

Traditional Rainwater Harvesting in Jordan:

A qualitative study of Project Rainkeep (1994-1995)

Authored by

Sonya Marie Jensen

## Dedication

For Ayla Spizawka, Desmond and Marlie Reid, and Damian Wright

May your generation learn to appreciate that water is finite.

Funding for this thesis has been provided by:

- Norwegian Lånekassen, Bergen Norway
- Bergenhalvøens Kommunale Kraftsselskap (BKK), Bergen Norway
- Senter-for-Miljø-og-Ressurser (SMR), Bergen Norway
- Pierre and Patricia Bikai fellowship funded by the American Center for Oriental Research, Amman Jordan

## Abstract

Ennis-McMillan (2006:129) refers to fresh water as “a resource that countries can no longer take for granted”. An inadequate water supply, commonly referred to as water-scarcity, is the result of a complex, causal relationship between the environment and human water consumption. The interactions between the two can generate water pollution, water scarcity, and unequal water distribution on a global scale (Ennis-McMillan 2006).

Jordan has repeatedly been labelled a water-scarce nation (Allan 2001; bint Talal 2004; Faruqi 2001; Gleick 1993; Iskandarani 2001). Strategies to overcome water-scarcity in Jordan have included demand management policies and international aid development projects. This thesis is based on the follow-up study of Project Rainkeep; a small-scale development pilot project intended to be a solution to water-scarcity with the re-introduction of rainwater collection in cisterns for domestic use. The project brought physical enhancements to existing cisterns and encouraged households to once again rely on rainwater collection to support their domestic water budget.

The orientation guiding the research has been to ask: *Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan?* In short, the development project did not affect that which it sought to alleviate, in part because water-scarcity was not seen as a problem for households due to a cultural of water-sharing, but there were other positive outcomes for households. In the exploration into the affects of Project Rainkeep, ‘regional political ecology’ has been adopted as the meta-theory. The research has been further broken down into three key areas of investigation: little traditions such as local level water-management, expert knowledge such as the state and Islam, and water-scarcity. Some of the main research questions have been:



1. How does a household negotiate access to and usage of a necessary but scarce resource?
2. What roles do great traditions of the state, development and Islam play in water-management?
3. How does knowledge about water availability affect the practice of water-management?

Data has been collected qualitatively through the use of semi-structured interviews conducted at the local level from project households and at the national level from water-management professionals. In addition, a literature review of key concepts such as local and expert knowledge, state water-management, the role of Islam, globalization and development, and water-scarcity has been conducted. Some of the principal findings have been that coping with water-scarcity at the household level incorporated a threefold strategy to access water publicly, privately and locally through pipes, water trucks and rainwater harvesting. From a cultural perspective, the importance of sharing, generosity and hospitality were values that led to a willingness to distribute water in the villages. In addition, the traditional gap between development aid and the recipients' perception of that aid existed. While those who worked to implement the project were unsatisfied with the project results and deemed Project Rainkeep a failure those who had their domestic cistern restored expressed gratitude and hope for future aid. It has been difficult to ascertain whether or not Islam played a role in water-management.

## Abbreviations

ACOR	American Center for Oriental Research
ADRA	Adventist Development and Relief Agency
CIDA	Canadian International Development Agency
GIS	Geographical Information Systems
GPS	Global Positioning Satellite
GTZ	German Agency for Technical Cooperation
IMF	International Monetary Fund
mcm	million cubic metres
mm	millimetres
MoWI	Ministry of Water and Irrigation
NWMPD	National Water Master Plan Directorate
pcpd	per capita per day
PR	Project Rainkeep
TEK	traditional environmental knowledge
UAW	Unaccounted for water
UN	United Nations
UiB	University in Bergen
WB	World Bank
WHO	World Health Organization
WIS	Water Information System
WSD	Water saving device

## Figures and Tables

### Chapter Three

Figure 3.1.....	Map of Jordan.....	26
Figure 3.2.....	Rainfall map.....	35
Table 3.3.....	Water budget.....	36
Figure 3.4.....	Hisban map.....	38
Figure 3.5.....	Scale of cistern.....	40
Table 3.6.....	Water bureaucracy.....	42
Figure 3.7.....	Water demand.....	43
Table 3.8.....	Water resources.....	48

### Chapter Four

Figure 4.1.....	GPS map of cisterns.....	52
-----------------	--------------------------	----

### Chapter Five

Figure 5.1.....	Household three.....	62
Figure 5.2.....	Household six.....	63
Figure 5.3.....	Household seven.....	64
Figure 5.4.....	Household two.....	65
Figure 5.5.....	Household five.....	66
Figure 5.6.....	Household seven.....	67
Figure 5.7.....	Household ten.....	68
Table 5.8.....	Household strategies.....	69
Figure 5.9.....	Water truck.....	70
Figure 5.10.....	Household five.....	71
Figure 5.11.....	El-Larish.....	72
Figure 5.12.....	Household sixteen.....	73
Figure 5.13.....	Household eleven.....	74
Figure 5.14.....	Household thirteen.....	76
Figure 5.15.....	Household seventeen.....	79

Figure 5.16.....Household six.....89  
Figure 5.17.....Household fourteen.....93  
Figure 5.18. ....Household eight.....94

Chapter Six

Figure 6.1.....Household one.....97

### Author's note

While in the field I was amazed to hear reports that a one-day-a-week water supply was adequate for household needs. It is hoped that by investigating water-scarcity in Jordan preventative, well-considered strategies will be implemented for managing future water resources on a global scale.

I genuinely hope that the following pages are enjoyed by all who invest time in reading them. I have valued my experiences in Jordan and Norway equally.

Sincerely,

Sonya Marie Jenssen

Dedication.....	ii
Abstract.....	iv
Abbreviations.....	vii
Figures and tables.....	viii
Author’s note.....	x

## Table of Contents

### **Chapter One: introduction to the study**

1.1. Introduction.....	1
1.2. Research question.....	1
1.3. Project Rainkeep.....	2
1.4. Organization of the thesis.....	4

### **Chapter Two: Theory**

2.1. Introduction.....	5
2.2. Political Ecology.....	6
2.3. Local knowledge and little traditions.....	7
2.4. Expert knowledge and great traditions.....	10
2.4.1. Supply and demand approaches to water-management.....	12
2.4.2. Islamic demand management.....	15
2.4.3. Development aid and globalization.....	18
2.5. Ecology.....	22
2.5.1. Water-scarcity.....	22
2.6. Concluding remarks.....	24

### **Chapter Three: Description of research area**

3.1.	Introduction.....	26
3.2.	History of Jordan.....	27
3.3.	Hydropolitics.....	29
3.4.	Water resources.....	33
3.4.1.	Surface water.....	33
3.4.2.	Groundwater.....	33
3.4.3.	Rainfall.....	35
3.5.	Project area.....	37
3.6.	Water bureaucracy.....	40
3.7.	Consumption levels.....	43
3.8.	Unaccounted for water.....	44
3.9.	Solutions.....	45
3.10.	Concluding remarks.....	49

### **Chapter Four: Methods**

4.1.	Introduction .....	50
4.2.	Interviewees.....	50
4.3.	Research question.....	53
4.4.	Methods.....	54
4.4.1	Techniques.....	54
4.4.2	Research community.....	56

4.4.3	Rules and procedures.....	57
4.5.	Dealing with biases.....	58
4.5.1	Cross-cultural research.....	58
4.6.	Concluding remarks.....	60

## **Chapter Five: Case study of Project Rainkeep**

5.1.	Introduction.....	61
5.2.	Little traditions.....	61
5.2.1.	Local level water-management.....	61
5.2.2.	Hospitality.....	72
5.3.	Great traditions.....	74
5.3.1.	Development gaps.....	75
5.3.2.	Islam and water-management.....	80
5.4.	Ecology.....	84
5.5.	Concluding remarks.....	89

## **Chapter Six: Concluding remarks**

6.1.	Introduction.....	95
6.2.	Unanswered questions.....	96
6.3.	Strengths and weaknesses.....	98
6.4.	Main findings.....	99
6.5.	Future work.....	101



## **Appendices**

1.1.	Project Guidelines.....	103
1.2.	Irvin Chart.....	104
4.1.	List of Interview Questions.....	113
4.2.	New Chart.....	116
4.3.	Field notes.....	121
4.4.	Coding Strategy.....	178
4.5.	Thematic field notes.....	181
4.6.	Permission.....	201
	<b>Bibliography .....</b>	<b>202</b>

## **Chapter One: Introduction to the study**

“Water is a precious liquid! ...Water is a vital liquid! ...Water is life!”

(Ennis-McMillan 2006:1)

### 1.1. Introduction

The restoration of rainwater harvesting systems through Project Rainkeep was in response to water-scarcity in the Madaba governorate in Jordan. While rainwater collection has been the source of water for millennia in the region modern infrastructures such as pipes have now replaced these ancient practices (LaBianca 1994). Rainwater harvesting does not mean to simply collect rainfall directly into a storage area. Rainwater harvesting is a practice where rainfall has been collected in a catchment area and funnelled to a storage area, namely the cistern. There have been some concerns voiced about the negative ecological impacts from rainwater harvesting due to the possibility that “rainwater harvested upstream reduces the runoff otherwise available to others, or the environment, downstream” (Cosgrove and Rijsberman 2000:40). In a country as dry as Jordan where rainfall is minimal and the evaporation rate is 85% rainwater harvesting does not pose any ecological threats because very little of the Jordan’s rainfall recharges aquifers or adds to surface run-off (Russell 1995).

### 1.2. Research question

The main research question is:

Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan?

Project Rainkeep was a development project that attempted to alter local practices in terms of household water-management. Some of the conditions that affect the public water supply, household water-management and development practices will be examined by looking at strategies responding to water-scarcity. The significance of this research question is to discuss the capabilities of an internationally-funded and led development project to alter water access patterns by introducing previously utilized techniques.

Essentially, is the modern landscape of pipes and groundwater pumping conducive to the return to ancient techniques of rainwater harvesting?

### 1.3. Project Rainkeep

Project Rainkeep, funded by the Canadian International Development Agency and the Adventist Development and Relief Agency-Jordanian branch (CIDA/ADRA), restored underground household cisterns. The project aimed to re-introduce rainwater harvesting in cisterns as a viable means for addressing the country's water shortage. It was considered a way for households to acquire more water at no cost, lessen the burden of provision of the government and relieve pressure on groundwater sources (LaBianca 1994). In turn, households with improved water access would experience better health and more secure financial situations (LaBianca 1994). The project aimed to relieve the pressures on the integrated water networks maintained by municipal governments since the 1960's (LaBianca 1994).

Project Rainkeep has been a window on local knowledge and expert knowledge in terms of how water is managed. Through the follow-up study of this project, rainwater harvesting has been reviewed as a potential solution to alleviate the suffering incurred by water-scarcity. Rainwater harvesting is particularly linked to local knowledge relevant to the village setting; however, it is not viewed by experts as the solution to water-scarcity. This particular study focuses on how the acknowledgement of water-scarcity has been a catalyst for an international development aid project that sought to re-introduce a local level water management technique.

The project implementation side had a number of stakeholders. Dr. Oystein S. LaBianca was the pilot project initiator and is the founding co-director for the Madaba Plains Archaeological Project where Project Rainkeep is based. LaBianca explains:

“Project Rainkeep was an initiative inspired by archaeological research on past water management practices in Jordan to heighten awareness among present-day local villagers and the public of the importance of household and

agricultural cisterns as a means to assure year-round supplies of fresh water for families and farms in Jordan”. (e-mail to author, January 25, 2006)

After the project had been completed, it was deemed that it had failed. In particular, scepticism was voiced by the funding director for ADRA-Jordan, Basim Aziz. He believed that the project failed because the restored cisterns were not used strictly for rainwater collection. Aziz sited that some other problems with the project were the high costs of operation to pay the project engineer who based in Amman to commute daily to the restoration sites. In addition, the engineer was criticized for having had poor judgement and for making mistakes due to unfamiliarity with the local cultural and geophysical terrain. During fieldwork not one household specifically critiqued his work; instead, these criticisms had come solely from Aziz and Malcolm Russell, an ethnographer who evaluated the project. Another ethnographer, Dr. Dorothy Irvin, created project guidelines that served as an evaluation tool (Appendix 1.1). In these guidelines, sweat equity was judged to be important for future cistern management along with the family’s water needs and economic situation. The definition of a cistern and all of its necessary parts was also clarified in these guidelines. Irvin produced a chart that I used in the course of my fieldwork to find the restored cisterns (Appendix 1.2). In Russell’s (1996) evaluation of the project, some of the anticipated concerns with the project included diminished water quality, potential mosquito larva and conflict over property ownership. Some critiques of the project levied by Russell (1996) included attempts to cut corners with the use of cheaper building materials, erratic judgments made by the project engineer, and poor selection of the restoration sites. Russell (1996) did observe that the sharing of cistern water and water conservation were important strategies in Madaba. Russell concluded that rainwater harvesting for household use “will not seriously affect the looming water shortage, either regionally or nationally ... Compared to the thirst of Jordan’s farms, industries and cities, the domestic water used by villagers pales in significance” (1996:7). Russell (1996) believed that only way to improve Jordan’s water shortage is to find new sources and change irrigation practices, although the project could offer some valuable financial returns to poor households.

While the previous evaluations did help to clarify some basic concepts this thesis has largely been its own project. Based on the above, Project Rainkeep was deemed a failure. I was prepared to investigate why development fails but instead I discovered that while this project deserves some criticisms that are typical for development practices, for the most part households were satisfied with Project Rainkeep. Therefore, this qualitative study has arrived at its own conclusions that are more positive than that of previous stakeholders.

#### 1.4. Organization of the thesis

This initial chapter gave a brief overview of water-scarcity and Project Rainkeep as a development project premised on water-scarcity. In chapter two the reader will be introduced to the theoretical framework. Key concepts, researchers and their debates will be described as they relate to the main research question. The grand theory of 'regional political ecology' (Blaikie and Brookfield 1987) is delineated into subsequent sections that discuss the categories of local and expert in light of state water-management, Islam and water-management, international development and water-scarcity. Chapter three describes the water resources and management of water in Jordan. The focus is on the entirety of Jordan because the water network is nationally integrated overseen by the Ministry of Water and Irrigation. Chapter four outlines the methods and discusses the interviewees, the research question and the methodological domain. The status of the researcher as a Norwegian and student is reflected upon, in addition, dealing with biases and conducting cross-cultural research are reflected upon. Chapter five is the data chapter. The theoretical framework of regional political ecology answers the research question by using the observations collected through the methodological domain. This is the largest chapter and incorporates discussion from previous chapters. Chapter six addresses the questions unanswered, the strength and weaknesses of the study and recommendations for future research in the field area.

## Chapter Two: Theory

“Emphasis on theory does not guarantee that social scientific research is unbiased and value free” (Davidson and Layder 1994:41).

### 2.1. Introduction:

Theories are “forms of explanations” that give us some indication of the nature of a particular phenomenon (Davidson and Layder 1994:41). In general, theory in conjunction with field observations results in the production of data, which is the final outcome of research (Wadel 1991). Theory can be used in two ways. Theory-testing is a way to prove a hypothesis that has “a fairly well worked out set of theoretical assumptions”; theory-constructing occurs when evidence and explanations have not been decided beforehand and the theories are generated by the research (Davidson and Layder 1994:44). Davidson and Layder (1994) note that “the idea of theory-constructing research is to begin to gather data and empirical evidence on a particular area ... by observing and talking to those people who are involved in such practices or activities” (46). The theoretical approach utilized here has been a combination of theory-testing and theory constructing.

This chapter is guided by the main research question: *Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan?*

Prior to departure to the field and based on the literary reviews, relevant theories were formulated. Theory testing was initiated at this pre-departure stage. Did an Islamic water demand management exist was one theory to be tested. This theory claimed that statements in the Qur’an and hadiths by the Prophet Mohammed have been adopted in water-management strategies at the government and local level. The general theory constructed in response to this was that Islam did not play an official role but may contribute to water use patterns. Another theory to be tested was whether the definition and impacts of water-scarcity altered depending on the standpoint of the water consumer. The theoretical result

was that water sharing is locally understood as a strategy for lessening the hardships of water-scarcity and that the gap between development implementation officials and recipient households led to different understandings for how to best address water-scarcity.

This chapter uses a general theory (Davidson and Layder 1994) of political ecology. Even more specifically, ‘regional political ecology’ has been chosen as an appropriate window from which to understand the stakeholders in Project Rainkeep (Blaikie and Brookfield 1987). Each component of the regional, the political and the ecology will be discussed in turn. First, the regional is reflected on in terms of how the environment is used and is exemplified through two little traditions of rainwater harvesting and hospitality. Next, the political addresses how the great traditions of the state and Islam manage water and influence patterns of use. In the following section, development is discussed as an extension of globalization. Finally, in the ecology section, little and great traditions are tied together when looking at how the local terrain, in particular water-scarcity, influences human reactions to the management of the resource.

## 2.2. Political ecology

A suitable “specific lens through which one can examine the interactions between the environment and society” is political ecology (Schubert 2005:9). Political ecology deals with:

- “(i) how both nature and societal structures determine each other and shape access to natural resources,
- (ii) how constructed concepts of society and nature determine human-environment interactions,
- (iii) the connections between the access to, and control over, resources and environmental change, and
- (iv) the social outcomes of environmental change (Schubert 2005:9).

In particular, the concept of ‘regional political ecology’ by Piers Blaikie and Harold Brookfield (1987) in *Land Degradation and Society* encapsulates the research topics under one meta-theoretical lens. Regional political ecology is the interaction between geography and socio-economics as they change in society and the environment over time (Blaikie and Brookfield 1987). Through the combination of the concerns of ecology and a “broadly defined political economy” that encompasses the “constantly shifting dialectic between society and land-based resources”, Blaikie and Brookfield (1987:17) paid particular attention to the role of marginalized peasants in Southeast Asia and the “chains of explanation” (27). The authors describe “reciprocal relations between land use and the environment in the case of soil erosion” as caused by social structures (Schubert 2005:13). Their conceptual framework was to “analyse land degradation on the basis of causal chains between ‘land managers’ and their land, other land users, groups in the wider society who affect them, the state, and, ultimately, the global economy (Blaikie and Brookfield 1987:27). Due to their Marxist-inspired tradition, Blaikie and Brookfield portrayed these chains of explanation “in terms of social relations of exploitation and surplus extraction at scales extending to the global political economy” (Walker 1998:9). The idea was that the chains of explanation radiated outward from the peasant as a land user to their community and then to regional, national and global region that was political and economic in nature (Walker 1998).

### 2.3. Local knowledge and little traditions

The regional incorporates how the history, the culture and the ecology of an area is realized through local knowledge. A typical definition of local knowledge is how the local context or setting, which includes the empirical knowledge of specific characteristics, circumstances, events, and relationships, informs the normative understandings of the local (Fischer 2000). From an ecological perspective, local knowledge is to know your environment through soils,



land types and climate patterns such as rainfall and lunar phases (Chambers 1983). Local knowledge is utilitarian and is based on a “tacit awareness” of one’s environment is necessary in order to understand the complexity of the knowledge system in mention (Fischer 2000:207). As these tacit elements of a society shift, for example the introduction of pipes, the behaviour of how to use this new tacit object alters other patterns of behaviour. Society is integrated and changing one link will shift all connecting links (Goehring 1993). Local knowledge could be viewed as a how-to-kit that offers instructions for how to operate in a given region in certain situations. Often local knowledge is considered in opposition to modern, scientific knowledge (Crewe and Harrison 1998). Local knowledge is informal in contrast to that which “defines scientific, professional, and intellectual elites in both Western and non-Western societies” (Fischer 2000:195).

An extension of local knowledge is indigenous knowledge, also known as traditional environmental knowledge [TEK] (Battiste and Henderson 2000). Indigenous knowledge is a relationship with an ecosystem through the accumulation of experiences at a specific time and place (Battiste and Henderson 2000). Indigenous conjures up the sentiment that one was native or first present in an area. In addition, indigenous knowledge is a form of identity that is often tied to the sustainability of an ecological domain (Suzuki 2006). The “ultimate source of knowledge is the changing ecosystem” and the reactions of certain people to this changing ecosystem (Battiste and Henderson 2000:41). Ultimately, indigenous knowledge is holistic and includes the “totality of knowledge” through the relationship of living beings to their environment (Battiste and Henderson 2000:43).

Similar to local knowledge, indigenous knowledge is found to be opposite to modern, scientific knowledge (Crewe and Harrison 1998) and responds to the “shifting dynamics of particular ecologies” as they change over time (Battiste and Henderson 2000:48). Interestingly, indigenous knowledge is “scientific in the sense that it is empirical,

experimental, and systematic. It differs in two important respects from Western science, however: traditional ecological knowledge is highly localized and it is social” (Battiste and Henderson 2000:44). Indigenous knowledge is the intersection of the relationships between humans, animals, plants, natural forces, spirits and the land in a particular location that represents the original knowledge of the Indigenous peoples (Battiste and Henderson 2000).

Both local knowledge and indigenous knowledge are dynamic and manifest in accordance to the shifting ecosystem and political systems (Goehring 1993). Indigenous knowledge or traditional environmental knowledge is often overridden when looking at the Middle East (Knudsen 2004). Knudsen (2004) contends that because Islam and the politics of the region are so domineering indigenous knowledge is often overlooked. Indigenous knowledge is seen as subordinate and localized compared to western, scientific knowledge (Angioni 2003). A problem with the term indigenous in Jordan is that the country is a melting pot of civilizations (bint Talal 2004; Noor 2003; Mansfield 1991); thus, the basic classification of indigenous knowledge was difficult to apply to a country with many ‘natives’. Using an aspect of indigenous knowledge by focusing on the concept of local knowledge was more suitable.

Local knowledge can be further actualized with the examination of specific modes of functioning in an arid ecology. Named “indigenous hardiness structures” there are seven survival techniques in arid regions such as Jordan (Lecture series 2004). These indigenous hardiness structures are also referred to as little traditions<sup>1</sup> and manifest in the following conditions:

1. mixed-agro pastoralism (shepherding and crops);

---

<sup>1</sup> Little traditions and great traditions are concepts first developed by Robert Redfield (1973) in *The Little Community and Peasant Society and Culture*. Chicago: University of Chicago Press.

2. local level water- management (rainwater harvesting and surface water collection);
3. fluid homelands (no fixed boundaries);
4. residential flexibility (living in tents, caves, houses);
5. hospitality (informal exchange network);
6. honour and shame (local policing through social control); and
7. tribalism (the ethnic bedrock of society) (Lecture series 2004).

Two of the little traditions, local level water-management and hospitality, are important regional practices in the field area. Local level water-management is exemplified by rainwater collection and the use of cisterns while hospitality is demonstrated by water sharing. Hospitality is identified as an informal exchange network or sharing (Lecture series 2004). Distributing water in a manner that allows for wide access makes rational sense in an arid environment. Scott (1976) identifies a “subsistence ethic” that works in the form of “social arrangements and relationships that help them to redistribute surpluses and protect themselves in bad years” (Robbins 2004:55). Scott (1976) based the identification of the subsistence ethic on observations of the peasant in Southeast Asia, as did Blaikie and Brookfield (1987). The development of the subsistence ethic is a consequence of living close to the margins and helps to guarantee survival based on the development of reciprocal relationships amongst neighbours (Scott 1976).

#### 2.4. Expert knowledge and great traditions

Political ecology as defined by Blaikie and Brookfield combines ecology and political economy as “a concern with the role of the state” (1987:17). This is a broadly-defined term but proves useful in its broadness. The political explores the position of the experts and how their beliefs as a large unit affect the regional. Knowledge is power (Chambers 1983). Those who are powerful tend to have the greatest accumulations of wealth with the ability to determine what new flows of information will be created, evidenced by centralized

and interconnected system of communication (Chambers 1983). Experts control the flow of information from the urban centres to the rural peripheries (Chambers 1983). This expert knowledge is modern and scientific knowledge and is based on principles that are “accessible ... in books and information retrieval systems, is easily communicated and taught all over the world” (bint Talal 2004:17). Expert knowledge connotes accessibility to information and the ability to affect the global village and the regional. In essence, “an expert is not an equal. He or she is by definition better than non-experts in at least one respect, that is in having greater expertise” (Crewe and Harrison 1998:92). Expert knowledge is intangible in nature compared to local knowledge (bint Talal 2004), which is often practically learned and exemplified in objects.

