appendix 1 - Demography of Jordan over time and its influence of refugee influxes

Year	Population of Jordan ^a	Major political event
1922	225,000	Emirate of Transjordan founded in 1921
1947	473,200	One year before the establishment of Israel
1952	586,200	After the 1948-1949 war with Israel
1970	1,508,200	Three years after the six days war with Israel, and the Israeli occupied the East Jerusalem and the West Bank.
1989	3,144,000	One year before the Iraq-Kuwait war
1993	3,993,000	Two years after the Iraq-Kuwait war
2002	5,098,000	One year before the war against Iraq
2004	5,350,000	One year after the war against Iraq
2010	6,113,000	One year before the Syrian crisis
2012	6,388,000	One year after the start of the Syrian crisis
2015	9,500,000	Three years after the start of the Syrian crisis

^a Estimated.

Source: Hussein, 2018: 388

Appendix 2 - Key informant

No.	Organization	Name	Position	When	Confidentiality	Pseudonym
1	University	N/A	Environmental Engineer	Dec. and Jan. 2020	Full	WE1
2	German-Jordan University	Dr. Munjed M. Al-Sharif	Previous Dean, Hydro engineer, 5 years of experience in MWI	Dec. 2020	None	N/A
3	MWI	Eng. Bashar Bataineh	Disi Project Director	Dec. and Jan. 2020	None	N/A
4	MWI/WAJ	Dr. Ahmad Ali Al-Uleimat	Assistant Secretary-General for Laboratories and Quality Affairs	Jan. 2020	None	N/A
5	Prior MWI/WAJ	Eng. Suzan Kilani	Previous Advisor for MWI and the Disi project	2x Jan. 2020	None	N/A
6	IHP President + Lebanese Ministry of Energy and Water	Fadi Comair	General Director of Hydraulic and Electric Resources, President for IHP, Water diplomat	Jan 2020	None	N/A
7	GGGI (office in Ministry of Environment)	Ahmed Al Amra	Country Representative, Jordan Program	Dec. 2020	None	N/A
8	INGO	N/A	Previous technical advisor for MWI and current project manager of NRW projects in Jordan (only North)	Jan. 2020	Full	WE2
9	GIZ / BGR background	Dr. Armin Margane	Senior Technical Advisor, NWMP, publisher, 34 years experience	Feb. 2020	None	N/A
10	EcoPeace	Abdel Rahman Sultan	Project Manager, 20 yrs experience	Feb. 2020	None	N/A
11	INGO	N/A	Head of the water department	Feb. 2020	Full	WE3
12	INGO	N/A	Hydro engineer in the water department	Feb. 2020	Full	WE4

Appendix 3 - Respondents of communities in rural Ma'an

No.	Pseudonym and family status	Family	Sex	Place	Occupation	Accommodation
1	F1 - father	1	Male	Village 2	Previous farmer	House
2	O1 - Older son	1	Male	Village 2	Student	House
3	F2 - Father	2	Male	Village 2	Unemployed	House
4	F3 - Father	3	Male	Village 2	Unemployed	Tent / nomads
5	OS2 - Older son	3	Male	Village 2	Unemployed	Tent / nomads
6	S1 - Son	3	Male	Village 2	Unemployed	Tent / nomads
7	S2 - Son	3	Male	Village 2	Unemployed	Tent / nomads
8	SS3 - Sheik	3	Male	Village 2	Unemployed	Tent / nomads
9	F4 - Main speaker	4	Male	Village 1	Unemployed	Tent / nomads
10	C1 - Cousin	4	Male	Village 1	Unemployed	Tent / nomads
11	C2 - Cousin	4	Male	Village 1	Unemployed	Tent / nomads
12	C3 - Cousin	4	Male	Village 1	Unemployed	Tent / nomads
13	F5 - Father	5	Male	Village 1	Unemployed	House
14	S3 - Teenage son	5	Male	Village 1	Student	House
15	F6 - Son	6	Male	Village 1	Phosphate company	House
16	M2 - Mother	6	Female	Village 1	Unemployed	House
17	D1 - Dad	6	Male	Village 1	Unemployed	House
18	C4 - Cousin	6	Male	Village 1	Unemployed	House
19	C5 - Cousin	6	Male	Village 1	Unemployed	House
20	F7 - Man/sheikh	7	Male	Village 2	Unemployed	Tent / nomads
21	F8 - Younger male	8	Male	Village 2	Unemployed	Tent / nomads
22	S5 - Sheikh (older)	8	Male	Village 2	Unemployed	Tent / nomads
23	P1 - Principal	N/A	Male	Village 2	Principal	Teacher accommodation
24	T1 - Teacher1	N/A	Male	Village 2	Teacher	Teacher accommodation
25	T2 - Teacher	N/A	Male	Village 2	Teacher	Family house
26	T3 - Teacher	N/A	Male	Village 2	Principal	Family house
27	P2 - Principal	N/A	Female	Village 1	Teacher	Family house
28	T4 - Teacher	N/A	Female	Village 1	Teacher	Family house