Expert knowledge can be regarded as “great traditions” which are normative principles disseminated by universalizing agents such as empires, dynasties and religious movements propagated by literate elites often by way of a large project (LaBianca 2005). In terms of today’s water management, dam building and water networks and pipelines could be regarded as great traditions. States and development institutions are modern great traditions that could support such endeavours. One previously considered great tradition was the hydraulic society that necessitated the presence of a strong state (Wittfogel 1957). The hydraulic society theory proposes that a state should be stronger than its society and through a centralized control of water resources, is the only means by which agrarian societies in arid and semi-arid landscapes can survive (Wittfogel 1957). In order to persist in a hydraulic society, labour must be divided, cultivation must be intensified and cooperation must occur on a large-scale (Wittfogel 1957).

In general, the provision of water to a large population via a centralized network is a great tradition administered by those with expert knowledge. “The ever-expanding human demands for freshwater in the twentieth century led society to supply-side solutions that

relied heavily on large-scale structural approaches to storing and moving freshwater” (Hunt 2004:51). The “quest to capture, store, and distribute a reliable supply of water (or energy) implies the capture of a commons resource and the building of structures and institutions to enclose, commodify, and control it” (Johnston and Donahue 1998:3). This process of control requires “centralized institutions of power and a reliance on technology to conquer natural forces” (Johnston and Donahue 1998:3). This “hydropolitical” scale of water-management looks at the interaction between the individual, the community and the bureaucracies from socio-political and economic angles (Allan 2001:160). It is common that the “centralization of authority and capital in water management often increases the distance between those who decide and those who experience the consequences of that decision” (Johnston and Donahue 1998:343).

#### 2.4.1. Supply and demand approaches to water-management

The hydro-politics of the Middle East are such that state institutions have responsibility for almost all of the water supply to each sector in the water budget (Allan 2001). In Jordan in particular, some functions have been transferred to the private sector, or the marketplace mode of social organization (Johnston and Donahue 1998), as a “conditional element in a package of assistance provided by the World Bank” in the late 1990’s (Allan 2001:160). There are two policy-driven strategies of water provision. Supply management assumes no limits to the supply and has been the traditional method of state water provision (Bakir 2005). Demand management is the response to conditions of water-scarcity and the acknowledgement that water is a finite resource that needs its usage to be controlled (Bakir 2005).

Historically, supply management is how most states supplied water (Bakir 2005). Supply management provides water based on the amount requested by the user. Within a framework of supply management more water needs to be supplied to match the demand by

opening up new water sources (Bakir 2005). These supply side strategies vary but can result in a combination of dam projects, deepwater wells, pumping of fossil aquifers, diverting water from its natural course and storing large volumes of surface water (Hunt 2004).

Demand management supplies water according to the allocated amount per sector as designated through governmental policies (Bakir 2005). Unlike supply management, the user does not turn on the taps to their satiation. Demand management results from a water-scarce environment and/or the acknowledgement that clean and abundant water is becoming a finite resource (Ohlsson and Turton 2000). The management capability of dealing with water-scarcity oscillates between natural resource scarcity and social resource scarcity much like the “turning of a screw” (Ohlsson and Turton 2000:3). Essentially at every turn of the screw “the crucial task is to identify the social bottlenecks which stand in the way of new kinds of adaptive measures” (Ohlsson and Turton 2000:4). Demand management in Jordan has reached the level of allocative efficiency where more value per drop is the goal (Ohlsson and Turton 2000). Ultimately, adapting to water scarcity seeks to accomplish natural resource reconstruction to a level at which the withdrawal rate is below natural resource sustainability levels (Allan and Karshenas 1996). Demand management is, of course, at the opposite end of the scale from supply management where water is viewed as abundant and continual.

Demand management is the end product of a historical process that has reconfigured the relationship of society and water. One of the possible historical developments leading up to demand management is the green environmental movement in the late 1970's (Allan and Karshenas 1996). It was not until the 1960's that the importance of protecting the environment was being discussed by academics (Suzuki 2006). The environmental movement spread, bringing attention to western consumers and producers the negative

ecological impacts that industrial production had on the planet's ecology. By the 1980's, the concept of sustainability had been established (Allan and Karshenas 1996). One of the policy recommendations for dealing with dwindling resources and the need for sustainability has been the precautionary principle (Allan and Karshenas 1996). The precautionary principle limits use of an environment based on speculation that usage may incur damage. It is a conservation strategy that first began in Germany in the 1980's in order to protect the environment, even in the absence of sufficient scientific evidence (Giddens 2000). By the mid-80's, the Brundtland commission had been formed and introduced sustainable development but with no mention of water-management (Schiffler 1995). This referred to "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Schiffler 1995:240).

The perception of how much water is available on the planet is changing. Where previously water was considered to be infinite in supply (Greaves 1998) there is now an acceptance of a "fixed volume of fresh water on the planet" (Ennis-McMillan 2006:14). In other words, water as an infinite resource has been replaced by to the "dominant motif in the contemporary consideration of water is scarcity" (Derman 1998:76). Some predict that "in the next few decades, limited water, inequitable resource distribution, and increased demands will intensify conflicts between beneficial uses of water and the need to protect the environment" (Ennis-McMillan 2006:15). Certainly in terms of the Middle East there is an extensive focus on water and conflict (Allan 2000 & 2001; bint Talal 2004; Dolatyar and Grey 2000; Hassoun 1998; Just et. al 1997; Lowi and Rothman 1993). Barlow and Clark (2002) appropriately dub water as the world's 'blue gold' where politics and wars will be over the increasing scarcity of fresh water. In order to become sustainable, integrated water resources management was seen as the next step after the precautionary principle (Ennis-McMillan 2006). Essentially, integrated water resource management recognizes "that the

world's freshwater supply is a finite and vulnerable resource, essential to sustain life, development, and the environment" (Ennis-McMillan 2006:24).

Water was endorsed as finite in the Dublin Principles of 1992 and again at the United Nations Conference on Environment and Development in Rio de Janeiro also in 1992 (Schiffler 1995). One of the action plans formed from these two conferences was the input and output rule. The input rule states that the "use of non-renewable groundwater is only permitted if simultaneously funds are established for future investments in renewable substitutes such as desalinated seawater" (Schiffler 1995:240). The output rule states that "water resources are not polluted in excess of their natural purification capacity" (Schiffler 1995:240). Sustainable development and integrated water resources management has been the midway point towards state water providers adopting demand management.

#### 2.4.2. Islamic demand management

Another great tradition is that of religion. Although there is a sizable minority population of Circassians, Kurds, Chechens, Armenians and Christians (bint Talal 2004), "Islamic practice and belief have dominated in the region" of Jordan River Basin for the last one thousand and five hundred years (Hassoun 1998:316). In order to understand how Islam could influence water-management it is important to consider the role of an Islamic political culture. Islamic political culture is the association of religion with justice that empowers movements seeking to curb tyranny and oppose foreign penetration (Bulliet 2004). Islam contains an edge and a centre. The edge is when people are in the process of becoming Muslim through conversion or through reconnecting to their religious roots via a spiritual revival; the center is the religious core (Bulliet 2004). The core consists of the Holy Qur'an, the literal word of God, the hadiths or traditions of the Prophet, Islamic law or sharia and the caliphate (Bulliet 2004). Ideally, Islam is a whole system of "social morality" that describes how someone should live "if he is to act according to God's will" (Mansfield



1991:13). If the sharia is disobeyed then the perpetrator has offended God and not the state (Mansfield 1991).

It is in terms of the center of Islam, the hadiths and sharia, from which an Islamic water demand management has developed. Islam and water-management combine to form Islamic Demand Water Management Theory. In the holy Qur'an there are two statements central to water management. First, the supply of water is fixed thereby demand must be managed as supplies cannot be increased and, second, water should not be wasted (Faruqui 2001). The Prophet Mohammad gave many instructions on how to responsibly utilize this limited resource (Faruqui 2001). Islam encourages the giving water away free of charge evidenced by the belief that Allah will reward those who do so (Kadouri et al. 2001). The Prophet considered it an "act of religious charity", which then became a legal obligation, to share water (Caponera 2001:95). However, the owner of water "should not be forced to provide water free of charge except in compelling conditions, and where other sources of water are not available" (Kadouri et al. 2001:90). Before the period of the Prophet Muhammad, known as the 'period of ignorance', water regulations were not established in the Arabia region (Caponera 2001). Wells were owned by tribes or by the individual who had ancestral claims to it and fees were charged to all strangers who drew water for themselves or their animals (Caponera 2001). Charity was a principle virtue for the Prophet, which meant both helping the misfortunate and "showing detachment from material things" (Caponera 2001:94).

In Islam, water is regarded as cleansing and pure, which is emphasized through the obligation to perform the ritual cleaning of ablution before prayer (Hassoun 1998). Access to water is also considered a right (Hassoun 1998).

"In Islam, punishment is reserved for those who deny access to water, pollute water, and damage the productivity of the land. Rewards are merited by those

who plant trees, care for animals properly, and maintain the land. Deeply communal concepts and tenets of sharing ... govern land and water use practice. Islamic law is pragmatic about determining water and land usage based on individual cases” (Hassoun 1998:316).

The Qur’an stipulates that access to water is ranked. Shirib, the law of thirst, specifies that humans and domestic animals have first priority for water consumption, then agricultural needs should be met and industry is the final allocation (Naff and Dellapenna 2002:479; Faruqi 2001). The law of thirst varies according to whether one is a Sunni or Shi’ite Muslim. Sunnis apply the right of thirst to all water classifications of private goods, restricted public goods and public goods (Caponera 2001) while Shi’ites limit the right of thirst to public water defined as unowned waters, sources and wells (Caponera 2001). Based on the law of thirst the state laws governing provision of freshwater should provide first for the domestic user.

Islamic law, sharia is “the place from which one descends to water” (Mallat 1995:128). According to Mallat (1995), sharia is a legal framework that has been attentive to the acknowledgement of water-scarcity in the region. There are four core principles of Islamic water law:

1. water is a gift from God and belongs to the community that leads to a primacy right for the domestic household, which is attended to by shirib the law of thirst that gives domestic water users first priority;
2. labour adds value to water and may create a qualified right to ownership, which justifies fees for water provision;
3. water sharing varies locally but there is an acknowledged right of prior appropriation and required distribution of surplus, which explains the statements that anyone who is in need can take water; and

4. liability is attached to the withholding or misuse of water, which would also lend one to share water with their neighbours, family or strangers (Mallat 1995).

These conditions were consolidated first in the civil code enacted through the Ottoman land laws in 1858 and remain as residual legislation in Jordan today (Mallat 1995). Sharia is both a moral and legal code for civil society's behaviour and states that freshwater is to be free for all people (Faruqui 2001; Naff and Dellapenna 2002), although this is negotiable. "Under sharia, since water only belongs to God and is His gift to humankind, it cannot be bought and sold as a commodity" yet a fee is tolerated when the water is physically contained (Naff and Dellapenna 2002:475).

Sharia recognizes two broad categories of water – that of owned and not owned (Naff and Dellapenna 2002:477). Ign Qudama notes that water is a substance that cannot be owned "unless it is taken in full possession, such as water contained in a jar or a privately dug well" but it is only the collected water that can be owned and never the source itself (Naff and Dellapenna 2002:477). Yet the dichotomy between owned and not owned is not that simple. Water originates from God and belongs to His community thus when the state claims to own water they are regarded as trust-holders for the community or nation, which makes the entire community – state and civil society – the co-owners of water (Naff and Dellapenna 2002:477). This is based on a hadith that states Muslims are the co-owners of three things: water, fire, and pasture (Naff and Dellapenna 2002; Caponera 2001).

Furthermore, it is forbidden to hoard water, as water is considered to be an "overriding community interest" and thereby Islamic law deems it immoral to treat water as a product for commerce or speculation (Naff and Dellapenna 2002:479; Caponera 2001). One may not be denied water if it is necessary for their survival or livelihood (Caponera 2001).

#### 2.4.3. Development aid and globalization

One of the tools for inducing changes in the local landscape occurs through development aid packages. Development embodies the notion that "certain countries and regions are less

or more developed than others” (Crewe and Harrison 1998:15). There are many variations of development. One type of development involves micro-credit or small scale projects that focus on certain social categories, for example poor rural women, to induce their economic independence (Crewe and Harrison 1998). Another type of development involves structural adjustment loans from the World Bank that instruct governments how to make infrastructure and policy changes in order to improve their economic development (Crewe and Harrison 1998). Development is understood in two different ways. The activities of institutions such as the World Bank (WB), United Nations (UN) and non-governmental organizations (NGO) are often described as development (Crewe and Harrison 1998:14). Development can also be portrayed as “an ideal, an objective towards which institutions and individuals claim to strive. This aim is seen as inherently good, implying a positive change, but its content is not necessarily specified” (Crewe and Harrison 1998:15).

Foreign NGOs and development projects depend upon a state that is strong and willing to cooperate with aid projects (bint Talal 2004). There needs to be an agreement between the state and aid groups to supply varied services so that there will not be competition between economic and social capital; it is the role of the NGO to fill gaps in services rather than act as an alternative to development led by the government (bint Talal 2004:30). Unfortunately, an uneven power relation exists between donors and foreign aid that limits the recipient’s access to information and discourages their full participation in adopting strategies and policies that will affect them directly (bint Talal 2004). Not only are aid packages frequently developed without input from potential recipients, but the ideology of development has become one of Western superiority (Hilhorst 2001). In addition, aid projects are often restricted by budgetary limitations, cultural misunderstandings and political restrictions (bint Talal 2004). An alternative to development is the “sustainable livelihoods” approach that works to eradicate poverty by achieving positive livelihood outcomes based on access to resources and the respect of fundamental rights and entitlements of the poor (bint Talal

2004:26). This approach utilizes input about how to appropriately develop a region with direct and on-going participation from the purported recipients of development from the initiation (bint Talal 2004).

In a world where the “intrusion of the global industrial economy is the first truly unifying facet of man’s material existence in history” the effects of modernity have been felt by everyone (Goehring 1993:10). Escobar (1994) believed that modernity is a judgement based on economic ability and status. Crewe and Harrison (2004) discuss development aid as a continuation of modernity in the form of evolution. Development aid is a way to help a society that lags behind on the evolutionary scale to achieve an evolved and developed society (Crewe and Harrison 1998). It is acknowledged that “evolutionism has rhetorically justified intervention in ‘backward’ countries since European colonization ...through the presupposition that the influence of more advanced outsiders will enable traditional societies to catch up with them” (Crewe and Harrison 1998:28). The different evolutionary patterns between colonizing forces and Indigenous peoples reflected their relationship to their surroundings (Goehring 1993). While Indigenous peoples were adapting to roles within the natural order Europeans were busy creating a “supranatural society largely freed of the constraints that nature imposed” (Goehring 1993:11).

The history of development begins in the post World War II era when experts begin to perceive conditions such as poverty and backwardness in Asia, Africa and Latin America as problematic (Escobar 1994). The discovery of poverty in certain geopolitical spaces gave way to naming the developed and undeveloped areas according to their various categories such as North and South, First and Third world, center and periphery (Escobar 1994). The strategy to solve these problems was to properly develop the societies (Escobar 1994). Defining a region as being underdeveloped, powerlessness, passive, poor, ignorant and lacking in historical agency serves to universalize and homogenize the area (Escobar 1994).

Major institutions such as the United Nations and the World Banks were established to oversee development in accordance with modernization agendas established by experts (Escobar 1994). Development has been shaped by globalization which has, through its very existence, introduced world citizens to one another and enhanced the very process of globalization.

Globalization is a political, technological, cultural and economic phenomenon that connects the citizens of the world with a speed that has little chance of slowing down (Giddens 2000). The connection between human communities motivated by the “global scope of socioeconomic relationships” is considerably new to our global community (Johnston and Donahue 1998:339). On the contrary, Levitt (2005) believes that we are witnessing the “third wave” of capitalist penetration, which actually began with European exploration and conquest five hundred years ago. Accordingly, the “epicentre of the first wave of globalization was located on the Atlantic rim of the Eurasian continent: Spain, Portugal, France, the Netherlands, the Vikings of Scandinavia, and of course, the Island of Britain” (Levitt 2005:517). In this third wave of globalization, current conditions include a homogenous, speedy, American system that is interested in integrating the world systems (Friedman 2000).

Yet globalization and development do not necessarily create a homogenous global society. Friedman (2000) argues that there is a “backlash” to globalization that gives voice to the opposing forces of the dominant, Americanization, homogenizing wave of globalization. Included among the many reactions to globalization are a revival of local cultures due to pressures on local identities and a reverse colonization trend whereby non-western countries influence developments in the west (Giddens 2000). One of the responses to globalization is the human need for a home territory that represents one’s identity (Friedman 2000). This counteraction to globalization is spoken of, in analogous terms, as the ‘olive tree’ while the

human drive for sustenance, improvement and prosperity fostered by globalization is referred to as the 'Lexus' (Friedman 2000). The Lexus is able to overtake the olive tree with the anonymous, transnational, homogenizing and standardizing market forces and technologies that make up today's globalizing economic system (Friedman 2000).

## 2.5. Ecology

The ecology aspect focuses specifically on the natural environment and how it affects human relationships. Human interactions to the natural world form a political ecology, as previously defined, and these relationships shift over time and space. Finding new sources of water, changing consumption patterns and altering the supply side are just some of the coping strategies of living with water-scarcity. Falkenmark and Rockström have redefined the classification of water-scarcity to include more than the physical lack of water, but also due to human activities such as population growth, urbanization, industrialization and globalization that are factors "squeezing the planet's life support system and its life elixir, fresh water" (2004:xix).

### 2.5.1. Water-scarcity

A "complex set of interrelated factors: population increases, urban growth, industrialization, over-consumption, pollution, inefficient and abusive water practices, unequal distribution, habitat destruction, and global climate change" result in water-scarcity (Ennis-McMillan 2006:9). The search for adequate water is an exploration for equity as growing social inequalities can explain why many people suffer from water-scarcity (Ennis-McMillan 2006). As a concept, water-scarcity incorporates two basic perspectives to include "water, culture, and power" (Sheridan 1998:184). The economic perspective views water as "an economic resource that should be subject to appropriate pricing combined with efficient systems of allocation and distribution" (Derman 1998:76). Within the economic perspective, the causes leading up to water-scarcity include increasing population,

urbanization, industrialization and unpredictable and declining rainfall (Derman 1998). The ecological perspective is concerned with “the availability of clean water for natural and human purposes” (Derman 1998:76). The ecological perspective focuses “on protection of the remaining rich freshwater systems from ‘pharaonic projects’ – massive public or private works that endanger important ecosystems” (Derman 1998:77).

There is an official measurement that classifies whether a region suffers from water-scarcity. The benchmark for water-scarcity is the availability of less than 1000 cubic metres (one cubic metre is equivalent to 1,000 litres) of freshwater per person per year (Faruqui 2001). Standards for “access to enough water for all needs” (Dolatyar and Gray 2000:118) have been set at 1000 cubic metres per person but the amount drops substantially to 200 cubic meters per year if the definition of water self-sufficiency is defined by the “provision of drinking and domestic water and a further quantity to support livelihoods” (Dolatyar and Gray 2000:119). The United Nations accepts that “a per capita benchmark of 50 litres per day (l/d) as a basic water requirement (BWR) for such domestic services as drinking, cooking, sanitation services and bathing” is adequate and they have urged the international community to “recognize BWR as a standard against which to measure access to safe water” (2003:9).

Global awareness of water-scarcity has been propagated by the major aid institutions of the world such as the United Nations (UN), World Bank (WB) and World Health Organization [WHO] (Ennis-McMillan 2006). In 1992, the international community adopted the Dublin Principles as a part of the holistic approach of Integrated Water Resources Management (Ennis-McMillan 2006). Four basic principles sought to “guide local, national, and international efforts to address the water crisis” (Ennis-McMillan 2006:23). The four principles are:



1. Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment;
2. Water development and management should be based on a participatory approach, involving users, planners, and policy-makers at all levels;
3. Women play a central role in the provision, management, and safeguarding of water; and
4. Water has an economic value in all its competing uses and should be recognized as an economic good (United Nations 1992).

The universal right to water is a continuation of the Dublin Principles established in 1992 that recognized water as finite. This right was adopted by the UN, WB and WHO in November 2002 through the UN Committee on Economic, Social, and Cultural Rights, general comment 15, which reads: “The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses” (WHO 2005). Prior to the 2002 declaration that water is a human right, Shue (1980) argued for a moral minimum of universal human rights to include the rights to subsistence; these were identified as unpolluted air, unpolluted water, adequate food, adequate clothing, adequate shelter and minimal preventative health care. Currently, water-scarcity is being confronted by global campaigns such as the UN Decade for Water for Life 2005 – 2015 and the Millennium Development Goals (MDG) 2000 – 2015. One of the MDG aims is to half the proportion of people without sustainable access to safe drinking water and sanitation by 2015 (UN 2005). The UN, WB and WHO are just a few examples of the many institutions that have identified the areas in the world with water shortages and instituted declarations to rectify the problem.

## 2.6. Concluding remarks

The “globalization of local landscapes” (Walker 1998:10) represents how ‘regional political ecology’ works as a way in which to examine the role of development in a water-scarce region. Little traditions of local level water management and hospitality and great traditions of state-management, development and Islam have demonstrated how social modes of organization have shifting relationships to their ecological environment. The pivotal ecological setting is one of water-scarcity. Water-scarcity is more than a “matter of disturbed terrain, increased population, and climate change”; it can be a “by-product of water-management projects” such as a leaking piped network and the “product of the social systems” (Johnston and Donahue 1998:2). A typical pattern when living within water-scarcity is that the urban setting is serviced better than households in rural areas; water quality, water supply, sewage facilities, ability to buy water privately, bottled water purchases and treatment of water are all aspects of water accessibility that are unfairly distributed (Stonich et al. 1998). Water consumption varies according to socio-economic class and it is acknowledged that the consumption of natural resources is the highest in the west, in particular, in North America (Suzuki 2006). That the parameters of water-scarcity have largely been set by western institutions is vital to remember when a region is labeled water-scarce.

### **Chapter Three: Description of research area**

“Jordan does not have enough water for the kind of future it envisages”

(Schiffler 1995:239).

#### 3.1. Introduction

Jordan has been repeatedly classified as a water-scarce nation (Allan 2001; bint Talal 2004; Faruqi 2001; Gleick 1993) and as their population increases annually at 3% (bint Talal 2004; NWMPD 2004) predictions of increasingly severe water-shortages heighten. The Ministry of Water has defined four main water sectors industrial, agricultural, domestic and tourism; all four sectors have a water demand higher than the available water supply (NWMPD 2004). Some of the contributing factors to water-scarcity in Jordan include: inadequate infrastructure, in part evident by leaky pipes in the water network, natural resource shortages, fluctuating populations that increase demand, and water diverted away from the Sea of Galilee, the Jordan River and its tributaries (Dolatyar and Gray 2000; Iskandarani 2001).

This chapter focuses on the historical, political and ecological aspects of water-management in Jordan. In order to understand the water system in Jordan it is important to consider how external historical factors have influenced the national water supply. Due to the contestation of land and water in the geographic region of Jordan and its neighbouring countries a particular hydro-politics where access to water is politically contested at the international level has developed (Allan 2001). A basic outline of the state establishment of Jordan and the creation of Israel will be examined first. Next, the naturally-occurring water resources of surface water, groundwater and rainfall within the borders of Jordan will be outlined. Finally, the water bureaucracy and some potential solutions to water-scarcity will be discussed.

Figure 3.1. Map of Jordan. Field work was conducted around Ma'daba. (Accessed at [www.worldatlas.com](http://www.worldatlas.com))



### 3.2. History of Jordan

Historical developments have helped to establish unequal access to the water resources in the Jordanian River Basin. It must be noted that the focus on whom or what is to blame for insufficient water supply in the region shifts depending on whether political allegiance falls with the Arabs or the Jews. The following historical outline is taken from a Jordanian perspective, which was seen as appropriate since this study took place in

Jordan. By understanding the modern history of the region the current debate over water access will be seen in part as due to a series of events following the inception of Israel.

The Emirate of Transjordan was founded in 1921 to become the independent Hashimite Kingdom of Jordan in 1946 (Noor 2003). As a constitutional monarchy Jordan has a prime minister as the head of government and a king as the head of state (Lonely Planet 2006). The heads of state, the Hashimites, are the direct descendants of the Prophet Muhammad and as a clan have ruled Mecca for more than a thousand years (Noor 2003). However, the Hashemite claim to Arab leadership is contested by some Arabs that in addition will “always suffer from its sponsorship by Britain” (Mansfield 1991:167).

The state formation of Jordan began in 1914 in the holy city of Mecca where Islam was born (Noor 2003). By June 1916, when the Great Arab Revolt was launched with support from the British government (Mansfield 1991) it had a mandate to “create an independent confederation of Arab states out of all the Arab provinces of the Ottoman Empire from Yemen to Syria, including the Arabian Peninsula, Lebanon, Mesopotamia (modern Iraq), and Palestine” (Noor 2003:56). For the next two years Ottoman strongholds were besieged by attacks from 30,000 Arab tribesmen (Noor 2003). The Great Arab Revolt that “culminated in a victorious march with their European allies into Damascus on October 1<sup>st</sup>, 1918” carried with it the expectations that the British would fulfill their promise of Arab independence (Noor 2003:58).

“But the Hashimites had been betrayed. In 1916, while they were launching their rebellion against the Ottoman Empire, Britain was already secretly negotiating with France to divide, after the war, the Arab lands whose independence the Hashimites were fighting for. In what became known as the Sykes-Picot Agreement, the French carved out Syria and Lebanon for themselves and the British took Palestine, Iraq, and the region east of Jordan River known as Transjordan” (Noor 2003:58).

When the Balfour Declaration was signed in 1917 policy was already in place for the creation of Israel (Noor 2003). This Declaration has “planted the seeds of a conflict which has lasted almost to the end of the century and is unlikely to be resolved before

another century has passed” (Mansfield 1991:159). Sir Arthur James Balfour, the British Foreign Secretary, had promised the Palestinian land to the Jewish people “as a national home”; although, nearly all of Palestine’s population had lived in this area for centuries (Noor 2003:59). The repercussions of this decision have been significant. “Promising independence to the Arabs in the wave of postwar Arab nationalism while at the same time promising a homeland to the Jewish people, the British Mandate made for an impossible situation” (Noor 2003:60). In 1947, the British turned over the fate of the region to the United Nations; the General Assembly voted to “partition Palestine into two states – one Arab, one Jewish – with Jerusalem to be placed under international control” (Noor 2003:61). Both the Arab and non-Arab Muslim countries voted against the partition, instead favouring a proposal to keep Palestine as one (Noor 2003). The UN Resolution 181 awarded the Jews fifty-five percent of the land even though they owned only six percent of the land and represented only one-third of the population (Noor 2003). The Arab countries refused to honor the UN resolution, which was passed by only two votes, and walked out of the General Assembly. “Once again, the future of the Arab people was being decided upon by European and Western countries. Palestine erupted into a deadly civil war” (Noor 2003:61).

### 3.3. Hydro-politics

The Jordan River Basin is a riparian hydrological unit that is shared amongst Jordan, Israel, Palestine, Syria and Lebanon (Lowi and Rothman 1993). The hydro-politics of the water resources in the Jordan River Basin are linked to the historical developments in the region. Jordan’s “current precarious predicament is largely a result of harsh competition for water in the Jordan River Basin” (Lindholm 1995:114). The “roots of the conflict” stem from scarcity of land and water and from competition between Arabs and Jews (Lowi and Rothman 1993). Absolute scarcity in the area is an old phenomenon where “indigenous people were well adapted to their natural environment” yet serious problems with water only arose when Jewish immigrants arrived in large numbers early on during the British Mandate (Dolatyar and Gray 2000:93). Previous to the establishment of the Jewish settlers there was “no international water conflict in the area” (Dolatyar and Gray 2000:94). Adding to the tension was the post-World War II portioning of the area that

split a formerly unified Jordan River Basin (Dolatyar and Gray 2000). While local residents had adapted to the natural environment the new settlers brought with them their previous lifestyle and beliefs, which included unrestricted access to water resources (Dolatyar and Gray 2000). In order to ensure the survival of the Jewish homeland water supply was vital (Dolatyar and Gray 2000; De Villiers 2001). Local water resources in the Jewish territory were insufficient to meet growth demands and the Jordan River basin figured significantly in Israel's development plans (Lowi and Rothman 1993).

Israel uses more water from the Jordan River basin than any other riparian country based on the Zionist right of return, which mandates staking a claim to land through agricultural production (Hassoun 1998). Disclosure of Israel's over-consumption of water resources tends to be based on statements made by the Arab side of the conflict rather than on any internal statements made by Israelis. Accordingly, it is the growing population, rising standards of living, and the "need to supply water pursuant to international undertakings" that have led to the over-utilization of renewable water sources in Israel (JVL 2006). The four main problem areas with water in Israel are poor internal water-management, over-pumping, water pollution, and development and sharing with neighbouring countries (Zaslavsky 2000). According to Zaslavsky (2000) it is Israel's own poor management of water resources that is the main cause for concern leading to water shortages and not natural water-scarcity.

The ultimate irony in the conflict over water access between Israel and its Arab neighbours is that according to Judaism and Islam land and resources have been endowed to both religious sects (Hassoun 1998). At issue is the problem of "a twice-promised land with twice-promised resources" (Hassoun 1998:316). The notable cultural difference between the Palestinian people as agrarian and the Israelis people as urban has meant a difference in the understanding of the regional ecology (Hassoun 1998). In coming from European and American cities, Israelis brought with them modern agricultural practices, methods of monocropping, swimming pools and manicured lawns, all of which are inappropriate practices in an arid region (Hassoun 1998). In addition, Israel has a clear power advantage by having the world's sixth largest military in the world; this allows

them to engage in activities that are unsuitable for the region (Hassoun 1998). One of the first undertakings of the newly established government of Israel in 1948 was to create a national water network, diverting water from the Galilee region to the Negev desert (Hassoun 1998). The Israeli commandeering of water resources in the Jordan Valley has been to the advantage of the Israeli farmers and households; it has essentially given them unrestricted access to freshwater. At the same time, Israel restricted Palestinian water use to pre-1967 levels of consumption and Jordan lost access to the water from the Jordan River due to the Israeli interception of water at the Golan Heights and the Sea of Galilee (Hassoun 1998).

The Jordan River has had the majority of its flow diverted by Israelis for Israeli use and attempts made by Jordan to dam the Yarmouk River, a tributary of the Jordan River, resulted in the first direct Israeli attack on water structures built by Jordan (Hassoun 1998). In 1964, Israel bombed the dam; some consider this accident “the first military confrontation in the Arab-Israeli conflict over the region’s water” (Hassoun 1998). Israel has also effectively drained the Galilee region, resulting in a sponge effect that has dried up regions in Lebanon, Jordan and Syria where all countries had planned to utilize the water (Hassoun 1998). With every armed conflict, the Israelis have increased their control of water in the region (Hassoun 1998). Another ecological devastation due to the Israeli diversion of water from the Jordan River and the Galilee region has been the “biological death of the Dead Sea” (Hassoun 1998:329). Steinhorn and Gat note that the Dead Sea, which had been a stable body of water for the last 10,000 years, has lost twenty-one percent of its area since the completion of Israeli water networks in 1952 (Hassoun 1998:330). In 1994, the Peace Accord was signed between Israel and Jordan; this created a partnership over the access to water in the Jordan River Basin (JVL 2006). The largest shared water resource in Jordan today is the Disi aquifer, which is shared with Saudi Arabia.

The discussion about water-scarcity is not limited to policy-makers. On the one hand, true water-scarcity exists in the Middle East (Hassoun 1998) where it is been reported that the Middle East is the driest region in the world and that freshwater availability here



has declined rapidly to a crisis level (Bakir 2005). More than ninety percent of Jordan receives less than 200 mm of rainfall annually (Dolatyar and Grey 2000). Furthermore, there are no new groundwater resources in Jordan, desalination is expensive and has a high energy demand, and the Peace Treaties for increased access to the Jordan and Yarmouk Rivers have still not taken place (MoWI 2006). On the other hand, water scarcity has not materialized as a serious crisis in the Middle East both because virtual water allows for the importation of grain to the area and because a cultural/political belief system exists that rejects the label of water-scarcity (Allan 2000). Absolutely “no Middle Eastern politician will deploy alien ‘new knowledge’ about the lack of sufficiency of water to confront deeply held communal beliefs about water” (Allan 2000:124). Regardless, Jordan has had to acclimatize to the discussion of water-scarcity.

Government policies have responded to water-scarcity through the adoption of a demand management unit at the Ministry of Water and Irrigation in 2002 (MoWI 2006). It is now commonplace for the government to talk of water-scarcity to its citizens and it was emphasized by the late King Hussein that “the development of the country’s water sector is vital for the development of all other sectors” (Ministry of Water and Irrigation 2004). The Jordanian government instructs and educates the population to conserve and reduce water consumption (Chatel 2004). The negotiation of water-scarcity as promoted through state-led conservation methods has played an important role in how locals manage water. One of the impacts of the discourse of water-scarcity is reflected in pricing schemes to limit use (Allan 2000). The World Health Organization has a program to promote national governments to combine religion and teachings of water-conservation in mosques (Faruqui 2001). Family planning is also one of the many demand water management tools considered relevant because it can help to prevent further reductions in the overall availability of water per capita (Faruqui 2001). In addition, rapid population growth to urban areas can complicate water scarcity (Falkenmark and Lindh 1993). According to Allan (2000), there has been a rejection of the label of water-scarcity on the local level; however, if the Jordanian state rejected this label completely they would be going against the opinion of experts of the United Nations, the World Bank and the World Health Organization.

### 3.4. Water resources

The natural water resources of Jordan consist of surface water, rainfall and groundwater, all of which are in decline due to over-consumption and natural scarcity. Mechanisms to increase water supply include desalination, virtual water, and the use of treated wastewater.

The bulk of water resources in Jordan are shared with neighbouring countries. Groundwater resources such as the Basalt aquifer is shared with Syria while the Disi aquifer is shared with Saudi Arabia (NWMPD 2004). Surface water from the Yarmouk and Jordan rivers is shared with Syria, Palestine and Israel (NWMPD 2004). It can be argued that the Yarmouk and Jordan rivers have not been utilized to their full potential due to inadequate infrastructure and trans-boundary water disputes (NWMPD 2004).

#### 3.4.1. Surface water

The Jordan River, although being the most famed surface water in the country, contributes the least to the surface water total (NWMPD 2004). Currently, Israel claims most of the Jordan River and directs the water to their coastal cities and to the Negev desert settlements for irrigation (Russell 1995). The important surface water bodies include the Yarmouk River, a part of the Jordan River Basin, and treated wastewater. Surface water accounts for approximately 40% of Jordan's water supply (Iskandarani 2001).

#### 3.4.2. Rainfall

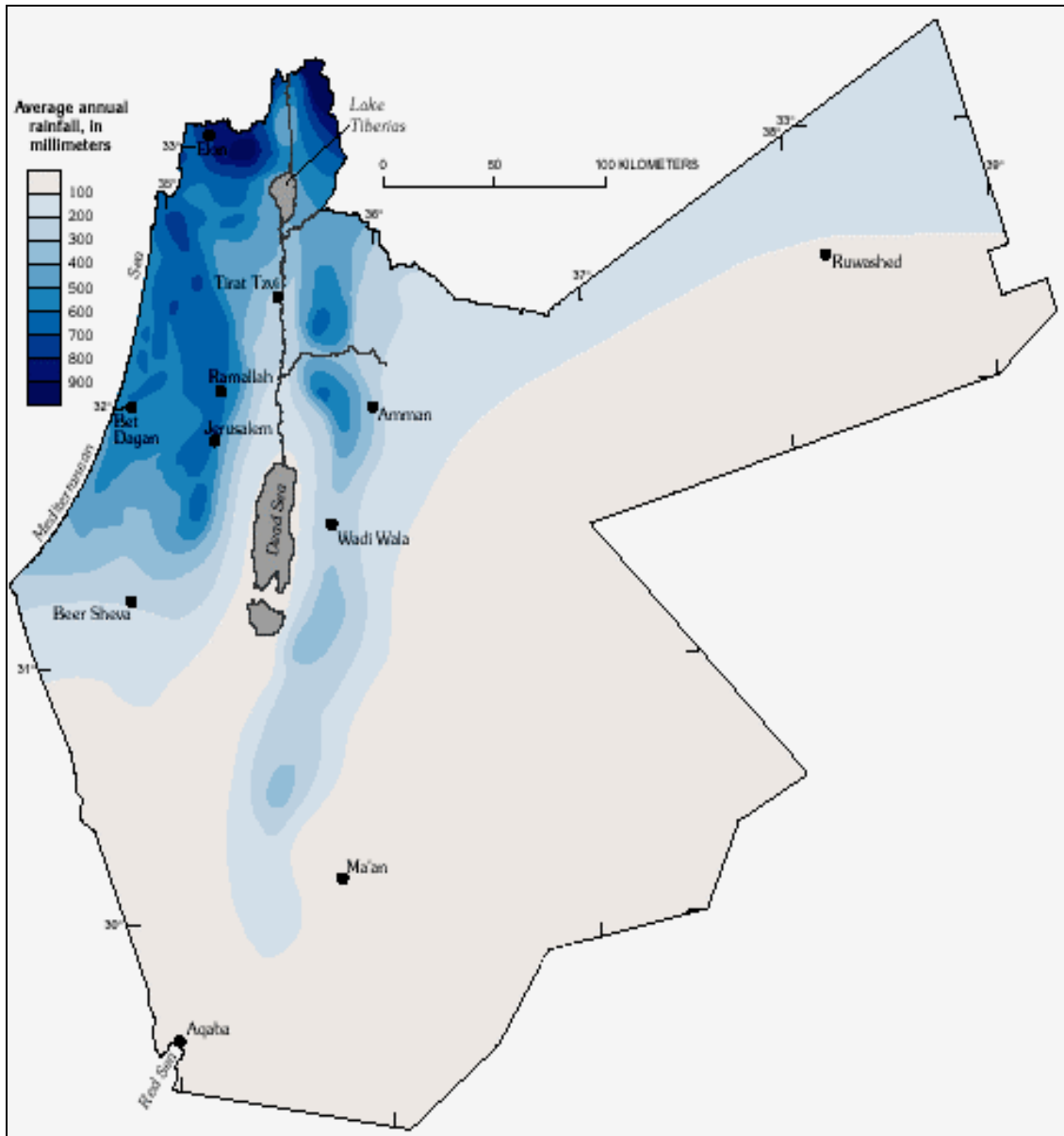
Even though on average Jordan receives relatively little rain it is an important source of freshwater replenishment to supply areas. The average yearly rainfall ranges from less than 50 millimetres (mm) in the desert to more than 500 mm in the highland region.

Unfortunately, precipitation does not automatically equate to usable water.

Approximately 75% of rainwater is lost to evaporation, which then leaves 15% for the replenishment of the rivers and 10% for the replenishment of groundwater sources (Saleh 1991). In addition, the amount and distribution of rain impacts human habitation by

impacting upon the output of agricultural products and the concentration of populations. To have a successful growing season rain must fall in the autumn (October to November), in the winter (December to February) and in the spring (March to May); when rainfall is irregularly distributed and insufficient agricultural crops cannot grow (Saleh 1991). Rain is also an important source of water for the domestic household, as an important factor in dictating where humans could reside. The population is largely concentrated in the rainfall belt with exceptions to this rule seen in the recently irrigated areas of the Jordan Valley; Palestinian refugee camps which make up 10% of the country's population; and Amman, where 30% of the entire population lives (Gubser 1983).

Figure 3.2. A rainfall map of Jordan, Palestine and Israel for in the early 21<sup>st</sup> century. ([www.exactme.org/overview/p0405.htm](http://www.exactme.org/overview/p0405.htm), accessed April 12, 2006)



### 3.4.3. Groundwater

The most important water resource in Jordan today is groundwater. Groundwater is water that is stored underground in spaces of soil or rock; water-bearing porous soil or rock strata that yield significant amounts of water to wells or springs are called aquifers (NWMPD 2004).

“Groundwater is the major source of domestic water in the country. In 1990 and 1991, wells supplied 85% and 87% respectively for drinking water purposes. In addition, springs were tapped for municipal use, at a rate of about 19 Mm<sup>3</sup>/a, i.e. 11% of the total domestic consumption. On the other hand, groundwater is also abstracted for industry purposes and agricultural irrigation, cattle watering and for the upkeep and maintenance of parks and recreation areas. Groundwater is used to a large extent in every region of the country. In the majority of the basins and upper aquifers the groundwater abstraction has exceeded the sustainable yield. As far as the identification of “new” groundwater resources is concerned, there is no such unknown reserve in Jordan. All the aquifer systems have been investigated and potentials have been assessed in the densely populated basins as: Amman-Zarqa, Yarmouk, Jordan Valley, Dead Sea, Wadi Mujib, and Read [sic] Sea” (MoWI 1993:0.4.1).

Table 3.3. Annual budget of renewable groundwater (NWMPD 2004:19).

<b>Water Budget Component</b>	<b>Quantity in MCM Annually</b>
Groundwater recharge from precipitation	395
Trans-boundary groundwater inflow from Syria	68
Return-flows from irrigation, leaks from pipes, reservoirs, sewage plants	70
<b>Total Inflow</b>	<b>533</b>
Groundwater abstraction (wells, springs)	440
Baseflow (excluding baseflow from fossil sources)	197
<b>Total Outflow</b>	<b>637</b>
Change in storage (inflow – outflow)	-104

The water budget in terms of groundwater shows that the total outflow is greater than the inflow meaning that the “groundwater budget is negative and groundwater management is not sustainable” (NWMPD 2004:18).

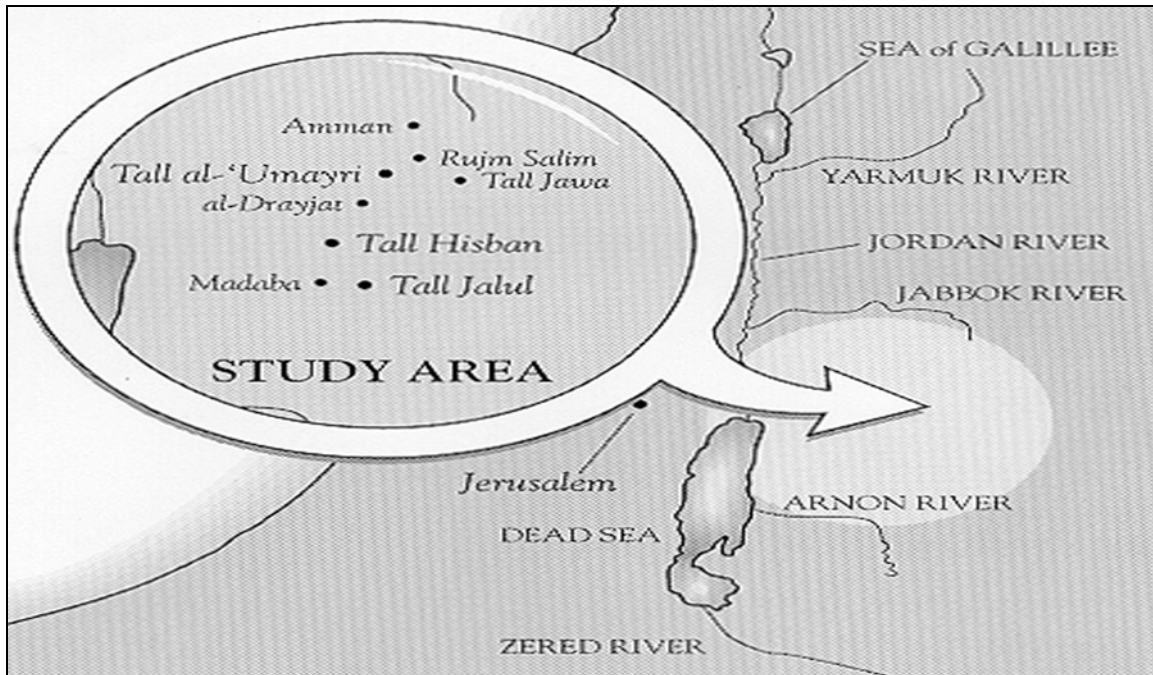
With a negative sustainability in terms of renewable groundwater resources there has been a decline in groundwater levels and a decrease in baseflow and spring discharge (NWMPD 2004). Furthermore, this overexploitation has led to a deterioration of water quality due to increasing salinity (NWMPD 2004). With groundwater and surface water no longer able to satisfy the needs of the population alternatives such as non-renewable groundwater have had to fill in the gaps until desalinated sea and brackish water become options (El-Naser 2004). Currently, there is a limited amount of non-renewable groundwater from the Ram Aquifer in the Disi area in southern Jordan; it yields 125 mcm towards the 533 mcm inflows in the national water budget (NWMPD 2004).

### 3.5. Project area

The villages where Project Rainkeep restored cisterns in the Great Rift Valley are distinguished by a sub-tropical climate of mild winters and very hot summers (NWMPD 2004). The average annual rainfall ranges from 350 mm in the north to 200 mm in the Dead Sea region and as little as less than 50 mm in the southern part of the Rift closer to the Red Sea (NWMPD 2004). In the months of June, July, August and September it does not rain (NWMPD 2004). The project area experienced 300 – 450 millimetres of rain annually (Russell 1995).

Project Rainkeep has its roots from the Mabada Plains Project, an archaeological excavation of Tall Hisban in Jordan. In Tall Hisban, settlements discovered by archaeological excavations demonstrate how water has been collected and stored in cisterns throughout the last three millennia (LaBianca 1995). Using the Tall Hisban as the basis for comparison is suitable because the basic elements of the water system “are typical of many other *tall* sites in our project area and of all *tall* sites spanning the same millennia throughout Jordan” (Lbianca 1995:773).

Figure 3.4. A location map depicting where Project Rainkeep was initiated in the village of Hisban.