It should be noted that most of the unemployed are taken up herding.

Appendix 4 – Interview guides

4.1 Semi-structured interviews with key informants

The guides slightly varied depending on the background and expertise of the informants. Therefore, the below states questions that might be non-relevant in certain contexts. In each interview around 10 questions were raised. Most interviews lasted between 1-2 hour(s).

Theme 1: Scope of Work/Perceived Roles

1. What is your title?
2. Which areas do you work with?
3. What are your academic interests?
4. For how long?
5. What are you working on at the moment?
6. What role is your organization's/institution's mandate in the water sector in Jordan?
7. Which projects have you had in the past in Ma'an?

Theme 2: Jordan's and Ma'an's water situation and NRW

8. What are the biggest challenges impacting Jordan's water situation?
9. What is projected as the climate change impact on water quantity in Jordan and Ma'an?
10. What is the general water quality in Jordan and Ma'an? Has the water quality changed over time?
11. What efforts are made to tackle the water quality in Jordan?
12. Which impact do you think that the water scarcity has on internal conflicts in Jordan?
13. What measures do you believe could be taken to close the water gap between supply and demand?
14. Do you know why the NRW percentage dropped to 44% in 2011 and went back up to 52% later on?
15. Why do you think that the Ma'an governorate has the highest percentage of NRW? (73,2%) and has it always been like that?

Theme 3: General knowledge on the Disi aquifer

16. What is your knowledge of the Disi Aquifer?
17. How long will it last?
18. What are the hydrological properties of the aquifer?
19. Why do you think that Jordan decided to set its target of a safe level of radiation 5 times higher than the WHO standard? (0.1 mSv)
20. Who does the Disi water belong to?

Theme 4: General knowledge on Disi Water Conveyance

21. What is your knowledge of the Disi Water Conveyance?
22. How was the Disi Water Conveyance concept developed?
23. What are the short- and long-term benefits of the DWC?
24. What are the short- and long-term negative consequences?
25. What are the social effects of the DWC on the Jordanian society?
26. What are the environmental consequences of the Disi project? Has any been reported?
27. How will the project affect water and electricity prices in Amman and the Disi area?

Theme 5: Water-related health issues

28. What are the health risks of drinking water containing high salinity?
29. What are the health risks of drinking water containing phosphorus?
30. What are the health risks from drinking Disi water pure?

Theme 6: Knowledge and opinions on sabotages and Southeast

31. How do people along the pipeline receive water? What is the quality of this water?
32. On a local level, who plays the greatest role in the distribution of water in the Southeast?
33. Does your organization have any water projects in Ma'an?
34. How have your organizations/institution tackled the administrative losses?
35. Why do you think that the sabotages on the DWC occur and why now?
36. Is there a contamination risk from the sabotages of the DWC?

Section 7: Projections

37. What could be a solution to stop these sabotages?
38. What role could natural-based solutions play for the future supply in Jordan?
39. How do you believe Jordan/Ma'an looks in 10-20 years considering the climate projections and decrease of water per capita?

4.1 Focus groups with respondents

Similar to the key informant interviews, the focus group interviews also brought up further questions or themes throughout the conversations.

English

Theme 1: Demography

How old are you?

What do you do for living?

Theme 2: Water supply and demand

Where do you get water from?

What do you use tap water for?

Who is responsible for providing water?

How much do they pay in water bill per month?

What should be the price of water

Theme 3: Disi Water Conveyance perception and impact

Do you know about the Disi Water Conveyance (pipeline)?

What do you think of it (Disi)?

Have you been affected by the pipeline?

How was your water situation before and after the establishment of the pipeline?

Did the water supply distribution change?

Theme 4: Sabotages

Have you heard about the sabotages of the pipeline? (*If no, explain*)

Why do you think that the sabotages are happening?

Have there been sabotages nearby here?

Do you know anyone engaged with the acts?

Theme 5: Prospects

How do you think your water situation will look in 10-20 years?

Arabic

كم عمرك؟

بتشتغل؟ اذا نعم شو طبيعة شغلك؟

من وين بتجيبو مياه؟

لشو بتستخدمو مياه الحنفية؟

من المسؤول عن كيفية حصولكم على المياه؟

نسبياً كم بتطلع عليكم فتورة المياه كل شهر؟

برأيكم قديش لازم يكون سعر المياه؟

هل تعرف معلومات عن نقل مياه الديسي؟

شو رأيكم بموضوع الديسي

هل تأثرت بخط الأنابيب؟

كيف كان وضعك بالنسبة للمياه قبل وبعد إنشاء

خط الأنابيب؟

تغير توزيع إمدادات المياه؟

سمعت عن اي تخريب صار بخط الأنابيب؟

لماذا تعتقد أن التخريب يحدث؟

عمرك سمعت عن تخريب صار قريب من هنا؟

بتعرف حدا اله دخل في اعمال التخريب

كيف تعتقد أن وضع المياه سيبدو في المستقبل؟

Appendix 5 – Pictures from the research sites

5.1 Pictures from water quality laboratory in the Water Authority of Jordan (WAJ)



5.2 Pictures from the rural Ma'an governorate



Appendix 6 – Simplified version of the Disi Water Conveyance components

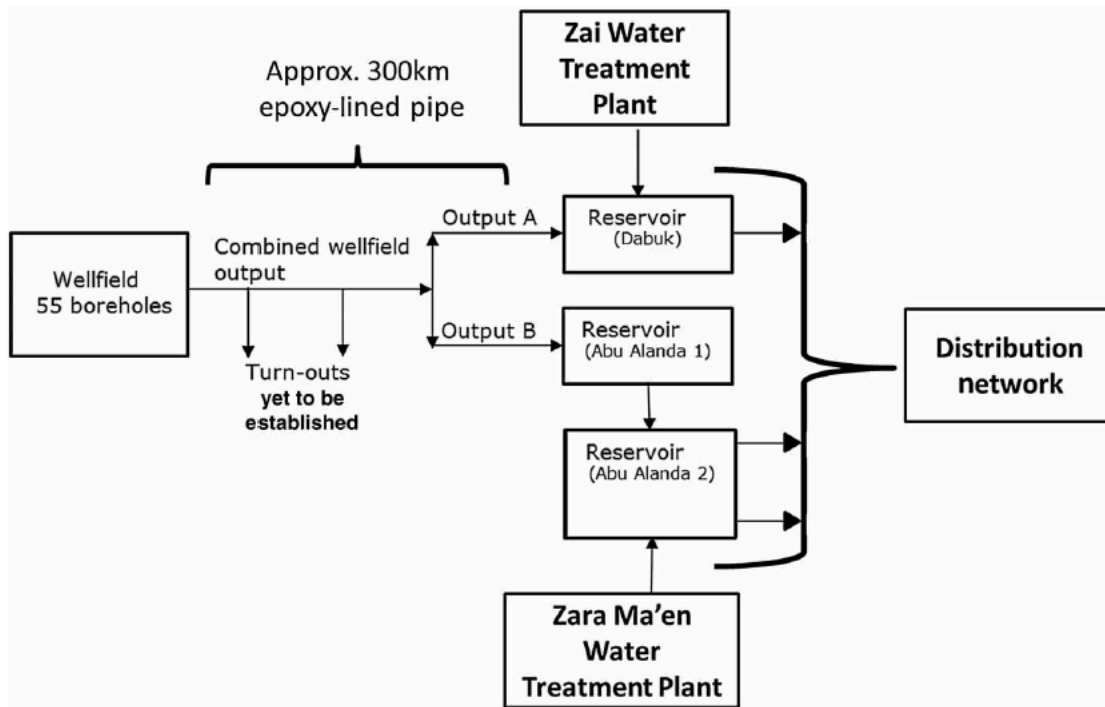


Figure 3 | Simplified schematic diagram of the well field and associated infrastructure put in place to allow blending on the outskirts of Amman.

Source: *El-Naser et al., 2016, p. 542*

Appendix 7: Historical satellite images of agricultural activities on the Disi-Saq aquifer, 2009-2016