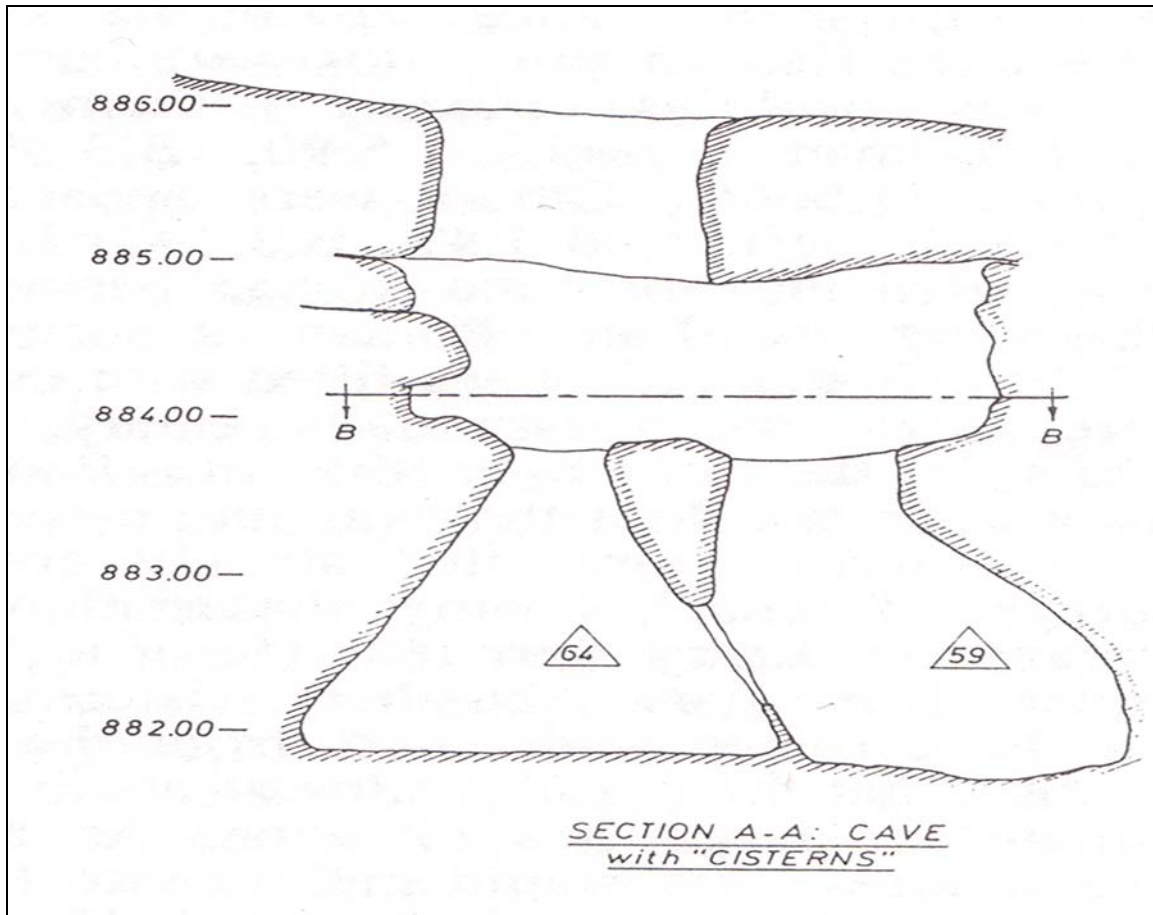


In an area with virtually no rain from April to September, ancient occupants could not rely on the modern techniques of groundwater pumping; rather, they had to rely on rainwater harvesting and surface run-off for their water supplies (LaBianca 1995). The use of catchment channels and cisterns for collecting rainwater dates back to the earliest human occupation of the tall circa 3000 years ago (LaBainca 1995). In the next period of human settlement, a plaster-lined cistern fed by rainwater collection channels carved from bedrock was found (LaBianca 1995). Two cisterns were found to have had repeated usage from a succession of Tall inhabitants, but the greatest expansion came during the Roman period (LaBianca 1995). During this period, “buildings, courtyards and streets all appear to have been constructed with water catchment in mind” (LaBianca 1995). Roofs and streets served as rainwater catchment basins that led the water into cisterns and two large reservoirs were found at the base of the Tall (LaBianca 1995). In the field area, all of the villages have government water access (email to author, April 20, 2006). A cistern is a storage unit that collects rainwater. Rainwater harvesting was once prolific in the area; in fact, it is partly the archaeological findings of catchment channels and

cisterns dating back to Iron I (circa three thousand years ago) in the Madaba governorate that inspired the initiation of Project Rainkeep (LaBianca 1995). Cisterns are tools for rainwater collection that provide “potable water for humans and livestock” by collecting rainfall and storing it in an underground hole that is either naturally occurring or manmade (Watson 1998). Cisterns have been present in the geographic region that is now Jordan for over 3,000 millennia (LaBianca 1995); they last indefinitely unless a powerful earthquake creates fault in the rocks and causes it to crack (Russell 1995). Cisterns are constructed with the available water source, the topography, the local knowledge, and the intended use of the water in mind (Lancaster 1999). A typical cistern in Jordan is hewn directly into rock; its size and form is “strongly shaped by the geology of the region” (Watson 1998:3). Russell notes that although “apparently simple in essence – a covered hole in the ground – to harvest rainwater successfully a cistern requires the following features” (1995:9): a catchment basin to catch the rain, a settlement basin to filter out sediments, a screen and child-safety lid over the opening of the cistern and an intact storage container with no cracks or leaks (LaBianca 1994). The openings of cisterns are generally large enough to allow for an adult to enter, in order to clear the inside of debris (Russell 1995). The catchment basin is very important to the overall ability to harvest rain. The catchment basin needs to be clean and free of debris and must be low enough so that the force of gravity will pull the water to the underground hole. These two requirements make rainwater harvesting in urban environments difficult (Appendix 4.3). Cisterns are successful water storage containers because of the protection they offer from the sun; thereby reducing evaporation from the 300 days of hot sun that Jordan experiences (Russell 1995). A cistern’s underground location also keeps water cool in scorching summer months (Russell 1995).



Figure 3.5. Side-scale dimensions of a cistern (Merling and Geraty 1994:101).



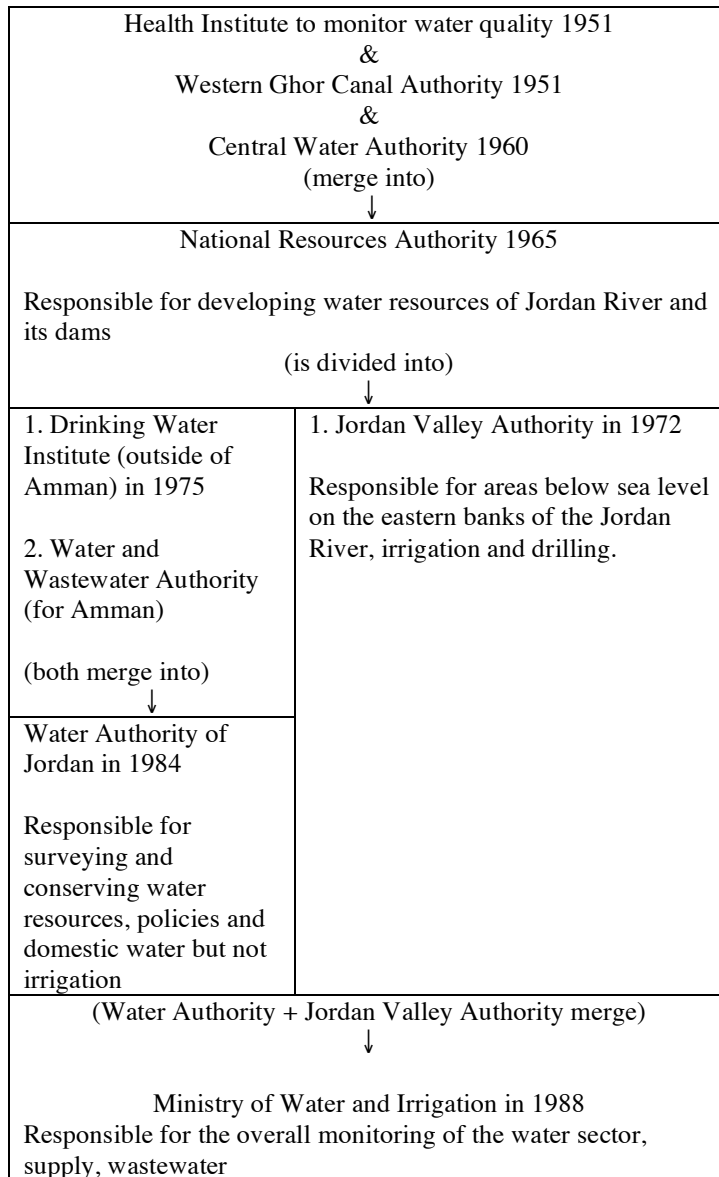
### 3.6. Water bureaucracy

The Jordanian water system administered by the government works to provide adequate quantity and quality of water to the domestic, industrial, agricultural and tourism sectors in the most efficient manner (MoWI 2006). The first state-led water administration formed to monitor water quality in 1951. The first deep wells in Jordan were dug by the Iraq Petroleum Company in the 1930's and in 1948 the Jordanian government took over the wells and pumping stations (Lancaster and Lancaster 1999). By 1962 the state operated a centralized water network with the help of the British and the further deep-drilling of wells (LaBianca 1995). Subsequently, the "Jordanian water resources are governmental property and under the control of the Ministry of Water and Irrigation (MoWI). The MoWI is the only authorized institution responsible for water resources

development, protection, planning, maintenance, operation and conservation” (MoWI 1993:4.1.1).

Water legislation is passed in Amman, the capital city where the Ministry of Water and Irrigation acts as the overarching bureaucracy in conjunction with a variety of water supply government agencies and foreign non-governmental agencies. The Water Sector Planning Support Project, produced by the Ministry of Water and Irrigation and funded by the German Agency for Technical Cooperation (GTZ), has developed an extensive Water Information System (WIS). This system is the framework, database and tools necessary for “providing water specialists with data and information for water sector monitoring, management and planning” (Bakri 2004:5). This system uses Geographical Information Systems (GIS) to monitor and analyze the current water demand management situation, assess water resources and demand projections, evaluate strategies to reverse water imbalances and to ultimately “better manage and develop Jordan’s water resources” (Bakri 2004:5).

Table 3.6. Water bureaucracy ([http://exact-me.org/institutions\\_jor.txt](http://exact-me.org/institutions_jor.txt), accessed December 5<sup>th</sup>, 2005).



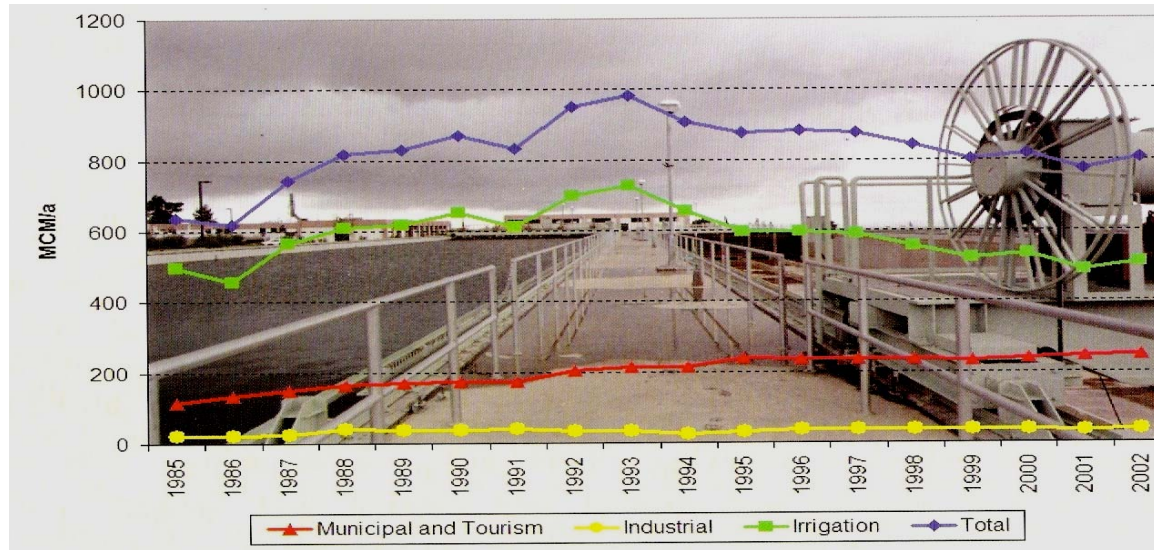
State supply to households is delivered by a piped network. A central water supply system was established with the aid of the British in the early 1960's (LaBianca 1995). Deepwater drilling acted as the forerunner of an integrated piped water network accessing groundwater. The first deep wells were dug by the Iraq Petroleum Company in the 1930's; in 1948, the Jordanian government took over the management of the wells and pumping stations left behind (Lancaster and Lancaster 1999). The best piped water access

is in Amman with 97% coverage; in the rural areas 83% of households are connected to government pipes (NWMPD 2004). The government water supply system aims to have all legal households connected to government water pipes (in discussion with author, Dr. Nawar Sunna, wastewater director for MoWi, December 7,2005).

### 3.7. Consumption levels

Water supply is distributed amongst four sectors of domestic, agriculture, industry and tourism (Ministry of Water and Irrigation 2004). Any additional water allocation within each sector is taken into considered based on the economic, social and environmental sustainability (MoWI 2006). First priority of water provision is given to the domestic consumer at an amount of 100 litres per capita per day (pcpd) (MoWI 2006).

Figure 3.7.The demand levels from all four sectors in Jordan (NWMPD 2004).



Overall, irrigated agriculture is the biggest consumer utilizing 64% of the total water used in 2001 (NWMPD 2004). Due to a reduction in irrigated areas as a result of drought, the amount of water used for irrigation purposes peaked in 1993 at 737 mcm falling to 511 mcm in 2001 (NWMPD 2004). Over half of Jordan’s irrigation occurs in the Jordan Valley and consists of drip irrigation in conjunction with greenhouses, plastic tunnels, plastic mulch and liquid fertilizers (Schiffler 1995). Waste-water is used for 12 per cent of all water used for irrigation in Jordan (Faruqui 2001).

From the period of 1996 – 2001, the annual municipal water consumption reached 163 mcm, equivalent to 94 litres per person per day (NWMPD 2004). A variation on amounts is due to each governorate's technical and socio-economic particulars such as the amount of pastoral and agricultural and tourism usage and building illegal homes. Today, the domestic use of water in Jordan is considered low by international standards (Bakir 2005).

### 3.8. Unaccounted for water

Providing water by way of pipes through city networks can be the most inefficient manner to transport water (Falkenmark et. al 1990). A significant amount of water is lost to leaks and improperly functioning infrastructure. Unaccounted for Water (UAW) is the difference between the volume of water delivered to a supply system and the volume of water accounted for by legitimate consumption (NWMPD 2004). UAW results from administrative losses such as water not accounted for due to illegal abstractions, unbilled water that provides tankers and hydrants, inaccurate meter readings, non-operational meters and un-metered connections, and physical losses resulting from leaks in the piped network (NWMPD 2004). Contributing to UAW were pumps that leaked, corroded or burst; a monitoring system that did not work and transmission lines that were exposed on the ground and prone to damage due to traffic or weather (MoWI 1993). UAW figures range from 36% in Jerash governorate to 74% in Mafraq governorate, of the total water supplied (NWMPD 2004). Physical losses due to leaks alone are estimated at 30% of the water supplied (NWMPD 2004). If the water network was rehabilitated allowing for only 15-20% UAW, another 100 mcm of water could be made available annually (NWMPD 2004).

Unaccounted for water (UAW) has to be calculated as a part of the water provided and tallied into the total water budget, which divides the amount of available water sources between the domestic, industrial, agricultural and tourism sectors (Bakir Hamed, Advisor for Rural Environmental Health, WHO, in discussion with author, November 23, 2005). Unfortunately, leaky pipes squander a scarce resource in Jordan. Pipes, meant to supply a

necessary resource, have by the very infrastructure induced loss of water. Dr. Philipp Mageria comments:

It is about 47% UAW but the percentage is lower in Amman. Some governorates it is higher and some lower. This is hard to measure. Yes it is a part of the water master plan assumptions. It has to be calculated even if 47 out of 100 of the supply was lost; it has still been supplied in the first place. The planning horizon for this water master plan until 2020 aims to have 16 or 17% UAW losses but this is optimistic. This is a shared loss. There are already loss reduction programs in Jerash, Kerak and Amman supported by foreign development. (Team leader, GTZ, in discussion with author, December 28, 2005).

### 3.9. Solutions

In demand management the state regulates the supply based on what is accessible, which results in erratic water supply for the consumer in Jordan. Demand management focuses on “manipulating the demands in a serious attempt to match them with the available water resources” (Bakir 2005). Demand management in Jordan began as a discussion in the mid-1990’s, Bakir Hamed (Adviser for Rural Environmental Health, WHO, in discussion with the author, November 23, 2005) and by 1997 water demand management was in place in terms of policy in Jordan, Dr. Philipp Mageria (Team leader, GTZ, in discussion with author, December 28, 2005). Unlike wetter environments where water is plentiful Jordanian policies have had to reflect the reality of lack of freshwater and little rainfall. Bakir states:

Supply management deals with structural or natural conditions whereas demand management deals with management-induced causes. Often people think that conservation of water is demand management but that is wrong. Conservation is a part of demand management. Basically, management-induced conditions lead to water-scarcity – water-shortage – water-stress, which leads to loss of development and to loss of health. (Adviser for Rural Environmental Health, WHO, in discussion with the author, November 23, 2005)

Demand management practices are reflected in public awareness and education strategies, wastewater use and economic incentives (Faruqui 2001). Fees for water are based on the increasing block fee, which bases fees on consumption level (Schiffler 1995). The Jordanian Ministry of Water and Irrigation started the Water Efficiency and Public Information for Action Campaign aimed at reducing water use with the dissemination of water saving devices (WSDs) (Chatel 2004). Initially, large water consumers such as hospitals, hotels and universities were targeted; however, there was little change until a water audit demonstrated how much energy and money large institutions could save in using WSDs (Chatel 2004). By 2003, 60% of large water consumers in Jordan had fitted their premises with WSDs (Chatel 2004). The government used a different approach with the domestic consumer by targeting people in their homes through television and newspapers and in the mosque and by educating elementary school-aged children (Chatel 2004).

A recent example of demand management in practice is that the Ministry of Water and Irrigation has been unable to supply northern farmers with irrigation water. Nuaimat (2006) noted that there is a 30 million cubic metres (mcm) shortage of water in the dam that supplies the northern part of the country and Amman. In order to provide sufficient water quantities to the capital the farmers will be compensated financially instead of being provided with agricultural water (Nuaimat 2006).

A demand water management unit was established through the Ministry of Water and Irrigation in 2002. Through this unit some management programs have been adopted. Water Loss Reduction programs work to reduce physical losses and to improve irrigation methods (NWMPD 2004). Other demand management strategies include changes in cropping patterns, water saving audits, campaigns in offices and households, enhanced consumption in monitoring and continued public education (NWMPD 2004). Collecting rainwater is seen as one of the options to lessen the hardship of the water-shortage. Every summer demand outstrips supply and a water rationing program has been in place since

1988 (Ministry of Water and Irrigation 2004). There is now a government law that requires all new buildings to include a cistern as a part of the building structure.

Finding more available water is another solution. The use of non-conventional water resources such as reclaimed water and desalinated water are adding more water to the budget and it is hoped that with the “use of Jordan’s rightful shares from the Jordanian-Israeli Peace Treaty” that there will be an “alleviation of the foreseeable future water shortage” (NWMPD 2004:36). In addition, the utilization of the Disi aquifer, a non-renewable aquifer, is considered vital to Jordan’s water supply until alternative resources are made available (NWMPD 2004).

Currently, twenty-seven desalination plants are in operation and seven are under construction (NWMPD 2004). Twenty-three of the plants are privately owned by farmers in the Jordan Valley while the remaining four are operated by the Water Authority for the purpose of drinking water (NWMPD 2004). Groundwater abstractions are intended to be reduced to a sustainable level by 2020 in order to protect aquifers from saltwater intrusion and depletion of fossil water (NWMPD 2004). To achieve groundwater sustainability, a new groundwater bylaw of 2002 includes measures to control the over-exploitation and drilling of illegal wells, as well as along with a penalty system for the overuse of groundwater (NWMPD 2004).

Another solution to the water shortages is an “ecological structural adjustment” that requires arid countries to prioritize water-use for activities that garner the most economic input (Schiffler 1995:255). In other words, by leaving agriculture to nations with the natural water resources to export food to nations where water is scarce, countries with water shortages can more effectively manage their water resources. Virtual water is a coping strategy that allows for water short countries to forego using water for agricultural, traditionally the largest water consumer, and instead to import their water needs through food (Allan 2000).



Table 3.8. Water resources forecast until the year 2020 (NWMPD 2004:37).

<b>Year and amount in mcm per annum</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
Wastewater for direct reuse in irrigation and industry	31	69	88	100
Desalinated sea water for Aquaba	0	5	5	5
Desalinated brackish water	10	39	47	47
Disi and Lajoun fossil water	83	190	124	126
Peace Treaty	85	110	110	110
Renewable groundwater	410	377	319	262
Surface water, including wastewater discharges into wadis to reservoir yields	548	569	583	598

The above solutions have focused on the expert side strategies that are administered by large institutions. Another potential solution occurs on the local level in the domestic setting. Local level water-management is often disregarded in terms of their impact on water consumption levels. It is widely accepted that agriculture is the largest water consumer on the global scale while domestic usage has too little affect to be of consideration when looking for ways to lessen water shortages. It is increasingly demonstrated that residential consumption must compete with industrial and agricultural consumption for a recognized limited supply of clean water (Ennis-McMillan 2006). Now as every drop of water matters it is vital to consider the role of the domestic user along with agriculture and industry to order to better utilize water. One solution to domestic water shortages would be for households to collect rainwater. The practice of rainwater harvesting is sometimes idealized as a practice that “provides opportunities for decentralised, community-based management of water resources” (Cosgrove and Rijsberman 2000:41). According to some researchers, “small-scale, indigenous systems can often be more effective at meeting community needs ... and community-level participation in water supply management often leads to other economical, educational, or health benefits as well” (Gleick 1993:111).

### 3.10. Concluding remarks

Jordan has an infrastructure network that is ailing from: lack of resources to improve the infrastructure; rapidly fluctuating populations; and lack of available water. The first two causes are related to outside catalysts. Infrastructure improvements are difficult to make when governments are focused on debt repayment to institutions such as the International Monetary Fund (IMF) and the World Bank (WB) under their mandates of structural adjustment (Schiffler 1995). Rapidly fluctuating population is premised on two main circumstances: returning patriots due to war in neighbouring lands, such as those returning from oil employment sectors in Iraq and Kuwait (Gubser 1983); and Palestinian refugees entering the capital city of Amman (bint Talal 2004). However, not everyone agrees that water-management has been damaged by outside factors; Bakir (2005) maintains that the management policies and practices of the Middle East have utilized supply side management and have given little consideration to 'challenging the demand on water'. Regardless, the demand for water exceeds the availability, thus, being unable to provide the barometer of 1000 m<sup>3</sup> per person annually defines Jordan as a water-scarce nation.

## Chapter Four: Methods

“Do we *create* order in what is *factually* chaos, or do we *describe* order in what is *apparently* chaos? (Köbben 1973:581)

### 4.1. Introduction:

Methodology refers to the “techniques employed to gather data and evidence in social research” (Davidson and Layder 1994:34). Once the data is collected a narrative analysis can be used to evaluate the responses from informants, which regards the data as it is relayed by informants instead of doing a literal reading (Silverman 2003). Such an analysis is important when there is a language barrier present between the informants and researcher where understanding the nuances of language is not possible (Silverman 2003). For the purposes of the study here, a qualitative study has been conducted. This chapter discusses the methods that were used during the fieldwork period conducted from November 5<sup>th</sup> to December 30<sup>th</sup>, 2005 in Jordan, both in Amman and in villages in the Madaba governorate. The interviewees and the research question will be introduced first. Next, the methodological domain will be outlined as a three-part structure that incorporates the techniques, the rules and procedures and the research community (Davidson and Layder 1994). The final section of the chapter will reflect upon the concerns embedded in cross-cultural research, illuminated by personal accounts from the author.