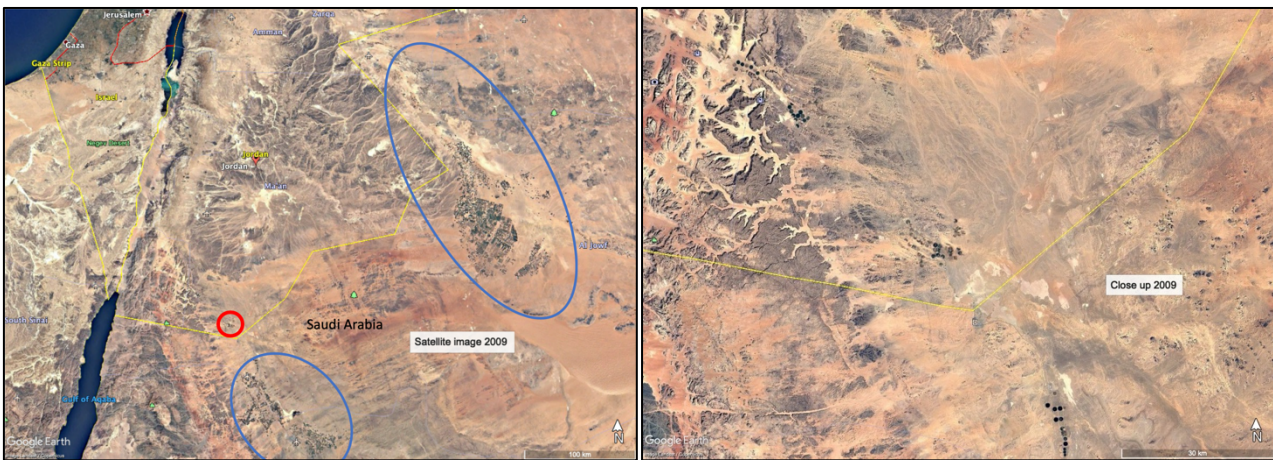


Figure 2: Left - satellite image 2009, Right: close up on red circle

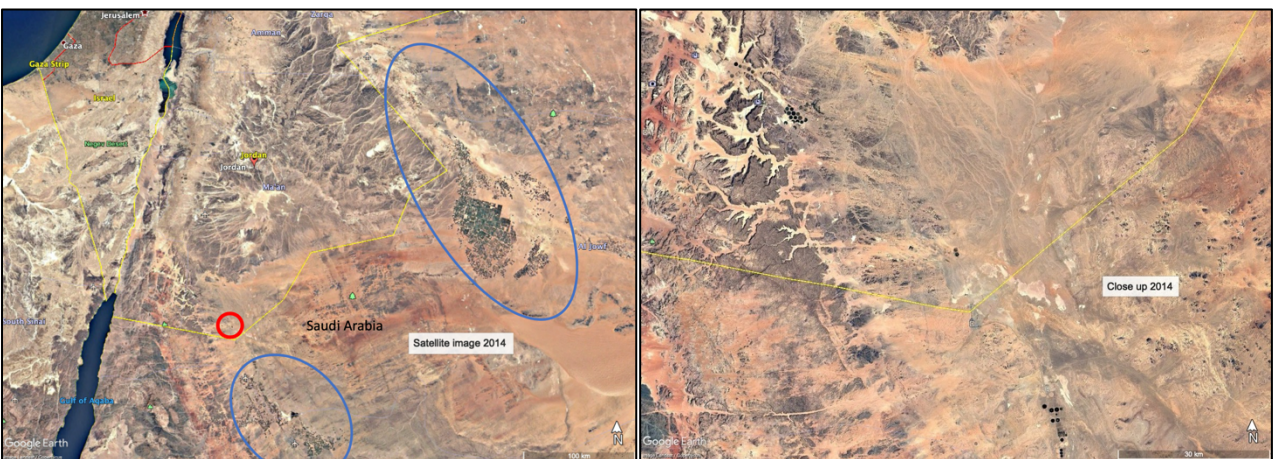


Figure 9: Left - satellite image 2014, Right: close up on red circle

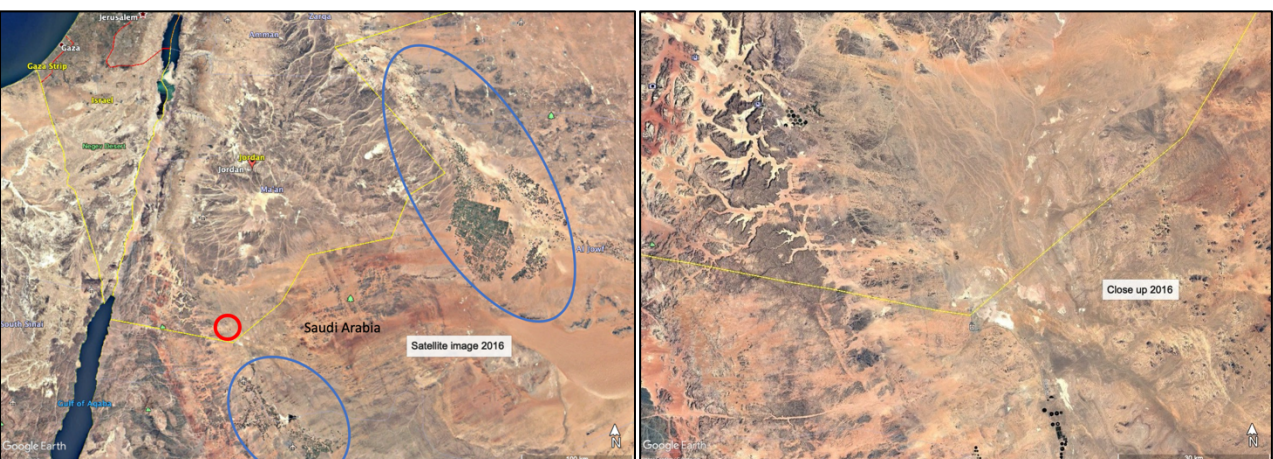


Figure 9: Right - satellite image 2016, Left: close up on red circle

Description of images:

Satellite images from the time-period 2009 to 2016 retrieved through Google Earth. Blue circles illustrate the agricultural activities on the Saudi Arabian side. The images show that from the year