### 4.2. Interviewees:

The informants were divided into categories that have been previously introduced in chapter two. The two categories utilized are the expert, synonymous with great traditions, and the local, synonymous with little traditions. Respondents were placed in categories according to their previous relationship to Project Rainkeep, either as a household recipient (local), a project planner (expert) or a bureaucratic water official (expert). The local and the expert categories were approached differently. The experts were all initially contacted via e-mail and then met in person at a pre-arranged time and place. This was the opposite of how the locals were contacted. Each household was tracked through a

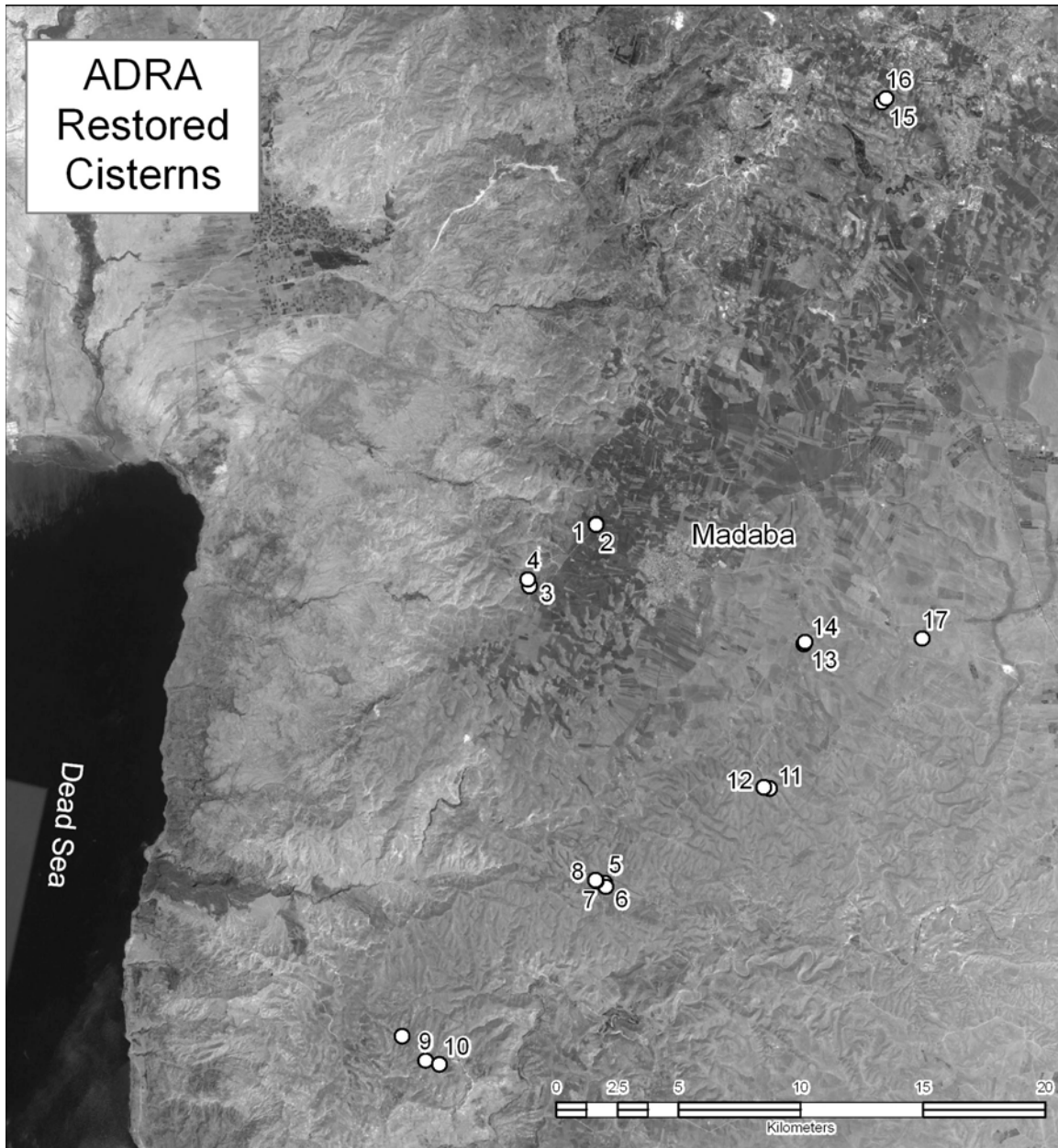
chart produced by Dr. Irvin (Appendix 1.2). When a restored cistern was located, the household was approached with no warning.

In terms of the expert category, five people were interviewed. The Adviser for Rural Environmental Health in Amman with the World Health Organization agreed to discuss his article about demand management in the Middle East. He then put me in contact with the director of the wastewater authority with the Ministry of Water and Irrigation.

Through involvement with Project Rainkeep, I met with the former director of ADRA-Jordan and the regional coordinator for Canada Fund for CIDA-Jordan. The team leader for German Technology Agency for Cooperation (GTZ) was met with after a simple email request on the last day in Amman. GTZ has worked closely with the Ministry of Water and Irrigation to coordinate Jordan's national water policy in the 1970's and 1990's.

Included in the category of local were those who had received restoration work from Project Rainkeep. Local refers to the household members present during the interviews in the following villages: Al-Faysaliyya Al-Fayah, Libb, Al-Gyrat, Dilat Amteyrat, Huwara, Bunayat and Al-Manara. The villages were randomly scattered throughout the Madaba governorate and ranged from a half hour's drive south of Amman to one and a half hours south of Amman. All of the villages ran along the eastern side of the Dead Sea south of Amman.

Figure 4.1. GPS map of restored cisterns (map courtesy of Gary L. Christopherson).



In the villages, a total of fifteen households were interviewed once and two households were interviewed twice. The project translator and her sister were also interviewed at the end of the fieldwork. In total, twenty-five interviews were conducted.

Prior to arrival in the field, it had not been considered that it would be mainly women who were interviewed at the household level. In total, twenty-four women compared to twelve men were present in the room during the interview process. Despite the pre-

departure notions that I would only be able to speak to the women as a female researcher, I was in fact able to speak to both men and women. Each household was different and the household member with whom I spoke seemed more dependent on their age and historical memory of the project than on their gender. In one household, we mainly spoke with the brothers while the mother actually left the room. It should seem obvious that, by speaking to women, their role in domestic water management would arise, but it did not. The interviews focused mainly on the project itself. This research oversight is further discussed in chapter six.

#### 4.3. Research question:

The main research question was practical in its approach: Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan? In order to answer this question, a two-step process was developed. First, the themes of development, water-scarcity and household management were broken down into questions that could be used as the probes to be answered during fieldwork. The following questions were simplified and amalgamated into the list of interview research questions (Appendix 4.1):

1. What is the discourse of water-scarcity? What is the expert position compared to that of the local?
2. What beliefs exist about Islam and water?
3. What is the discourse surrounding water-management? How do locals and experts positions differ?
4. How is water collected, stored, and utilized at the household level in Jordan? What role do women play?
5. What strategies are being adopted by the state and its citizens to share or conserve water? Is rainwater harvesting seen as a way to share and conserve?
6. Did an outsider humanitarian project encourage rainwater harvesting techniques with the community or the state?

Once the data was collected, the main question was divided into sub-questions. Each of the three questions below help to answer an aspect of the main research question:

1. How does a household negotiate access to, and usage of, a necessary but scarce resource?
2. What roles do great traditions of the state, development and Islam play in water-management?
3. How does knowledge about water availability affect the practice of water-management?

#### 4.4. Methods:

The methodological domain is a three-part structure that “all research must pass in order for it to achieve certain standards of integrity and validity” (Davidson and Layder 1994:35). This structure encompasses the techniques, the research community and rules and procedures (Davidson and Layder 1994). The techniques are the practical application of the research question, the research community is the intended audience and the rules and procedures are the behaviour that guides the research. The following sections will focus on each aspect of the three-part structure.

##### 4.4.1. Techniques:

The techniques are the methods used to formulate the data. Data is the combination of observations, methods and theory (Wadel 1991). A qualitative methodology was used. In general, qualitative research is interested in “obtaining full and sincere responses to relatively open-ended enquiries” (Davidson and Layder 1994:121). The main method was qualitative interviews, involving the textual artifact of field notes, digital photography and Global Positioning Satellite (GPS) readings. Access to informants was premised on the condition that this was a follow-up study of Project Rainkeep.

Interviews are structures of power (Wolf 1992). Establishing a “good rapport” means gaining trust and behaving appropriately in the situation, which is a vital element to the research process (Davidson and Layder 1994:122). Researchers need to acquire the appropriate way to ask questions and are often guilty of imposing their “communicative hegemony” in the beginning as they are unfamiliar with the local cultural terrain (Briggs 1992:89). Examples of communicative hegemony include: skipping over norms such as

greetings and linguistic repetitions, controlling the interaction by stimulating when the topic will shift and disrupting the flow of conversation due to missed important referential frames (Briggs 1992). I had to ‘learn how to ask’ (Briggs 1992). Familiarity with the meta-communication (Briggs 1992), clues about how to behave appropriately in the cultural setting, is learned through time in the field. In order to demonstrate awareness of meta-communication, I mimicked how people greeted one another, approached and entered a home, and accepted hospitality. Through this process, I hoped to minimize my presence by appearing natural in the setting to signal that I knew how to behave properly.

Qualitative interviews used semi-structured questions written beforehand and memorized to be asked when appropriate during the interviews. The questions for the experts were targeted towards their specific expertise. For example, the former director of ADRA-Jordan was interviewed about Project Rainkeep specifically from the project management perspective. Another expert, the team leader for GTZ, was interviewed about Jordanian water policy. This was not the case with the local interviews. Each household was subject to essentially the same list of questions (Appendix 4.1). The reasoning behind this strategy was that I wanted to get an outline of how Project Rainkeep had affected the households in the general sense. The locals were grouped into one classification as a single unit as ‘the recipient households’ who had expertise pertaining to the project and local level water-management whereas the experts were positioned as a diverse unit.

The first step when interviewing households in the villages was to take a GPS reading and digital photograph of the cistern. After this, if no household member came out to greet us, my translator would approach the home to inquire as to whether or not I could ask a few questions about the cistern in their yard. After confirming that taking notes was acceptable, I asked my memorized list of questions, quickly writing down key phrases and responses. This was one way to lend the façade of having a conversation and not conducting an interview. Most often it was women with whom I spoke. Once the interview was over, usually conducted in about thirty minutes, we would leave to find the next household. Occasionally we would linger after the interview (one household invited me to move in with them), but my driver was usually waiting in the van so we left



immediately. At the end of the day, I would chart all of the responses based on what themes seemed to be appearing, such as water-sharing, satisfaction with the project and indifference to the inscription from the Qur'an (Appendix 4.2). In order to recall the interview as accurately as possible, I would type my shorthand notes taken earlier in the day into a more complete version, which I refer to as field notes (Appendix 4.3). These field notes were used in chapter five to analyze Project Rainkeep.

My field notes are the primary source of hard data as I opted to not tape-record the interviews. Following the writing of the field notes, it was necessary to code them into themes from the research question: water-scarcity, demand management, development, Islamic political culture, expert and local knowledge. The process of using a coding strategy enabled the collected information to be categorized into easily retrievable areas with the help of an abbreviated code (Appendix 4.4). Using these newly grouped field notes, the research question could be answered by highlighting supporting details from the field notes. The end result was a reorganization of the original field notes according to research themes (Appendix 4.5).

The use of GPS and digital photography served more as a compliment to the interviews and field notes. In fact, the GPS points were not easily transformable onto a map due to my inexperience. I did not collect all of the necessary information to map these points. Nonetheless, the location of each cistern has been noted, is traceable and a map of the GPS points has been produced.

#### 4.4.2. Research community:

The research community consists of those to whom I am academically and ethically responsible. In essence, the research community is the main audience. My research community includes peers in Canada and Norway, as well as a supervisory team in Norway and the USA. While I am academically responsible to the University of Bergen in Norway and to social science research in general, this thesis is written with a twofold audience in mind. On the one hand, it is written for those who are going to evaluate my

accomplishments in the academic sense. On the other hand, it is written the development community and those who are impacted by development.

#### 4.4.3. Rules and procedures:

Rules and procedures guide the researcher's conduct. Conducting interviews was contingent on my status as a foreigner and a student. A status is the collection of rights and duties representing one's position in society, which can either be innately ascribed or acquired through achievement (Linton 1936). In my role as a researcher, I had ascribed status as a Norwegian and acquired status as a student (Appendix 4.3). These were relevant in fieldwork. In Jordan, the most important allegiance is through one's tribe (bint Talal 2004). When we approached a home, the initial point of reference was to exchange information about to which tribe the household, my translator and my driver belonged (Appendix 4.3). It was easily understood that my Norwegian ancestry was my tribe even though my place of residence was Canada. My ascribed status as a Norwegian meant that I was a foreigner, which allowed me to pose questions considered common local knowledge. In addition, my acquired status as a student resulted in the expectation that I should be asking many questions. I got the sense that the interviewees would allow for endless questions.

Another element of the rules and procedures was research ethics. I was concerned about how to proceed ethically and noted a difference between my place of residence, Canada, and my place of academia, Norway. Canada has a stronger liability culture than Norway. Had I been a student in Canada, my interview questions would have necessitated an approval procedure whereas in Norway nothing more than a verbal 'I won't do anything unethical' was undertaken in terms of gaining research approval. To avert ethical misunderstandings, research approval was requested from the Department of Antiquities, the body that oversees all permits with subjects related to archaeology in Jordan. A week after making the request, the permission letter was hand delivered; however, the permission was related more to security than to ethics in that there was a concern that I might drop poison into the cisterns or damage them (Appendix 4.6).

As a part of my need to negotiate ethics, my translator explained to each interview participant that I would code their identity, making any statements untraceable back to them, and that the interview could be stopped at any time. This common practice known as informed consent is one of the rules and procedures of the methodological domain in social sciences (Davidson and Layder 1994).

#### 4.5. Dealing with biases:

Triangulation refers to the cross-checking of data by interviewing across social and political spectrums. It is considered one of the ways in which a researcher's bias to select material that defends a certain position can be minimized (Davidson and Layder 1994). Although two categories of Jordanian citizen were interviewed, those classified as experts in water and development provision and those classified as locals on the development receiving end, my bias did manifest in how I conducted the interviews. On the one hand, the experts were interviewed thoroughly and accurately. I prepared for the interviews beforehand and felt pressure to interview them to their satisfaction rather than mine. I also tended to dress more formally to interview experts. On the other hand, my only preparation for interviewing locals was to reflect on previous responses and adjust the mental list of questions. The interview was casual and unannounced while I strove to show that I regarded them as equals. In the village setting, I dressed conservatively, taking care to wear clothes covering my stomach, legs, ankles and arms. Although I attempted to achieve minimal bias by interviewing two major classifications of people, I had arrived at the research process with preconceived notions of how experts and locals would respond best and acted accordingly. In interviewing the experts, I wanted to create an intellectual space of equals whereas, in the local interview setting, I focused on showing respect by learning bits of the local culture.

##### 4.5.1. Cross-cultural research

Engaging in cross-cultural research entailed problems with translation and accuracy of terms. For example, in explaining the physical structure of a cistern, I understood the word *lid* to refer to the cover over the hole while my translator referred to *lid* as the entire cement catchment area. These are “interpretations of categories” (Aase 1997:1). The

concept of a lid had been placed into two different categories. This difference of categories was not realized until I began to wonder why ADRA had done so little work in terms of restoration. Defining a cistern also had linguistic issues. Was a cistern just the hole or was it the entire catchment area? I recognize the importance of languages and note the shortcomings that I had as a non-Arabic speaker in the villages of Jordan. I also suspect that interesting comments that were made by household members were not translated to me due to the perceived lack of relevance to my topic.

The interview process went along so fast. I had to think quickly on my feet in order to get all the questions out and I still have questions. I have to really trust Nihad and her explanation and translation. I doubt that it is all being translated because there will be a long paragraph in Arabic boiled down to one or two sentences in English. (Appendix 4.3)

There could also be some issues with the translation when asking about the household's water source. I discovered afterwards that reliance on trucked in private water did not mean that the household did not have government water pipes. Rather a reliance on trucked in water was used as a last resort when the public supply did not have sufficient resources, which was mainly during the summer months (Appendix 4.3).

Throughout the fieldwork I felt a continual struggle to have the research goals understood by my translator, which was due to more than linguistic differences. She and I had little in common in respect to our lived experiences and I felt that these differences posed a problem in creating a common understanding. I formulated the questions and there is no guarantee that the Arabic translation retained my meaning. My most useful assistant and cultural informant was my Arabic teacher. Although our ascribed status sets differ, we have comparable achieved status sets (Linton 1936). She and I had similar roles in society, in that we were professional workers with higher education who were well-traveled and had lived outside of our natal homes. Essentially, we came from similar class positions and had similar social status. In knowing her, barriers to understanding the local society were lessened and I began to see the Jordanian people as a diverse group that could not be stereotyped into a general category of behaviour.

#### 4.6. Concluding remarks

The ability to conduct research and study individuals is often actualized through elements of power in terms of who has it, how it is used and for what purposes (Wolf 1992).

“When the Western anthropologist first strolls into a third-world village, she is a walking symbol of her native country’s power, assuming ... she is white and accompanied by the boxes bristling with modern technology” (Wolf 1992:133). It must be recognized that my position as a researcher is embodied with unequal power relations and that those whom I interviewed reacted to my global position of privilege. My translator was questioned about how my status could have altered the responses. She seemed to think that people wanted to be friendly and that by answering my questions there was a potential for further aid (Appendix 4.3). Furthermore, qualitative studies entail a “dual responsibility” to the audience and to the informants (Wolf 1992:137). This dual responsibility required that I have been self-reflexive regarding my position as a researcher. In addition, the collection of data has been made readily accessible to anyone interested in my procedures.

## **Chapter Five: Case study of Project Rainkeep**

“The convenience of piped water discouraged labor-intensive storage of rainfall, and few cisterns remain in use. However, the presence of pipes does not assure constant access”  
(Russell 1996:2).

### 5.1. Introduction

In this section, the main research question will be answered: Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan? Project Rainkeep has been the access point to look at the aspects of ‘regional political ecology’ as outlined in chapter two. The data collected from fieldwork has been placed into the categories of regional, political and ecology as they pertain to the research question. The regional examines household water-management practices of the little traditions of local level water-management and hospitality. Next, the political discusses the development project and outlines the information gaps between the development project, Project Rainkeep, and the households. The ecology section covers how water-scarcity in policy is in opposition to the experience of the locals.

### 5.2. Little traditions

The little tradition of local level water-management is demonstrated through the collection of rainwater in cisterns and in knowing how the water delivery system functions. In addition, another little tradition of hospitality exists in the sharing of water. This section will answer: How does a household negotiate access to and usage of a necessary but scarce resource?

#### 5.2.1. Local level water-management

The cisterns were ‘measured’ according to what households reported, which ranged from four to twenty meters in width and six to twenty-five meters in depth (Appendix 4.3). The largest cistern ever found in the fieldwork research area dates back to the Roman period measuring 330 feet in length, 312 feet in width and 15 feet in depth (LaBianca 1995:774). It is difficult to show a relationship with the size of the cistern to the number of families

using each cistern because the cistern measurements were approximate. Cisterns stored drinking water as long as the cistern was clean otherwise used they were used for cleaning, providing water for the garden and/or water for domestic animals.

Figure 5.1. Household three told the author their cistern is twenty meters wide by twelve meters deep supplying four families. This cistern collected rain and piped water and used it for drinking and animals.



Figure 5.2. Household six claims to be much smaller at four meters wide by six meters deep supplied two families. They collected rain and piped water and used it for drinking and animals.



With the introduction of pipes and groundwater pumping most households no longer need to rely on cisterns to collect and store their domestic water but some households did express a preference for rainwater based on the quality and taste of it over piped or tanked in water. Households who only harvested rain in their cistern were satisfied with the quality of the water even preferred it as drinking water. I was served rainwater tea or coffee a couple of times during the interviews and could also attest to a personal preference for the taste of rainwater.



Figure 5.3. Household seven prefers to drink rainwater collected in cisterns because it tastes better and is healthier.



In the study of water-management in rural Mexico, Ennis-McMillan (2006) discovered that drinking water quality was judged physical qualities of the water such as the colour, smell and taste. This was a similar discovery made in fieldwork. Beliefs about water quality were rooted in water temperature. Regardless of where the water in the cistern came from, water quality was judged as good if it was cold in the summer and warm in the winter. The explanation for this self-regulating temperature gauge was attributed to ‘something to do with nature and because the cistern was so deep in the ground’ (Appendix 4.3). One household did say that the rainwater was dirty but not the cistern itself; therefore, they never harvested rain and filled their cistern only with trucked in water. Water in the cisterns tended to be reserved for drinking purposes, regardless of whether the water has been collected from rainfall, supplied by piped water or privately trucked in tank water whereas water stored in rooftop tanks tended to be used for

cleaning purposes. Of course, collecting rainwater and supplying household drinking water from the cistern depended on whether the cistern and catchment basin was deemed clean or not.

Figure 5.4. Household two believed their cistern to be too dirty to drink from and only drinks from the cistern if there is no other water available.



There was no set pattern of cistern use that every household ascribed to but generalities did arise. Rainwater harvesting depended on three things: adequate rainfall, belief about rainfall being clean, and the cistern and catchment area being clean (Appendix 4.3). Cisterns can be used to hold ‘outside’ water sources if rainwater is perceived dirty and even if the cistern is perceived as dirty then piped or trucked in water sources are used to fill the cistern (Appendix 4.3). When households referred to the cistern as dirty but still used it for holding drinking water the assumption can be made that they were making reference to the catchment basin being dirty (Appendix 4.3).

Rainwater harvesting requires a catchment area in the form of a nearby roof or the ground surrounding the cistern. A simple path or plastic pipe directed the water towards the cistern through one or two holes at the base of the cement lid that ADRA had built. Sometimes the water was filtered through a screen in order to catch large particles before entering the cistern. It was often mentioned that it had to rain once or twice in order to ensure that the catchment area was clean before people would uncover the cistern holes to collect the rainfall (Appendix 4.3).

Figure 5.5. Household five collected the water on their roof and led it down a pipe to this garbage-filled path. It had not rained yet this season.





Figure 5.6. Household seven collected rainwater for the roof of the neighbouring school by using a pipe to direct the water to the cistern. This was the cleanest cistern found.



Figure 5.7. Household ten was the only cistern with a pump.



Cisterns have transitioned from strictly being a rainwater collection unit and often acted as a storage tank to hold government pipe water or private trucked in water. There is a distinction between a cistern and a rooftop tank, which does not collect rainwater but holds piped and trucked in water. Cisterns are not used in urban settings, such as in Amman, and are belong to the village landscape and traditional ways (Appendix 4.3). In addition, there has been a rural to urban migration that affects the drop in usage (Basim Aziz, former funding director, ADRA-Jordan, in discussion with author, November 27, 2005). All villages in the field area had piped water access and rainwater harvesting was practiced due preference for the rainwater.

By the 1940's, modern deep drilling techniques and pumps supplied wealthier residents in Amman with water via household pipes (Russell 1995). By 1966, 83% of residents in Amman had access to indoor tap water provided by the government (Russell 1995). When pipes could not provide residents who had become accustomed to an in-home

supply, entrepreneurs seized the opportunity to provide water from certified wells via privately-operated tanker trucks, “at prices far above the national water system” (Russell 1995:7). According to the German Technical Agency for Cooperation (GTZ), all villages in the field area have access to government water supplies. Rainwater was preferred for drinking while piped water was used as the back-up supply for drinking water. Cisterns, if not collecting rain, acted as storage tanks for piped or trucked in water. While the focus of the project was to reintroduce rainwater collection in cisterns they were often used for storage of water piped or trucked in water.

Table 5.8. Thirteen of the seventeen households interviewed used the following strategies to access water for the household cistern.

Households responded	Rainwater harvesting	Public Pipes	Private tanks	Combination of 2+ methods
Total: 13	4	2	3	4

Water is provided by private water-sellers but the cost is much higher than that of piped water (Schiffler 1995). Although, sometimes households were left with no other choice than to buy water, which means that Project Rainkeep could also assist in improving a household’s financial situation as less money would need to be utilized towards water supplies (LaBianca 1994). It was common use both public water suppliers managed by the government and to use private enterprises to supply water at a higher cost when the government pipes did not provide water.



Figure 5.9. The back of a privately-run water truck that reads “potable water”.



Figure 5.10. Household five collected rainwater previous to the restoration and only collected rainwater in the cistern, which was used for drinking water while the piped water supply was used for cleaning



Negotiating access to water for the household meant knowing how the supply system worked. Every household in Jordan is supplied only once a week with water, as long as they are connected to the public supply network of piped water. When the pipes were turned on was advertised in local newspapers or through local word-of-mouth. In addition, most households knew where their water source came from.

How do they know when the water is coming? Is it advertised in the newspaper? No, the water authority tells them. Each town has a specific day.

How many hours does the water get turned on for? Half a day.

Oh, one last question. Where does the piped water come from? El-Larish and el-Walla.

Is el-Walla groundwater? No, it is spring water. (Appendix 4.3).



Figure 5.11. El-Larish, the groundwater pumping station, fills up private water trucks. It is the men's job to order household water.



I couldn't resist asking if there were future plans to provide all rural areas of Jordan with piped water supplies. Dr. Nawar Sunna responds:

There is 99% coverage in Jordan and some of the areas fall outside of the district area and there is the problem with transport as some places are very far away. There is the priority to provide everyone but not everyone lives there legally. Some people build illegally. These people rely on tanked in water. (Director of Wastewater, Ministry of Water and Irrigation, in discussion with author, December 7, 2005).