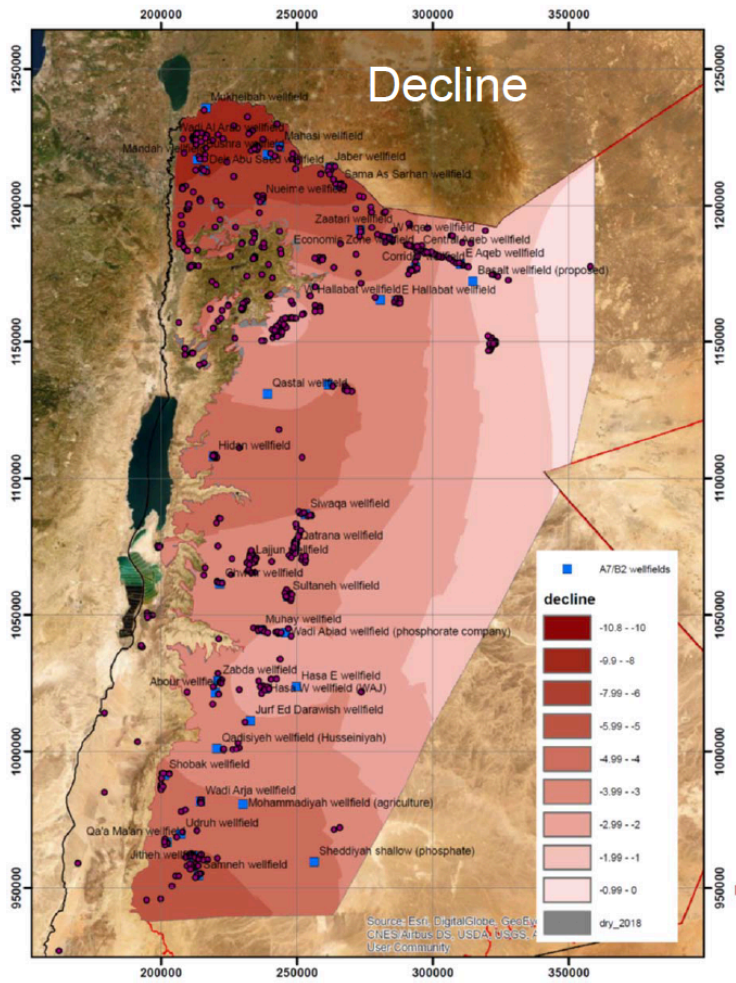
2009 to 2016, Saudi Arabia has not been influenced by the transboundary buffer zone agreement as no projects were within 10 km of the border. Its agricultural projects located on the aquifer have expanded throughout the years. On the other hand, the red circle illustrates the development of Jordanian agricultural projects near the border, which were established in 1988. However, it is interesting to note that the project was already closing the majority of its activity in 2014, one year before the agreement and the same year as the launching of the Disi Water Conveyance. Furthermore, not all agricultural projects at the Disi aquifer are closed, left-upper corner shows that projects near the famous tourist point, Wadi Rum remain unaffected in 2016.

Findings regarding the Disi-Saq agreement's efficiency:

The 2015 Disi-Saq agreement intended to preserve the fossil groundwater by, for example, closing all agricultural projects within 10 km of the border the following five years. While Müller et al. (2016) claim it is one of the more successful transboundary agreements in the region, the Water Authority of Jordan (WAJ) complains about its minimal effect as KSA has numerous agricultural projects consuming the water of Disi just outside the buffer zone. Furthermore, the historical satellite images above document that KSA never had agricultural projects within the buffer zone and has expanded such activities on the basin since 2015. These increase the risk of development of major *cones of depression* that can affect the water flow and lead it towards drilling points, which could cause water to flow away from the Jordanian border towards KSA (Kilani, 2020). A phenomenon already reported in some parts of the aquifer in KSA (Al-Salamah & Ghumman, 2010).

The images also illustrate that Jordan already closed down agricultural project within the *buffer zone* in 2014, one year before the agreement and same year as the construction of the Disi Water Conveyance (DWC), as it shifted from using the 100 MCM for irrigation in the South to domestic use in the North (El-Naser et al., 2016; Salameh, Shteivi & Al Raggad, 2018). This matches the statements of members of families 1, 7, and 8 who were farmworkers at the closed agricultural project in Muddawara. They all were attracted to Village 2 by the construction of a school and surrounding housing units built the same year. A state strategy that emulates the sedentarization policies of the British. Another component of the transboundary agreement was the establishment of a Joint Committee with mandatory meetings every six months, however, officials in WAJ and MWI confirmed that in the past five years no meeting had taken place as they state that KSA withholds its information. This puts the effectiveness of the agreement into question.