### 5.2.2. Hospitality

Even though water was deemed plentiful due to the advent of pipes, every household interviewed claimed that they would share water from their cistern with anyone in need (Appendix 4.3). This little tradition of hospitality was manifest in water sharing. It was common local knowledge that cisterns were accessible to anyone in need. Usually a cistern was placed in the courtyard of a house and serviced between two to twelve

families. Water itself is a public good and is not considered private. Although, there was a distinction made between access to the water in the cistern and who owned the cistern. Ownership of the cistern did not lead to exclusive rights of access to the water held in the cistern but the ownership of the land included the ownership of the cistern. Although inheritance of property extends through the male line one widowed woman did claim to be the land and cistern owner (Appendix 4.3).

Figure 5.12. Household sixteen. She was the owner of the land and the cistern. There were plans to start an olive farm and use the water in the cistern for that. Currently, the cistern was considered dirty and the water was used only for the domestic animals.



Figure 5.13. Household eleven. The cistern was owned by someone who lived out of town but it could be used by anyone. This household filled it with rainwater and private tanks.



Water-sharing could also be the spirit of hospitality that Jordanians boast as their cultural identity. Hilda Ayoub (Manager of Schools Examination, British Council, in discussion with author, December 18, 2005) mentions that sharing in general is a principle and an identity of Jordanians more so than in the neighbouring countries. She claims that it stems from the Bedouin tradition of hospitality that gives what one has to a guest. Ayoub states that sharing should not be solely connected to Islam since Islam is a new religion and that Christian is also a religion of sharing; therefore, water-sharing is a little tradition of hospitality.

### 5.3. Great traditions

This section addresses the how great traditions of the state, development and Islam manage water. As a summary from chapter two, globalization outlined how the world is increasingly connected. One of the aspects of globalization is propagating agendas that have been defined by western ideas of what is modern. Modernity for our purposes is the supply of water through pipes. Development aid is a tool to assist regions to become modern, in this case, to support the right of access to water. This section will answer: What roles do great traditions of the state, development and Islam play in water-management?

### 5.3.1. Development gaps

Project Rainkeep, known as ADRA's work to the locals, wanted to re-introduce the practice of rainwater collection in cisterns to the local level water user. Cisterns are seen as backwards and out-to-date in terms of the modern world. Basim Aziz expressed:

You won't find the cisterns. Jordan is a changing country. Let me tell you a story. The sheikh in Huwara told me that I could buy 1000 square meters for 1000 JD and now it is over 50,000 JD to buy land there. Jordan is developing and things are changed here now. If I buy some land and there is a small cistern on it – what I am going to do with it? (former funding director, ADRA-Jordan, in discussion with author, November 27, 2005)

The budget for the restoration of the cisterns far exceeded expectations. The proposal predicted \$120 US per person totalling \$12,000 US to restore cisterns in ten households with an average of six occupants (LaBianca 1994). According to Russell and Irvin, the average cistern restoration ran about \$800 US (Russell 1995). Basim Aziz, former funding director for ADRA, mentioned that restoration work was pricey due to having to hire outside cement masons from Syria and to pay for a three month salary of the project engineer who in addition had to commute from Amman to the field sites, which could be anywhere from half an hour to one and half hours (in discussion with author, November 27, 2005). To build a completely new cistern is expensive, largely due to the amount of labour required – “working with pick and shovel, a man may excavate one in about three months” (Russell 1995). Construction costs, including plastering, run about \$1,400 US in 1997 (Russell 1995). Cistern restoration is a good investment if the cisterns provide water that otherwise would be purchased privately and if the annual cleaning fees are small (Russell 1995). Russell (1996) suggested future improvements to cisterns could include: rope ladders; electric pumps and filters to better clean out the cistern; tubing to the trough; an improved leak detection system; and plastic lining in the catchment basins.



Figure 5.14. Household thirteen was the pilot project restoration and was never used (before or after the restoration).



The first step in fieldwork was to find the restored cisterns in remote villages. In the first few days in the field the mention of Project Rainkeep only drew blank stares. We were basing our search on a chart that Dr. Dorothy Irwin had produced as a result of her research in 1995 (Appendix 1.1). The chart was basic; each restored cistern was coded along with some comments about the household and their water use habits, usually the

name of a village and, in three cases, a person's name. When there was a name listed the restored cistern was found the quickly. It was discovered that people didn't identify the project with the name Project Rainkeep; rather, the project was known locally as ADRA's work. Initially I thought that this was due to the difficulty of transliteration from Arabic to English but it became apparent after the first visit to a cistern restoration site that ADRA had branded each cistern with an inscription of their name, the date of completion, and a verse from the Qur'an that roughly translates as *Everything is created from water*. Due to the visibility of ADRA's name on each cistern it was ensured that the project was never even known as Project Rainkeep to the locals and identified exclusively as ADRA's work.

Once we identified the project as belonging to ADRA we were successful in finding seventeen out of the supposed thirty-two restored cisterns. There were over 300 cisterns identified in the area but only thirty two were chosen for the pilot project (Bakir Hamed, former funding director, ADRA-Jordan, in discussion with author, November 27, 2005). Unfortunately, all the files about the project were confiscated by the Ministry for Social Development when ADRA left Jordan years after the project was complete. Therefore, it is even unknown how many cisterns were restored. The funding director told me personally that thirty-two were restored while reports by Dorothy Irvin and Malcolm Russell, two project ethnographers, mention that there were only twenty-eight cisterns restored.

While the project aimed to stimulate the return to rainwater harvesting some households were still using cisterns for rainwater collection or water storage in combination with public or private water supplies. The project intended to inspire households to use cisterns as they had been used in antiquity – strictly to collect rainwater. But it can no longer be assumed that rainwater harvesting is an appropriate technique for accessing a household's main water source due to the unreliability of the rain, the perceived reduction of rain, and the satisfaction and dependence on pipes and tanked water. The return to a practice that does not supply a household with adequate water supplies was not the project goal but in measuring success of the project on whether cisterns only collected rainwater gives no allowance for household flexibility. The criteria on the project side

were unreasonable, especially when complaints of increasingly little rain were frequently made by households (Appendix 4.3). The project intended cisterns to collect rainwater only for people and domestic animals but cisterns are only one part of the multiplex of the water system in the Madaba governorate. Household water is available three ways: through the supply of public water via pipes to homes once a week, with the purchase of water from private water trucks and in the ability to collect rainwater in cisterns. Households utilized the restored cisterns to hold all types of water, public or private yet the project was deemed a failure by the funding agency because the cisterns held water other than rainwater. Basim Aziz, former director of ADRA-Jordan, funding agency for Project Rainkeep, talks about the reasons why this project failed:

USAID denied helping this project because they were worried about how the project would control pollution and how they could guarantee that the people would not use the cisterns to fill up with pumped water. The project didn't succeed. USAID was right. The people used pumped water and then they started using the water liberally and using more than they needed. They never cleaned the cisterns. There were so many negatives with the project. (in discussion with author, November 27, 2005).

Figure 5.15. Household seventeen were the only participants openly expressing dissatisfaction with ADRA's work. They stopped using the cistern when the pipes came about ten years ago (mid 1990's).



There was an immediate disconnect between the households and the project in that they did not know why they had been selected for help nor was it understood that they were supposed to help. Basim Azaz, former funding director of ADRA, claimed that the reason villagers did not contribute labour was because:

They are lazy. And they use them for their gardens and animals. It is women who are doing the work but it is a man's job but the men don't want to do it. (in discussion with author, November, 27, 2005).



One of the typical development tools used by experts is sweat equity: a strategy used to instil a sense of ownership of the project onto the local population. Sweat equity could lead local participants to continue and fulfill development goals once the agency has left the area, in other words, sweat equity builds project sustainability. According to Aziz, sweat equity did not work with Project Rainkeep. He claims that the entire project was a failure, in part, because sweat equity failed due to the village people being lazy and not wanting to help the project workers (former funding director, ADRA-Jordan, in discussion with author, November 27, 2005). A critique of sweat equity is that what is needed for a sustainable project is local participation at the conceptual level not at the implementation level (bint Talal 2004). Sweat equity, which was a part of the project funding proposal guidelines (Appendix 1.1), was not explained or understood by the households. They commented that:

We didn't help because ADRA brought their own workers but we brought them food and water.

ADRA contributed the lid and trough and made the family dig (I try to explain sweat equity, which Nihad finds weird). Do they think it was weird to have do dig? No, they think it was a good thing.

They didn't help actually but they brought them food, water, and tea because ADRA brought their own workers. They think that they can fix this cistern by themselves now. (Appendix 4.3).

Development projects are aid packages formulated by experts in order to influence change even though an expert's time in the project area is minimal compared to a lifetime of living in the selected area. Chambers (1983) refers to the quick in-and-out research of an area targeted for aid as 'rural development tourism'.

### 5.3.2. Islam and water-management

More than ninety percent of Jordan is Muslim with virtually everyone following the Sunni school of Islam (bint Talal 2004; Gubser 1983). According to Sunni beliefs, the law of thirst applies to water classified as private goods, restricted public goods and public goods (Caponera 2001). The role of Islam and water management as previously

described is considered to influence the principles guiding water access and use. This hypothesis was tested in the field.

Each cistern that was restored by the project had an inscription from the Qur'an and ADRA's name displayed on the side of the cistern that would be seen when passed by on the street. The branding of each cistern with a statement from the holy book of Islam along with ADRA's name brought up many questions. Did the inscription from the Qur'an inscribed on the sides of the cistern have any meaning to the households? Why was it placed there? Basim Aziz disclosed the project's reasons for placing the inscription on each restored cistern:

The Qur'anic verse reads "We created everything from water". There are three reasons why we did this. Number one – we wanted to show that this was not an American project, number two – the verse speaks about the importance of water to people, and number three – to prevent someone from damaging the cistern by showing who had worked on it (former funding director. ADRA-Jordan, in discussion with author, November 27, 2005).

No household expressed concern that it was necessary to ward off attack by using an Islamic inscription to demonstrate that the project was local. Every household explained that ADRA had placed the inscription on the cistern out of their accord not out of request by the households. I was explained countless times that the inscription mentioned the importance of water (Appendix 4.3). In addition, when an attempt to link the hadiths with water sharing I was told:

It is politeness and kindness from the owner of the cistern to allow anyone to use it and maybe one day they will need help. (Appendix 4.3)

I had wanted to investigate how Islam played out locally and whether the inscriptions were necessary reminders as to the importance of water, which they were, but were Islam and water use patterns linked for households. This was never uncovered. I suspect that the intent of the question was misunderstood and skewed in translation. I have no proof of this other than one incident when my translator repeated the question back to me: Ask

why ADRA put the inscription on the cisterns?. I was not interested in why ADRA had placed the inscription but whether or not the inscription connected water use and Islam. This misunderstanding was not realized until the last household was interviewed.

When asked if the WHO considers the principles of water use in the Qur'an as important Bakir Hamed responds:

No. Islamic, Christian, Jewish, Hindu water-management approach is not about religion. I am speaking personally and I am a Muslim myself. Islamic teaching doesn't harm nature and this may be the only religion that talks about nature in a practical manner and because Islam arose from the Saudi Arabian Peninsula where the climatic conditions are very harsh. Islam doesn't talk about water-management, or child protection, or quitting smoking, or anything like this but there are of course "religious channels" to communicate through about these things. No, there is no such thing as Islamic demand water management theory. I was asked to speak at a conference sponsored by the Canadian government about Islam and conservation and I said no because I don't believe it. The promotion of demand management is about management. In summary, demand management is about asking...someone says I need ten trucks of water and you ask why? Do you have a garden? Ok, you don't need the grass so we take away the water for that. Do you recycle water? Do you have water-saving appliances? It is the same if a farmer asks, for example, to grow bananas and wants 100 cubic meters. We ask is there a market for this? This is a feasibility study. Question the legitimacy of the use of water that is demand management. (Advisor, Rural Environmental Health, WHO, in discussion with author, November 23, 2005).

Does the payment policy of the Ministry of Water and Irrigation adhere to the law of thirst which prioritizes domestic use, then agriculture and lastly industry? According to Dr. Nawal Emile Sunna, Director of Laboratories and Quality Department, Ministry of Water and Irrigation, fees are based on their intended usage with agriculture the most expensive at 1 JD (\$2.5 US) per cubic meter with domestic water provision being the

cheapest in order to uphold minimum health standards (in discussion with author, December 7, 2005). In a very practical sense, Jordan has had to tax the largest water consumer, agricultural, and give water access priority to industry, thus, not strictly adhering to the law of thirst. This eradicates food security for the nation. Dr. Philipp Magiera

In my personal opinion unfortunately for Jordan food self-sufficiency cannot be reached here. That is a sad reality. Jordan already imports 2.5 times their water availability through food. There are one billion unconventional sources expected to cover the demand. Politically motivated statements like food self-sufficiency are not possible. (Team Leader, GTZ, in discussion with author, December 28, 2005)

On the one hand industrial activities can generate more currency per water used than agriculture but on the other hand this means giving up food self-sufficiency as a nation, which looking at where Jordan sits, leaves it in a precarious state of negotiations with its neighbours.

Linking water-sharing to Islam has been difficult. I experienced first-hand an immediate offer of tea and or coffee after given a seat in every household. This could be attributed to water-sharing and shirib but it could also be linked to the little tradition of hospitality (LaBianca 2005) that is characteristic of the Arabian Peninsula. I did have the opportunity to question my translator Nihad and her sister Withaina about the role of Islam:

Does Islam have anything to say about water sharing? Yes, it is very important for everyone who needs water. For me, if I see someone I imagine that I am in that situation.

It is mentioned in the Qur'an? Yes and the Prophet Muhammad said we should be aware and careful with water even if we have a lot. He said that even if you live next to a river and have plenty that you should be careful. (in discussion with author, December 24, 2005).

There is both demand water-management and Islam operating in Jordan but is there Islamic demand water-management? After my research, I would say no, that Islam cannot be combined with the principles water-management at the state level. Of course, Islam talks about beliefs on how to delegate and share water but that doesn't do more than provide a backdrop for consumption patterns and could guide the individual consumer. It is worth consideration that water managers in Jordan may not be actively using Islamic water demand management.

#### 5.4. Ecology

The natural availability of a resource determines the human relationship to the area. But it does not determine what the response to manage that resource will be. Throughout the thesis there have been two categories of water-managers exemplified in the expert and the local. Water-scarcity is understood differently by various social categories and can result in demand management to denial of scarcity. This section will answer: How does knowledge about water availability affect the practice of water-management?

The “dominant motif of water is scarce” (Derman 1998:76) engages the economic and the ecological perspective. It is typical of the economic perspective (Derman 1998) to endorse the statements of the larger aid institutions. The Adviser for Rural Environmental Health with the World Health Organization and the Director of Wastewater at the Ministry of Water and Irrigation affirmed that Jordan is indeed living in water-scarcity as defined by the United Nations of less than 1,000 cubic meters per capita per year (Faruqi 2001:xiii). Bakir Hamed states:

Water-scarcity is a threat to health and that is our concern at the WHO. In 1993 the WHO was the first organization to look at water-scarcity in this way and we held further conferences in 1996 and 2001 and 2003. We started talking about demand management then, which was a new idea for people. The “missing link” in water management is demand water management, which includes efficient use and allocation of water and environmental protection and pollution control of water. (Advisor for Rural Environmental Health, WHO, in discussion with author, November 23, 2005).

Dr. Nawal Sunna was asked if she agreed with the water-scarcity index set by the United Nations:

Yes, I agree with them. Those figures set by the UN are very low. There is limited water here in Jordan. The households only get water one day a week and they don't have very much that they can use. (Director for Wastewater, Ministry of Water and Irrigation, in discussion with author December 7, 2005).

The policy makers and implementers ascribe to water-scarcity measures, which affects how the water budget is drawn up – or how the water available is allocated to the various sectors. Bakir comments on role of the individual and prioritizing water consumption:

The individual's consumption in the home means almost nothing. The domestic user is a small piece of the pie and doesn't matter that much. People are often wrong about that. Fifty percent of water waste is lost in the distribution system through leaky pipes also water is significantly lost in industry and agricultural practices. There is a "water budget" that looks at water allocation for the three main sectors of domestic, industrial, and agriculture. If you look at water as money you have to ask who is bringing back a profit? If you give agriculture 70 dollars and they bring back 60 then the country is losing money but if you give 20 to industry and they bring back more then...but you also have to consider the social benefits of those who don't bring back more. You have to give to the sectors that are using the water more efficiently and give better returns to the economy. You have to also consider pollution as eating away at the resource. That is why pollution control is very important because it is no good if the water gets misused by pollution. People tend to use more water than they have and that is a problem. (Advisor for Rural Environmental Health, WHO, in discussion with author, November 23, 2005).

Everyone working in water provision and water policy in Amman are considered experts that subscribe to the economic perspective while local, rural environments engage in the ecological perspective (Derman 1998). A rural environment has a different relationship to water availability. It is noted by researchers who have done extensive fieldwork in villages in Jordan that water is not seen as a scarce resource but as a “varying and unpredictable resource” (Lancaster and Lancaster 1999:142). Both my translator and driver were from a rural village. In an interview with my translator Nihad and her sister Withaina they discuss what water scarcity means in their lives.

Are people using more water? (Resounding) yes!! They wash cars, swimming pools. The cities are using more.

Then do you have less in the countryside because of the cities? The cities know that they have a lot of water for all the day and we get in the pipes only one or two times a week in the countryside so people in the villages use less. Is this a source of conflict between the cities and the countryside? Sometimes they think that they more educate, high class. Sometimes they look to people in villages as less civilized.

You don't want to live in Amman? No I see no need. Only in summer when we have lack of water!

Does the government say water shortage? Yes, all the time. The people in the countryside know this problem. We call this problem “tragedy of water” because we know this problem and are aware of it. We are scared when we hear water shortage. (in discussion with author, December 24, 2005).

When my translator Nihad Biadi and her sister Withaina were asked about water allocation and sector priorities they answered in much the way I had anticipated:

It should be equal. Ever section needs water and should get what they need.

Everything needs water. (in discussion with author, December 24, 2005).

Infrastructures such as deep-water drilling and pipes have drastically altered the perception of water availability in Jordan. The households demonstrated a reliance on the piped water system; as long as pipes supplied water or private tankers could be purchased

there was enough water. What developed at the local level of water management was a hierarchy for obtaining domestic water. Piped water supplied by the government was the first choice, notably, the easiest to access. While rainwater is preferred for drinking under conditions of insufficient rainfall pipes acted as a supplementary supply for domestic chores. Failing the reliance on these two methods tanked in water was purchased privately. Some households relied on pipes and tanks only and did not use their cistern for reasons mentioned – it was dirty and/or there were insufficient amounts of rainfall. Comments expressing satisfaction with the piped network ensuring water security were numerous:

Do you ever have water problems? Nowadays no. In the past there wasn't enough water.

Do the pipes always provide enough water? It comes one day a week. It is enough.

Do they ever have water problems? No.

Is there ever a time when they didn't have enough water? Yes, they had a problem two – three years ago because there was not enough from the pipes.

Do they get enough water from the pipes? No not enough. Sometimes the water authority doesn't allow enough water through the pipes so they have to buy a tanker.

Is the cistern filled up with piped water? If the rainfall is not good then we use piped water.

Are there pipes to the villages or do people have to use cisterns? There are pipes. Cisterns are only for drinking and piped water is used for cleaning the house and washing.

Pipes came and the cistern water could just be used for drinking.

Have they ever had water problems? Yes in the past but no problems now because they have pipes now. (Appendix 4.3).

Pipes serve to alleviate the fear of water-shortages, even so, with pipes and tanks able to meet the demands of households the awareness that water is not plentiful was evidenced in statements made by Nihad and Withaina (Appendix 4.3). My driver Feeras sometimes joined us in our household interviews. In this discussion it was the second visit to the



household and there were many males present. Feeras and one of the brothers in the household explain the reasons for water shortages in Jordan: an increasing population, Israel takes more than their fair share, Jordan's lack of coastline (Dead Sea is unusable and the Red Sea is too small) and the climate is too hot resulting in little rain (Appendix 4.3).

Use abatement was another coping strategy for living amidst water-scarcity, which limits water consumption by prioritizing its use. Two households mentioned that chores were put aside if there was not enough water and others mentioned that even though the cistern may be dirty they will drink the water if there is nothing else.

Tell them I apologize for interrupting their cleaning. No, it is okay because we are waiting for the water from the pipes to be turned on.

Oh, Monday is the day for water here? Yes. (excerpt with household six Appendix 4.3)

Figure 5.16. Household six waits to do the chores like washing until the water trucks come.



Water-scarcity leads experts to enact and enforce demand management policies, the end result being that household water supplies must be bought from private water trucks and water must be shared. As discussed in chapter four, there is limited freshwater availability in Jordan and people of Jordan have to adjust policies and behaviours in order to manage the scarce resource. Different experiences lead to a different standard of water needs. Many households stated that they had no water problems, which they attributed to the introduction of pipes, while water policy experts confirm the realities of the water-scarcity index.

## 5.5. Concluding remarks

Project Rainkeep was a pilot project with an aim to “learn lessons that could be incorporated in an expanded version of this project in the future” (email to author, January 25, 2005). Some of the questions at the time of the original project were:

1. why have people abandoned their cisterns;
2. are these cisterns antiquities;
3. what problems would we have with the government (department of antiquities) if we undertook to restore them;
4. is this a cost-effective intervention as far as improving water availability is concerned;
5. to what extent has the know-how related to cistern construction and maintenance been lost/preserved;
6. what kind of ownership issues emerge once a cistern is restored; and
7. who controls access to functioning cisterns.

Not all the above questions were answered in-depth during the field research. It was discovered that people had not always abandoned their cisterns, rather, that this was an assumption on the part of the project. Respondents noted that they were collecting rainwater as before the project or no longer collecting due to the availability of water brought to them through pipes. As mentioned earlier, the lack of sufficient rainfall was also a key reason for a household to no longer use the cistern for rainwater collection. In a couple of interviews it was mentioned that the cisterns were from the Roman era while one household noted that the cistern was forty years old. As for problems with the government, this was never asked. It was mentioned by Basim Aziz, the former funding director of ADRA, that this project went way over budget of the \$11,000 US due to staffing and transport. Some households felt that ADRA had withdrawn rather quickly and that they were not finished with their work. This may have been due to lack of funds. ADRA claimed they had to use cistern restoration workers from Syria because there was no-one available in Jordan to do the job, which is hard to fathom with there being so many cisterns in Jordan. The cement masons had to be imported in. Issues of ownership and control are not appropriate questions to this society, as far as I could see in my limited fieldwork. As mentioned earlier, households share amongst themselves and with

any passing stranger in need. There was a sense of whose property the cistern was on and who was responsible for the filling of it but anyone had access to the water inside. There were many problems in gaining access to expert project side because ADRA has withdrawn from Jordan and under Jordanian law the Ministry of Social Development confiscated their files. This left me with only the former funding director and Oystein Labianca to interview. How does all the above relate back to the research question: Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan? In this section I have focused mainly on the local viewpoint and can summarize the following:

1. Pipes do not entirely replace cisterns, rather, there becomes a three-part system in accessing water through self-collection of rain, government supply of pipes (where possible) and private water trucks that water
2. Development is appreciated yet misunderstood in terms of sweat equity, goals, and targeted group
3. Water scarcity is acknowledged more so by experts but with the advent of pipes locals feel that their supply level has increased and they have less of a “problem” than before
4. Water is shared amongst neighbours, family and strangers, which relieves pressure on single households to supply their needs independently
5. Although Islam speaks about how to delegate and use water, it is not an obvious consideration in policy yet it may support water-sharing

Overall, Project Rainkeep was a small-scale development project that did have a positive affect on the majority of households, in fact, only one out of the seventeen households claimed that ADRA had done poor work. While a few households were unhappy about ADRA having left the area most households expressed a further need for assistance (Appendix 5.3). Based on this, two questions were used to measure the success of the project:

1. Are the cisterns in continued use to hold water either supplied by pipes, tankers, rainwater collection, or a combination?

2. Did the recipients of the project have encouraging feedback, ie, are they satisfied with the work of the project, would they recommend further work done?

In all, ten out of seventeen households were using the cisterns and all but one interviewed household wished for further assistance and gave encouraging feedback. The project contributed to the households a sense of feeling safe around the cisterns. A cement encasement was built around the hole in the ground, which provided a base for a tight-fitting lid and a trough for the animals. The lid prevented children from falling into the formerly gaping hole in the ground. When we did find two uncovered cisterns their size was surprising. My driver and translator exhibited concern for my safety as I walked along the edge of an open cistern.

Figure 5.17. Household fourteen is an open cistern. Fear of falling in could easily be understood.



Some of the cisterns were not located close to homes or people were not home, which meant that six of the seventeen households were not interviewed, although, each household was photographed and given a GPS reading. One cistern was photographed in a hurry due to it having been turned into a sewage tank. The Qur'an inscription was removed from the side of the cistern because this was *haaram*, according to my translator. She also did not want to knock on their door and ask questions (Appendix 5.3).



Figure 5.18. Household eight. This cistern that had been converted to a cesspit.



This chapter sought to uncover the many nuances involved in a development project like Project Rainkeep. The purpose of the pilot project was to demonstrate to Jordanians that rainwater harvesting is a viable means for doing something about the country's water shortage (LaBianca 1994). Did the project incur changes at the local level? Some households were already using cisterns, people appreciated the addition of a lid, but the negotiating of water access was reliant on more than the presence of a cistern. Accessing water is a strategy that is negotiated based on ordinary local knowledge and policies of the experts. The political ecology of water-management is multifaceted and depends on the natural resources of the area, the infrastructure, the ideology of policy and provision, and the hierarchy of users.

## **Chapter Six: Concluding remarks**

“Sustainability of water both as a resource and as a cultural marker is best served when all stakeholders are at the table” (Johnston and Donahue 1998:345).

### 6.1. Introduction

Water management in Jordan is a national system that has to integrate ecological conditions, the politics of the Middle East, the bureaucratic water provision system and local level techniques. All of these factors affect water supply, which in turn influences water availability and subsequent consumption levels. Although the focus of this study has been Jordan as a holistic water-management system, Jordan has been affected by global ideologies of development. In essence, the attempt of Project Rainkeep to make positive change for a handful of households is a part of the larger spectrum of globalization. All societies have been altered by a dominant world economy and world order that pose challenges and require a reinvention of the local knowledge (Goehring 1993).

One of the changes uncovered in fieldwork was that cisterns are no longer the sole provider of domestic water due to the introduction of pipes. This has led to a reliance on modern infrastructure, which is viable as long as the pipes provide water. During the course of fieldwork, it was discovered that water shortage is a matter of perception. The households perceived that there was no water-shortage due to the existence of pipes, even with only a one-day-a-week supply. However, in order to achieve overall water security, it was common to access household water through a combination of three methods: government piped water, private water trucks and rainwater harvesting.

Another important discovery during the course of fieldwork was that water is shared. While national water bureaucracies have adopted the policy of demand management at the local level, it is common knowledge that water is available to anyone in need of quenching their thirst. It is noted that in Jordan “disputes over water are avoided by the knowledge common ... of first come, first served ameliorated by the assurance of the quenching of thirst” (Lancaster and Lancaster 1999:142). Without exception, every



household stated that they would share water from their cistern or roof-top tanks with a neighbour or a passing stranger. It was difficult to access an understanding of the motivations for sharing water. While Islam does indeed have much to say about sharing water and *shirib*, the law of thirst that allocates water first for the domestic setting, Jordan is considered a melting pot of civilizations (bint Talal 2004; Noor 2003). Therefore, what roles do pre-Muslim societies play in water-management, specifically in water sharing? Hilda Ayoub claimed that water sharing is an aspect of generosity attached to the identity of Jordanians, traceable to the hospitality of the Bedouins (Manager of Schools Examination, British Council, in discussion with author, December 18, 2005). That water is shared is an important cultural element that alleviates the strain of water shortages and could be considered more important than an aid package that reintroduces rainwater harvesting.

## 6.2. Unanswered questions

A society is like a woven tapestry – all areas are intertwined but not readily apparent. Margery Wolf (1992) discusses the layers in society as a part of the ‘cultural onion’. One of the layers that I felt was difficult to access was the role of men and women in the household. I spoke mainly to women and I would like to know where the men are and how their absence affects the way in which water is accessed for the household. I did discover that men were responsible for ordering private water as this entailed traveling to the pump station while women swept the catchment area before the first rain (Russell 1995) and hauled the water out of the cistern with a bucket. It was also the role of the men to dig the cistern (Lancaster and Lancaster 1999). What other expectations are included in the role of wife and mother and how do these affect water-management in the household? How do the women’s roles shift when the men are not present?

Figure 6.1. Household one said that ordering from a private pumping station was the man's work and hauling up the water from the cistern was the woman's work.



I hypothesize that knowing where the men are would lead to understanding how the household is configured, which would lead to questions of household sustainability. It is readily acknowledged that “village organization varies considerably” in Jordan (Gubser 1983:33) and that the definition of a household is a social category that is in constant flux (Crewe and Harrison 1998). By understanding the kin relations in Jordan, in particular that of the villages that received restoration aid, social behaviours such as water-sharing could be further explored. Another important layer in the cultural onion is the role of Islam in water-management. How Islam is interpreted and acted upon locally to adjust behaviours in accordance to being a ‘proper Muslim’ is a topic that needs further investigation. I never felt that I was able to ascertain how the great tradition of Islam influenced village water-management. It remains to be seen whether or not Islam influences water-sharing. Questions were asked regarding the impact of the Qur’anic inscription engraved on each cistern. The responses received about Islam sounded

automatic, almost like a script, and it felt as though people were reluctant to discuss Islam with me. I interpret this as religion being personal and that I was a stranger. Possibly most important was that I am not part of the 'brotherhood' of Islam and therefore am unable to understand their position as Muslims. This is speculative. Longer fieldwork and learning Arabic might contribute to having questions answered about the role that Islam has in water-management. In understanding the cultural layers of the household and Islam, questions regarding strategies for water-management could be better answered. I believe that it would be necessary to live amongst households, most probably during the summer when there are water hardships, to witness the strategies. Ultimately, in becoming more intimate with the local village society, the sharp division of the expert and the local would start to fade. With repeated and extended exposure "how the boundaries between one apparent category of social actors and another are bridged, transformed, and shifted" would be uncovered (Crewe and Harrison 1998:19). Through longer and more intense exposure to the field area, I could then begin to explore the "complexity and multi-level nature of the development processes" (Crewe and Harrison 1998:19). Rather than focusing on two opposing perspectives in development, as I have done in examining the expert and the local category, additional questions would enable the research to be deepened to the inquiry of how the relationships and the interfaces of these relationships relate to development.

### 6.3. Strengths and weaknesses

A strength of this research has been to understand that while development work does not always have the outcome intended by the project, the unexpected results are positive. In addition, learning about water-management in a water-scarce environment is a valuable tool that can be applied globally. In saying this, it is pertinent to understand that neither development nor the effects of globalization are homogenous. Each village, city, individual and household responds differently to the stimuli of development in the particular condition in which it occurs.

Two additional strengths of this research relate to my main academic supervisor being the initiator of Project Rainkeep. A strength was that I felt pressured to think about critiques

of Project Rainkeep thoroughly before voicing them to Dr. LaBianca in order to present a balanced picture to him. A related strength is that I had ready access to information about the project implementation side of Project Rainkeep and Dr. LaBianca could guide me as I uncovered the details of the project.

A weakness that I would like to highlight was that the dichotomous positioning of ‘us versus them’ rarely became blurred categories throughout my research. I used these two main categories because of my needs as a novel researcher trying to understand the society in basic frames. I have personal experience in ‘studying a society’ from having lived three years in Norway over the last ten years. I will always remain an outsider to Norwegian society because I am not “ekte norsk” (a true Norwegian trans.ed). Based on these experiences, I am hesitant about making grand claims about understanding any society. Therefore, I chose to simplify a society into classic angles of how development is critiqued into groupings of us and them (Crewe and Harrison 1998).

General weaknesses of the study pertain to the short period of fieldwork and not knowing the language. After only two months of fieldwork, I question how much of the water system I actually understood. This was in part due to language barriers that affected the translation of the specifics of household water access.

#### 6.4. Main findings

The following summations answer the main research question: Did a development project alleviate suffering from water-scarcity and alter household water-management practices with the re-introduction of rainwater harvesting in village homes in Jordan?

1. Cisterns have been incorporated into the modern water-system in that they support a multiplex of collection techniques– pipes, tankers, and rainwater.
2. Cistern water was the preferred drinking water source and water quality was claimed to be good based on the temperature of the water.
3. Water-scarcity is based on various levels of need dependent upon whether one lives in Amman or a village and is an expert or a local.

4. Disconnect between the households and the aims of the project was apparent in the following ways:
  - i. The concept of sweat equity was seen by the ADRA as a way to stimulate attachment and future maintenance of the project, ie, “sustainability”. This concept did not work; ADRA claimed that the households were “lazy villagers” unwilling to help in the restoration work whereas the households claimed that they never got the chance to work because the ADRA arrived prepared to work with their own workers.
  - ii. Households didn’t know why they were chosen yet ADRA claimed that the target group was widows. But the households were not female-headed and the owners of the cisterns were for the most part male. This shows a lack of understanding on the part of the ADRA towards the division of property/household arrangements.
  - iii. The inscription from the Qur’an. ADRA claimed it was a way to mark the cisterns as not American yet the households did not feel that having an inscription was important. They answered that ADRA had placed this there on their own accord.
5. Water-sharing is a necessary and vital ethic on the part of the households.

The project did not alter household management practices but demonstrated support for the use of cisterns, which are useful for the storage of water and not necessarily just for rainwater collection. This raises the question of whether or not the use of development should be re-evaluated, given that there is seems to be an assumption of need that is not shared by the locals (Crewe and Harrison 1998). Project Rainkeep assumed a suffering of water-scarcity while it was most striking that the household perception of water-scarcity was not based on quantity of supply but on the presence of supply. The perception that water would be available was assurance enough to alleviate concerns about water-scarcity. This occurred on the local level without the necessary incursion of development. Access to water was ensured through water-sharing that disallow the hoarding of water to

someone in need. Hospitality, a highly valued trait in a person, would also ensure access to water.

In addition to specific findings related to the research question, this thesis has striven to produce a rough guide for future endeavours in development work in Jordan. In general, it could serve as a guide for NGO's and charity works, especially around the subject of water management.

### 6.5. Future work

Many lessons have been learned throughout the course of fieldwork. Based on findings presented by Malcolm Russell and Dorothy Irvin, Project Rainkeep did not succeed. Sweat equity was a failure, domestic water use is too low to affect the water budget, and restoration work compromised household water access. Yet contrary to Russell and Irvin's conclusions, this qualitative study has judged Project Rainkeep to be a success. Recipients voiced a continued need for assistance via development project to achieve greater water security. The cistern restoration work did not necessarily instigate a return to the practice of rainwater collection. Instead, the work of Project Rainkeep assured that members in the households felt that rainwater collection was safe for children and conduct in a clean structure. It is difficult to rely on rainwater collection as a water supply when the rains fall with unpredictability and infrequently.

In our current state of globalisation the knowledge about insufficient water supplies has been exchanged amongst states and institutions convening and shifting the ideology of water availability from plentiful to scarce (Ennis-McMillan 2006). Governments and large global institutions tend to focus on large infrastructure projects while what is needed in terms of helping the local household are left to the smaller aid projects, much like Project Rainkeep. These projects can be of benefit to the larger context of aid and government provision by providing an understanding for how policy and procedures are applied. For example, one realization that was discovered in fieldwork was that by definition rainwater harvesting cannot be conducted in Amman because the collection basin needs to be clean and higher than the cistern. This is not possible to achieve in

current apartment blocks with roof-top tanks. But what if this knowledge was used to build a new type of cistern? In general, policy is an ideal for behaviour and what occurs in the home is often not in strict adherence to the identified guidelines. Therefore, in understanding how people actually live, and in our case manage domestic water usage, a bottoms-up approach can be taken to address the burgeoning global crisis of water-scarcity.

It would be of interest to initiate a phase two of Project Rainkeep in one village instead of the scattering of villages. For example, some cisterns were never used before or after the restoration thus the benefits of restoring those particular cisterns were lost. In addition, rainwater harvesting is only possible when it rains so there should be greater flexibility in terms of project goals. For example, the restored cisterns were used by some households to hold government supplied or privately-purchased water and not necessarily just rainwater. This was deemed a project failure from the implementation side yet the restored cistern was appreciated by the households. A clearer identification of needs would be useful in achieving a 'successful' project. In general, a closer relationship between 'aid' and 'recipient' would lead to a project that is regarded as a success by all participants.

## Appendix 1.1. Project Guidelines

### Project Rainkeep Cistern Restoration Guidelines

The following have been found, through examination of ancient cisterns, and interviews and experience, to be important. In addition, knowledge and experience are important qualifications for anyone supervising a cistern restoration.

1. Sweat Equity--Family willingness to contribute their labor, as established in intake interview. Those unwilling or unable to work on restoration may be a poor bet for future management, cleaning, and maintenance of a restored cistern.
2. A clear picture of the family's water needs and water use patterns regarding municipal water, purchased tank water, and rainwater, as established in intake interview. What expectations does the rainkeep Project have about how a successful cistern repair will affect this pattern?
3. A clear picture of the family's economic situation, including the number of household members and their earning status, as established in intake interview. In general, a widowed mother or grandmother will never have the income possibilities of an employed male, or even an unemployed male, although she may have as many children depending on her.
4. A water collection area that is clean or can be made clean, whether on the ground or on the roof, as established in intake interview and inspection.
5. Clarity about the family's perception of what their cistern requires to function successfully for rainwater collection and storage, and respect for this perception.
6. Clear identification of the existing, functioning elements of the family's cistern, and good integration of these elements into the restoration plan, to avoid destruction of sturdy, beautiful, and successful cistern parts, and to avoid the expense of unnecessary duplication.
7. Elements of a functioning cistern:
  - A. Intact water storage container, no cracks or leaks
  - B. Sufficient clean or cleanable water collection area, on ground or roof of house.
  - C. Settling basin outside intake hole, to allow settling of some impurities
  - D. Screen over intake hole, to keep out some impurities
  - E. Intake hole, which can be entirely blocked when water is not flowing in, to keep out impurities
  - F. Rim which entirely encloses cistern opening, to prevent entrance of birds, snakes, rodents, garbage, dirt, etc.
  - G. Hinged child safety door, comprising
    1. larger door big enough to cover opening in rim (usually 50-70 cm. each way) to be opened for cleaning or for very large water buckets, and
    2. smaller door (approximately 35-40 cm. each way), to be opened for drawing water



## Appendix 1.2. Irvin Chart

Source: Dorothy Irvin's report from the twenty-seven cistern units worked on in 1995.

Chart produced July 31, 1996

Italic print is used on information gained from post completion interviews conducted by Dorothy Irvin in 1996

	Location	Beneficiary	Size	Qualities	Date of completion	Comments	Post completion evaluation
Pilot 1	Jalul					Cistern is filled with trucked in water, and kept padlocked	
Pilot 2	Bunaiyat	Umm Abdullah	s	The rim that ADRA built on this project was the more durable of the two types. It has a wall of cement blocks around the ground level opening, and the 4 edges of the cistern door rest on		Rashid was the cement mason-learned his trade in Beirut Due to failure of compliancy, beneficiary should not be offered further aid for rain collection (Irvin)	Umm Abdullah has violated her agreement to use her roof as a collection area, and is instead storing her pigeons there (but not when it rains, she says) As of 1996,

				this wall			the owner said cistern was in perfect condition, and showed no signs of wear
R2 and R3	Huwara		Large, about 10-13 meters across, 8 meters deep	Unroofed, and fenced with locked gate Operated well, caught lots of water, but also lots of trash, dead animals. Sunlight caused algae-impure drinking water	1995, ADRA Built a short wall around it - 1.5 meters Settling Basin Built	Irvin was not impressed. Felt that the work was not only incomplete, but in fact compromised the previous qualities of the cistern, namely safety and the ability to catch lots of water.	Wall prevents previous quantity of catchment water caught Too short to keep children out, therefore a safety risk Gate too small to let animals in, so water has to be taken out bucket by bucket
C1	Huwara		s			Was cleaned out as part of the restoration	

						project Is kept locked, although owners say that nearby neighbors know where the key is and are allowed to use the water	
C2	Maybe Huwara						Does not collect rainwater, is used to store trucked in water
C3	Maybe Huwara1						Does not collect rainwater, is used to store trucked in water
C4	al-Manara			Already holding water satisfactorily			Collecting rainwater as before PRK
C5	al- Manara			Already holding water satisfactorily			Collecting rainwater as before PRK

C6	Dalilet al-Matrat					Correlation btw. Collecting water and leakage: Irvin suggests that Those who cannot afford to buy water either do not or cannot afford cistern repair	Leaked after completion, did not hold water as of July, 1996 Collecting rainwater as before PRK
C7	Dalilet al-Matrat			Already holding water satisfactorily			Collecting rainwater as before PRK
C8	Libb			Already holding water satisfactorily			Collecting rainwater as before PRK
C9	Libb			Already holding water satisfactorily			Collecting rainwater as before PRK
C10	Libb			Already holding water satisfactorily			Does not collect rainwater, used to store trucked in water

C11	Libb	10 members in 2 houses		<i>Cistern used for drinking water- not primary source of water supply. Already holding water satisfactorily  Did not need inside restoration</i>		<i>Cleanliness of water may be a concern.</i>	<i>Collecting rainwater as before PRK  Family believes that the new hinged door as safer than the old one, and are happy with it.</i>
C12	Libb			Already holding water satisfactorily			
C13	Al Ghreiat, or al- Qryat	Omar Ahmad Brezat	Depth: 4 meters	Before repair: in good condition  Work done: no work on the inside, - none needed- , PRK built cement block rim, added child safety lit and	Aug. 15, 1995	<i>Correlation btw. Collecting water and leakage: Irvin suggests that Those who cannot afford to buy water either do not or cannot afford cistern repair</i>	Interview, July 9, 1996  Recipient asked for a child safety lid, which they received and were pleased with  <i>Leaked after completion,</i>

				watering trough			<i>did not hold water as of July, 1996 Collecting rainwater as before PRK</i>
C14	Al-Ghreiat			Already holding water satisfactorily			Collecting rainwater as before PRK
C15	Al Ghreiat					See comment C13	Leaked after completion, did not hold water as of July, 1996 Collecting rainwater as before PRK
C16	Al Naamiyeh						
C17						See comment C13	Leaked after completion, did not hold water as of July, 1996 Collecting rainwater as before PRK

C18	Al-Naamiyeh			Already holding water satisfactorily			Collecting rainwater as before PRK
C19	Ma'in			Already holding water satisfactorily		A pipe and a hose would enable water to cross two dirty areas: a road, and a pasture, to be collected from the roof	Collecting rainwater as before PRK
C20	Ma'in					See comment C13	Leaked after completion, did not hold water as of July, 1996 Collecting rainwater as before PRK
C21		Al-Faihah		Already holding water satisfactorily			
C22		Al-Faihah		Already holding water satisfactorily			

C23	Faisaliyah	Arab Women's Association				Possibly cleaned out as part of the restoration project	
C24							
C25	Al-Yusra			Already holding water satisfactorily			
C26	Al-Yusra			Already holding water satisfactorily			
C27	Al-Bunaiyat			Newly enlarged Plastered on the inside Currently holding truck water			
C28	Al-Faisaliya			Already holding water satisfactorily			

Maybe Huwara. Irvin's report names a "reservoir #2 and #3" as from this location- are reservoir, cistern, the same? Information on these two reservoirs are files as R unit 2 and R unit 3 to avoid confusion

*including one employed male age 32, family says that income is sufficient*



*They also supply their neighbors with drinking water. Other water is gained from the municipality and stored on their rooftop. They do not buy water except small fee to municipality (1.5-2.0 JD/Month)*

*Believed to have been cut around 1970 and in use ever since*

Family says that the cistern never goes dry (they never clean it)

*The family says that their water cistern is never dry- which means they never clean it out. It is 2 meters from the road and may collect some silt, oil, etc. there is no filter. Family is satisfied with the water cleanliness however.*

*According to Irvin, the family's water situation was satisfactory before PRK intervention and situation remains the same. States that the family believes they were chosen because of their visibility from the road, not because of their economic situation. Others who actually needed cisterns repaired were turned down.*

Location differs- referring to the same cistern?

Filled every year, even without much rain. Did not leak. Home made filter from a perforated lid.

#### **Appendix 4.1. List of Interview Questions**

These questions were memorized and asked when interviewing the households or the locals

Nihad introduces me as a master student from Norway looking at the impact of the restored cistern that ADRA worked on.

Then she always tells me that I can ask anything whereby I ask her if she can ask that it is okay that I write notes.

I start with.....

How did they/you hear about ADRA? Did they come here or did you come to them?

Do you know why ADRA picked you?

Do you remember the project? What did it fix?

How was the cistern previous to PR? What is a cistern?

How big is the cistern? How much rain/water does it collect/store? Why don't you collect rainwater?

Do you use it to collect rain?

Do you fill it with piped in water?

Is it your main source of water?

What do you use the water for? How much water do use in a day? In a month?

Is it good water quality? What is good water quality?

Do you prefer to use the cistern? Or would you prefer to just have pipes?

How much does piped water cost?

How many households use the cistern?

Would piped water be also shared by anyone?

Who owns the cistern and the land? Can women own property?

Does your neighbour have a cistern? Are there other cisterns in the area?

Did any neighbours or family members restore cisterns after ADRA?

Do you think cisterns are a good idea?

Who is responsible for looking after the cistern? Men, women, everyone...?

Did ADRA do good work? Any complaints?

Should they do more work in the future?

Why do you think ADRA had an inscription from the Qu'ran put on the cistern?

Do you feel that Islam tells people how to use water? Is water-sharing an important ethic from the Qu'ran?

Does Jordan have enough water for people?

Do you ever have a water shortage?

How do you manage with less water? What do you do differently?