Appendix 8: 2040 decline of aquifer B2/A7



Source: GIZ PowerPoint presentation, 2019

Appendix 9: Map of the Disi-Saq Aquifer

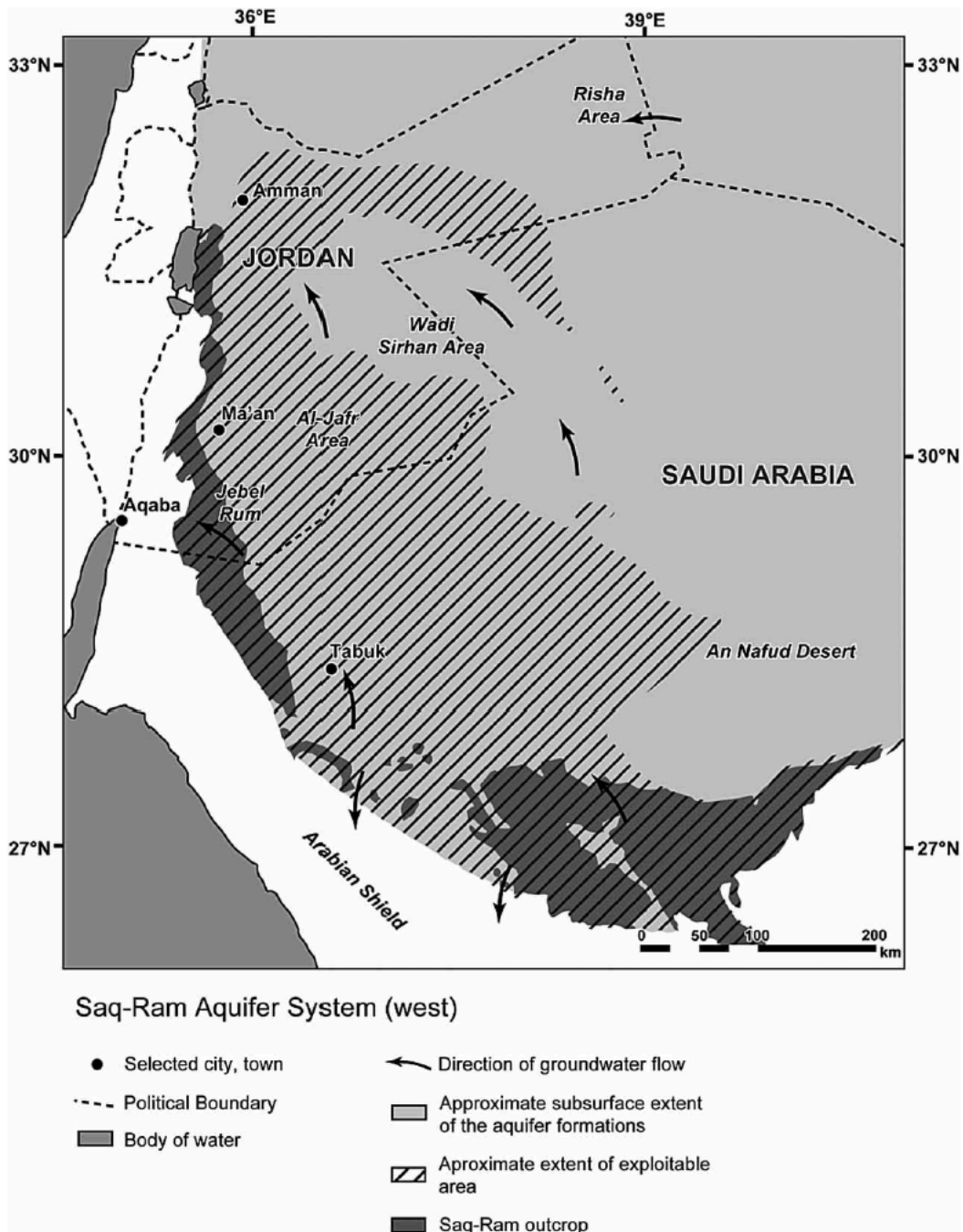


Figure 1 | Regional map showing the extents of the confined and unconfined Ram aquifer (adapted from: UN-ESCWA and BGR, 2013. Inventory of shared water resources in Western Asia, Beirut, Lebanon).

Source: El-Naser et al., 2016: 529