## Appendix 4.2. New Chart

Date	Location	Present during interview	Physical properties of cistern	RWH or trucked	Water-quality	Families per cistern	Water-shared	What ADRA fixed	Amount of water used	Comments about ADRA	Relation to thesis question
22.11.05	Turkmenia in Al-Faysaliyya  Coded: Household One  36761677E 3514549N	Women 2, kids 2	7 meters deep, stone on lid	Trucked in from El-Larish.  Water ordering is men's work	Cistern – dirty, trucks – clean Good=warm in winter and cold in summer	4	Yes, will share with neighbour if they don't have enough water	Lid, trough, which led to child safety	20-30 days per filled cistern in summer, longer in winter	Grateful but asked for more help and was denied. ADRA was "done".  (returned 07.12.05)	Neg. water shortage, Reflections on development, Role of genders, comments about poverty
22.11.05	Turkmenia in Al-Faysaliyya  Coded: Household Two  36761695E 3514521N	Woman 1, sons 4, daughter-in-law 1	40 yrs old, hole was blow out, broken trough, no stone on lid  Trough 3 meters, raised trough in section closest to hole	Trucked	Cistern – dirty. Drink cistern water only if necessary. Same comment about temp	4 –5	Yes, will share	Lid, trough, which led to child safety	Didn't ask	His grandfather had hope that ADRA would return with pump. I will look into this  (returned 07.12.05)	Critique of development locally,
24.11.05	Al-Fayah  Coded: Household Three  36758960E 3512011N	Women 3, teenager 1, kids 2	20 meters wide, 12 meters deep in use, clean cistern every year	RAIN!!  If low rains, piped in water	Prefers rain. Use cistern for drinking and trees. Had tea, was soft and light	4	Yes, will share with strangers. Often in summer	Lid, trough, which led to child safety and clean water	Drink 1 liter day pp/5 liter for tea per household	Very happy. Good thing if ADRA did more work.  (returned 07.12.05)	RWH, maintenance
24.11.05	Al-Fayah  Coded: Household Four  36758891E 3512269N	Noone answered the door  Took photos  Neighbours to Hshld 3	Had water collection terrace, cistern at the bottom of slant, pipe from cistern bottom to	Assume rainwater Collection						Returned 07.12.05  Still not home	RWH

			field								
28.11.05	Libb Coded: Household Five  36762045E 3499853N	Women 2, elderly man 1, kids 3, employee from Libb Municipality	From Roman times.  25 meters deep, 7 meters wide.  Garbage in the ground trough to fill cistern	RWH only in cistern, used for drinking.  Piped for cleaning.	Prefer to drink rainwater, more healthy and tastes better.	8 but cistern is only for drinking.	Yes, and neighbours can use the water if necessary.	Lid. (there was no trough)	A filled cistern last from one winter to the next winter, one year.	Did good work and they would be grateful is this work continued in the future.	RWH, no water problems, Qu'ran inscription., Importance of pipes
28.11.05	Libb Coded: Household Six  36762088E 3499693N	Women 2, man from municipality	6 meters deep, 4 meters wide.  Right beside road	No RWH, area not clean enough (later told me that tea is made from rainwater)	Didn't ask	2 families and water is also used for trees.	Yes, anyone can use it.	Lid.	Didn't ask	Did good work. Ppl need their cisterns fixed, work like this in the future would be good.	Importance of pipes, how water supplied, Qu'ran inscription
28.11.05	Libb Coded: Household Seven  36761690E 3499950N	Women 3, man from municipality, my driver	Very clean cistern, stairs, rainwater collected from neighbouring school roof and chaneled down	RWH for drinking, only. Cistern collects rain.	Prefer to drink rainwater.	12 families	Yes, anybody in the village who wants or needs water can take it.	Lid.	Cistern gets filled with good rains.	Yes, did good work and would be grateful for future work.	RWH, no water problems, Qu'ran inscription
28.11.05	Libb Coded: Household Eight  36761662E 3499967N	Didn't interview	Turned into a toilet, haram.  Removed Qu'ran inscription due to haram					Assume Lid			Not in use, Qu'ran principles.
01.12.05	Al-Gyrat Coded: Household Nine	Didn't Interview	Not by a house, in a bedrock field  Two holes in	No water in it			Old man who showed us cistern said it is	Assume Lid			Empty, we found it – in Bani Haymiyya – district

	36754709E 3492574N		ground to collect rain				more use of those who live nearby				Basim said we wouldn't find!!
01.12.05	Al-Gyrat  Coded: Household Ten (Omrad Breizat)  36755288E 3492429N	Old man who knew ADRA sites, Omrad, Feeras, elderly woman briefly, woman	First one with a pump and pipes	Piped but three other non-restored cisterns used for RWH	Cistern is used for drinking, cleaning, and animals.  Doesn't have a farm.	10 families.	Yes, anyone can use it.	Lid and trough.	Didn't ask.	Did good work even though it is easy work cistern is safer for children now.	RWH on property, water-sharing ethic, sustainability of development.
01.12.05	Namiah (outside Al-Gyrat)  Not coded: Not restored by ADRA  36753756E 3493584N	Elderly woman, woman	Looks identical to ADRA's work,  8 months old	RWH and pipes							RWH, replication cistern  See: Bani Haymida Social Development Mr. Slaiman Addada
04.12.05	Dlilat Amteyrat  Coded: Household Eleven  36768768E 3503720N	Woman, two kids, Feeras	10-15 meters deep, two hole sin ground to collect rain.  Not much water	RWH and trucked in tank water	The cistern is not clean so they have to wait until sediments settle before drinking	One family, they don't own the cistern	The owner doesn't live in the area, he lets anyone use the cistern.	They weren't present when ADRA came.  Looks like trough and lid.	One trucked in tank fills cistern halfway.  Orders more water every 20-30 days.	Didn't ask.  They are new people.	RWH, price of water, ownership
04.12.05	Dlilat Amteyrat  Coded: Household Twelve  36768536E 3503778N	No-one	Located on the corner of two roads.  Collection holes in ground, one with dung.  Lid was metal w/2	Water in it but no houses nearby.  Did there used to be a house?  Why would							A mystery.

			stones. Trough approx 3 meters long.	ADRA fix this one?							
05.12.05	Huwara  Coded: Household Thirteen  36770184E 3509627N	No-one present, Owned by Mohammed Jazza Anoofad, son of the sheikh  PILOT!!	Outer barbed wire fence,  Natural hole, Maybe 10 m wide and 15 m deep		Empty			Brick fence 1.5 meter, catchment trough			First restored cistern, not in use
05.12.05	Huwara  Coded: Household Fourteen  36770226E 3509697N	Two men, not the owner.  Owner is Zial Nyif	Same as above but brick fence is closer to hole	RWH	Algae water, no- one uses it			Brick fence 1.5 meter, catchment trough, and sides of cistern			RWH, for agriculture ?
05.12.05	Bunayat  Coded: Household Fifteen  36773378E 3531810N	Man and kid, Feeras	Trough is gone, only Qu'ran inscription is left, filled with junk – helmet, ladder	Used to RWH							Building a road so the cistern has to be moved
05.12.05	Bunayat  Coded: Household Sixteen  36773544E 35319339N	Elderly woman, kid	Dirty, water in it, lid has resting stones	RWH and tanked water	Dirty water at present. Used for animals and planned olive tree farm	For the homes around the cistern – 3?	Yes, anyone can use it	Lid, trough	One tank fills the cistern 25%	Didn't ask	RWH, cost of water



06.12.05	Al-Manara  Coded: Household Seventeen  36775016E 3509838N	Elderly woman, kid, Feeras	Little water, 10 stones on the lid, cracked trough, only one with screens over the ground collection holes  Beside road  Longest trough – maybe 4-5 meters long	Used to be RWH	Not in use now due to PIPES	Her family	Yes, anyone can use it	Lid, trough	Uses pipes sometimes needs to be buy tanked in water	Very unhappy with ADRA. They didn't use enough cement.	Dissatisfied with ADRA, pipes - modernity
----------	--	----------------------------------	---	-------------------	-----------------------------------	---------------	------------------------------	----------------	--	---	--

### Appendix 4.3. Field notes

It needs to be noted that I didn't record the interviews so they are all filtered through my shorthand notes. The tenses switch back-and-forth because I am speaking to Nihad about the interviewees. At times, the grammar is painful but that is either how it came out or how the shorthand reads. Towards the end of my interviews I tried to occasionally capture verbatim what Nihad said more as an experiment to demonstrate how the dialogue was being conveyed. At other times, I am actually speaking to Nihad, my translator, or thinking, which is demonstrated by parentheses.

Nihad was not present for the 'expert' interviews as these were conducted in English.

Also the names of towns and people are transliterated from Arabic to English and will therefore vary in the spelling. There has been a GPS reading of each site found so that the location will be possible to find again should the name change in the future.

November 22, 2005

Place: Turkmenia in Faysaliyya

Household 1: maid (f), mother-in-law, kids 1f and 1male

Photographed the cistern outside, two stones holding the lid down, Josef Aboulabrad, our host from the Municipality of Faysaliyya, asked at the door if we could come in.

We took our muddy shoes off at the entrance and sat on our legs on the sofa mats.

Nihad introduced my purpose and the maid went and got the mother-in-law because she herself had only lived in that house for two years.

Nihad reintroduced me.

The old woman had very dry hands but a kind and gentle manner.

Was the cistern here before PR? Yes it was already present.

What did PR contribute? The safety lid and they built the trough for animals to drink from.

Was PR a good thing? Yes, it was a good thing because it protects their children.

How did they find out about PR? Neighbour heard about PR and went and asked for help and told PR that their neighbour needed help as well.

Is the cistern the main source for water? Yes, for people and animals.

What is the water quality like? It is filled with piped water, so the quality is good.

Does it catch rainwater? No never, rainwater is dirty.

How many families use the cistern? We will share with our neighbour if they don't have water.

Are your neighbours in your family? Yes, we are all in the same family.

How much water does your family use? A filled cistern will last about 20-30 days in the summer and longer in the winter.

How do people survive with water-shortages? They wait to do the chores like washing until the water trucks come.

When does the water truck come? Have to go and order water from the pumping station at El-Larish. This is where the water trucks fill up on water from the ground.

How do you feel about foreigners working with PR? Grateful.

What about the Iraqi engineer? I heard he made some mistakes. No, his work was good and there are no problems.

In the future, would it be good to have another project? Yes, this would be a good thing.

When do they have water-shortages? From the end of May to the beginning of October.

The water gets pumped every Wednesday.

Men are responsible for ordering the water – that is men’s work, women can’t go there.

Who takes the water from the cistern? Woman.

Every year the family grows so there is a bigger need for more cisterns.

How many families use this cistern? Four and they have one old cistern here and they asked for help from PR but they said “their work is done here”.

People don’t have a lot of money so they need help.

The water system is from pumped groundwater (El-Larish) to cisterns – rooftop tanks – pipes in the house.

How deep is this cistern? 7 meters.

Water quality is good because the water is warm in the winter and cold in the summer, must have something to do with nature.

Tell them that they can ask me any questions. The women laughed.

Place: Turkmenia in Faysaliyya

Household 2: mother, four sons, daughter-in-law, this cistern had less water and the trough was broken, no stone on the lid

Remembers PR.

Cistern is used for cleaning and animals, they don't use the water for drinking because the cistern is not clean enough. Things fall in like stones when they open the lid.

The rooftop tank is used for drinking water.

Sometimes we drink the water in the cisterns if there is nothing else.

Doesn't remember PR so well because it was 10 years ago (the second oldest son says, he was only a teenager then as he puts to one of his younger brothers)

Was PR good? Yes, it is good for the children's safety and keeps objects out (the lid) and the trough building is good for the animals.

What did they use before PR to cover the cistern? They bought covers like a piece of metal to protect the children.

Best thing about PR? Yes, main thing was the lid and trough.

How many families use the cistern? Four to five families and they allow others if they have a water-shortage.

How is it shared? Houses around the cistern can use them and across the street the same for them and their neighbours.

Is PR a good thing? Yes.

Do all the neighbours have cisterns? One used to have an old cistern but it is covered now. Neighbours don't have cisterns. One neighbour has a new cistern that he made two years ago.

ADRA promised better cisterns for people and animals in the future but never came back and didn't do anything. ADRA promised pumps from cisterns to tanks and troughs for the animals.

Are you mad at ADRA? No, his grandfather had hope for him and his neighbour to have pumps.

Why did ADRA do this? We are grateful but don't know why they didn't come back.

He suggests that someone should come back every five years.

Anybody have any questions for me? Yes, what is your name?

Water is cold in summer and warm in winter, this is good.

ADRA contributed the lid and trough and made the family dig (I try to explain sweat equity, which Nihad finds weird)

Do they think it was weird to have do dig? No, they think it was a good thing.

This cistern is forty years old and was made by exploding a hole.

Does the cistern collect rainwater? No, it is too high off the ground to collect rain.

A collection of my thoughts: social science research in all its glory cannot be rigidly ascribed to. The interviews in these two settings needed to flow along in a more conversational manner. Nihad first described me as a master student from Norway and

the purpose of my research is to talk about PR and ADRA. Then she asked the people if they mind if I write down notes while they are talking. Household 1 didn't hesitate while household 2 did slightly but it was okay still. Household 1 had no men present and the older woman spoke freely while household two the mother needed more prompting and it was the two oldest sons who spoke the most. What I notice about the conversation here is that both men and woman speak. The conversation seems equal in time and voice. Nihad has no problem taking me places and describing our purpose. The municipality was quick to supply us with one of their staff Josef, who towards the end asked for my address, which Nihad asked me if I wanted to give it out to him. She said that she wouldn't give out her address to anyone other than family, that I couldn't give it out to everyone that I meet. So I listened to her and said no, tell him I have no address, that I am a nomad, that I am Bedoian. She laughed. But Josef pressed on and asked for Labianca and where ADRA's main base is so I gave him Labianca's card (in the car) and said that ADRA is based in Canada during coffee with Abdel Hadi Ashrah or Aboun Hamoud who claimed to be in the photograph with Oystein. Josef said that Canada was also helping to take care of sheep in Faysaliyya. We tried to find two cisterns in Al-Yusra but didn't. Was told that they were behind this hill, after first walking up a hill, what we found were cisterns but they were not restored by ADRA. They were carved right into the limestone. One of them was a HUGE underground cave that has we fallen in....

The interview process went along so fast. I had to think quickly on my feet in order to get all the questions out and I still have questions. I have to really trust Nihad and her explanation and translation. I doubt that it is all being translated just because there will be a long paragraph in Arabic boiled down to one or two sentences in English.

Some common themes were: to mention the willingness to share water with neighbours; the temperature of the water being warm in winter and cold in the summer as an indication of good water quality; numbers of families per cistern was the same; being grateful for PR, cisterns bring there before PR.

I would like to return to household number two after I have had some contact with ADRA.

The people didn't mind interviewing and talking to me. In household 1 we got sweet tea. In household 2 we got sweet coffee and gas heater.

The one son in household 2 was so cute and flirty shy, staring and staring until I looked away.

Questions for myself – how is neighbour defined? What is the family unit? The brothers laughed when I asked if their sister-in-law was their sister. ADRA needs sustainability – sweat equity didn't work in household 2.

**I NEED TO CONTACT ADRA!!!**

What is my role in these homes? The oldest brother in household 2 seemed to be requesting me to get in touch with ADRA, which I offered to do but I had Nihad explain that I can't do anything – I have no wasta!!

Wasta is a concept that illicitly shy giggles from people.....don't quite understand why or what this is about.

The modern method of blowing up a hole to make digging for cisterns easier.

Some metacmn norms incl – weak, weak handshake, accepting offers of coffee or tea, taking off shoes at door, sitting on legs, say my name but it is not necessary when I am standing, Nihad explains who I am when I when we are sitting. **JUST COPY PEOPLE!!!!**

The second oldest brother of household 2 says he wants to go to New York but says no money, no money chimes his younger two brothers.

Date: November 23<sup>rd</sup> 2005

Place: Hamed Bakir, World Health Organization, Amman Jordan



Setting: His office, I came 40 minutes early but only had to wait one minute. He spoke to me for about an hour, gave me a contact, and mentioned that I could go up to WHO library on the second floor. When I asked if he minded that I record the interview he said that he did mind, therefore, the following information has been rewritten based on my rapid notes that were taken during this lecture –style interview.

What is your educational background? Are you Jordanian? I am a civil engineer and I did my postgraduate degree with a focus on water in Britain. No, I am Palestinian/American or American/Palestinian however you say it.

What is Amman's main source of water? It is groundwater, the Jordan River..I wish to reframe from answering that because I do not want to give you incorrect information but I can give you the email of a friend who works in the Ministry of Water and Irrigation. She might be able to answer your questions about Jordan. I work on the regional area not specifically Jordan. Water-scarcity is a threat to health and that is our concern at WHO. In 1993 WHO was the first organization to look at water-scarcity in this way and then we held further conferences in 1996 and 2001 and 2003. We started talking about demand management then, which was a new idea for people. The “missing link” in water management is demand water management, which includes efficient use and allocation of water and environmental protection and pollution control of water.

When did Jordan start using demand management? WHO focuses on the region of Eastern Mediterranean that runs from Morocco to Syria to Sudan and includes twenty-three countries. What I could say about Jordan would be things that I have observed and is my opinion not facts.

In your article you mention some of the demands on the water supply – could you expand on those such as rapid population growth, urbanization, and socioeconomic development? I have read in other articles it discussed that rapid population growth is related to the American involvement in Iraq and the need for people to return home or leave. I would be especially interested if you could expand upon the definition of socioeconomic

development... This is what I call the three A's – Assessment, Analyse, and Action. There are underlying causes, structural causes, and water-management driven causes. (He tells a story about a child with diarrhea to illustrate the point of levels of analysis and action...the pt is a bit lost on me...). Traditionally, water-management has been premised on the engineering idea that “we want” and okay the requested amount is supplied. This is what I call the “supply mentality” – you need more water and I give it to you. Now, there is a limit to the amount of water available which is affected by climate and geographical conditions, which the Gulf area can't do anything about so I tell them to forget about it because it goes beyond the control of water-management and population growth also goes beyond the control of water-management. Socioeconomic development changes due to health improvements, better education, and longer life expectancy – I call these structural causes. We can't deny a country wanting to grow and develop and expand their economy. There are enough people working on these things and public awareness. What I am talking about is management-induced conditions. The individual's consumption in the home means almost nothing. The domestic user is a small piece of the pie and doesn't matter that much. People are often wrong about that. Fifty percent of water waste is lost in the distribution system through leaky pipes, also water is significantly lost in industry and agricultural practices. There is a “water budget” that looks at water allocation for the three main sectors of domestic, industrial, and agriculture. This is an ad hoc distribution, not planned, and nobody knows why. If you look at water as money you have to ask who is bringing back a profit? If you give agriculture 70 dollars and they bring back 60 then the country is losing money but if you give 20 to industry and they bring back more then...but you also have to consider the social benefits of those who don't bring back more. You have to give to the sectors that are using the water more efficiently and give better returns to the economy. You have to also consider pollution as eating away at the resource. That is why pollution control is very important because it is no good if the water gets misused by pollution. People tend to use more water than they have, that is a problem. Supply management deals with structural, ie natural, conditions whereas demand management deals with management-induced causes. Often people think that conservation of water is demand management but that is wrong. Conservation is a part of demand management.

Thank you that was a very good explanation. Basically, management-induced conditions lead to water-scarcity – water-shortage – water-stress, which leads to loss of development and to loss of health.

Where does tourism as a sector in the water budget fit into? It is of course better for the business if the tourist conserves water but “commercial applications” are making money. I think that there should be “no cheap water for tourists” – if they use they should pay for it. For example, if it costs 1 dollar per cubic meter the tourist is charged 5 dollars per cubic meter.

Have you seen improvements in the region with the practices of the largest water users, ie, in irrigation and leaky pipes? Accepting demand management took time. In 1998 I was invited to speak at a conference about Integrated Water Resource Management about the Gulf States. I decided to change my talk when I noticed in the program that the focus was on the resource and how to get at it rather than efficient use. I said that they needed to change right now at this conference. I think lots of governments are changing and making progress. In 2004 the Jordanian government sponsored a conference on water demand management.

Was the WHO responsible for starting the discussion about water demand management? No, the idea came from other places but the WHO has had a hand in helping to promote and define demand water management theory but the WHO is not the brainchild of it. The WHO is not a water-management agency, their concern is with health.

I have one last question. The project I am evaluating, Project Rainkeep, which was sponsored by ADRA, a branch of the Canadian government worked on restoring cisterns. They felt it was important to have a verse from the Qu’ran inscribed on the side of each restored cistern. I have read a lot about the conjunction of Islam and water demand management theory; does the WHO consider the principles of water use in the Qu’ran important to water demand management? No. Islamic, Christian, Jewish, Hindu water-management approach is not about religion. I am speaking personally and I am a Muslim myself. Islamic teaching doesn’t harm nature and this may be the only religion that talks

about nature in a practical manner and because Islam arose from the Saudi Arabian Peninsula where the climatic conditions are very harsh. Islam doesn't talk about water-management, or child protection, or quitting smoking, or anything like this but there are of course "religious channels" to communicate through about these things. No, there is no such thing as Islamic demand water management theory. I was asked to speak at a conference sponsored by the Canadian government about Islam and conservation and I said no because I don't believe it. The promotion of demand management is about management. In summary, demand management is about asking...someone says I need ten trucks of water and you ask why? Do you have a garden? Ok, you don't need the grass so we take away the water for that. Do you recycle water? Do you have water-saving appliances? It is the same if a farmer asks, for example, to grow bananas and wants 100 cubic meters. We ask is there a market for this? This is a feasibility study. Question the legitimacy of the use of water that is demand management.

So is desalination seen as supply management? Yes. But that doesn't mean that you can't develop more resources under demand management but you have to exhaust all the current resources before you develop more new ones.

I thanked him for meeting with me and he said that he wished he could be of more help!!

My thoughts about the interview: market? Feasibility? Water is money...I had to put aside my values and my politics in order to stay open to listen to Hamed. He explained things well and I feel like I have a better idea but I also feel like since he works on the regional he couldn't talk about the local, which I feel is the typical approach for big institutions. It was good to have some of my beliefs confirmed but also disappointing. He is positive that the situation is improving but it was also interesting that he only wanted to focus on water demand management and not the structural factors....I would think that would expand the knowledge but I guess having a simple equation water = money is what works. I hope his Ministry contact pans out but after today I feel like I want to talk to some social activists!! Demand management is important and yes the Gulf has to work with what they have and I agree with this but still the mention of the market in conjunction with the importance of water doesn't bode well with me. A comment about

the fieldnotes is that he spoke very eloquently and my chicken scratch does not do what he told me justice.

Date: November 24<sup>th</sup>, 2005

Place: Al-Fayah, further down the road from Al-Faysaliyya

Household 3: three women, one teenager (f), three kids

Setting: We were approached by the teenage girl and she asked and we were invited in to sit in the entrance of the house. Served here my first glass of rainwater tea!! Was very good and fresh, in fact, drank two glasses. Nihad introduced me. Note to self – get Nihad to type out in Arabic what she says about me. Midway in the interview we are offered breakfast but decline. I take Nihad's cue to decline but then when I say no she immediately asks if I am sure.

How did you here about PR? ADRA came here by themselves. The cistern was a disaster before PR.

The cistern was a disaster before PR? What was wrong with the cistern? It was not safe for children and it wasn't clean.

Did it collect rain before PR? Yes.

Now does it collect rain? We clean it every year, collect rain, and use the water for drinking and water for our trees.

How much rain is collected? Depends on the rain, If good, the cistern fills up.

How big is the cistern? 20 meters wide and twelve meters deep.

Is the cistern filled up with piped water? If the rainfall is not good then we use piped water.

Do you prefer piped or rain water? Rain. Rainwater tastes better.

I have never had rainwater! This tea is made from rainwater. This water is very clean.

How many families use this cistern? Four, all brothers and we allow anyone passing by to take water.

Hum, this is something I hear a lot. How often does this happen that a stranger takes water? Often, people are passing by often but more in the summer.

One woman, teenager, and kid leave. They had to go somewhere.

Two women start talking.

The water is warm in the winter, this is good.

Why is this? Because it is so deep in the ground.

I say that they can ask me anything.

Do they know where the other cistern is? Yes, close to here.

Are they a different family? Yes, another family.

The cistern is better than before because it is safer.

Why? Before ADRA the lid was made from stones then ADRA came and replaced the lid with an easier one.

Are they happy with ADRA's work? Yes, they are happy. It will be good if ADRA does more work in the future.

Do they need more cisterns as their families grow? They are satisfied with this cistern. It will remain the four families here as one gets married they build a new house and they have a need for their own cistern then.

In collecting the rainwater they can't open the lid for the first and second time when it rains because it is not clean. You have to wait until the third or fourth time it rains to collect the water.

(I clarify. The rain washes the area around the cistern which cleans it).

Maybe this is a weird question...How much water do you drink as a person? As an individual? They can't answer how much for one person. (Nihad suggests asking about for the month. I explain that where I come from everything is measured, which she translates to them). Maybe one liter, five liters for tea for the household per day.

They mention that I can ask anything.

What type of farm do you have? Olives and grapes.

What uses the most water? Olives.

(Nihad says she wants to ask a question) Was ADRA good? Yes.

Everything about ADRA? Yes, but they only made the lid.

Not the trough? Yes, they did that one too.

But it is so short. This is because this used to be the lid before and the other one for the sheep (don't quite understand..)

Since you said I could ask anything, is it weird for me to come around and ask questions since PR was ten years ago? At first but when Nihad explained that it is research then it was okay.

Notes to self: I switch the tenses from you and they in the notes because it will all get changed in the translation through Nihad anyway. I asked her to ask “them” something and she says either “they” or “you” back to me. It went well. Very cute kids again both the boy and girl. The one woman inquired if I was married, to which Nihad replied no and I added no, not yet. These last two women were married to the brothers, which I clarified through Nihad that it is normal for the women to leave their family house. I didn’t have any strong impressions from this interview. Interesting how water-sharing is ALWAYS mentioned after I ask how many households/families use the cistern. There must be a relation. I need to start asking about the Qu’ran inscription. Thus far it seems like PR restored cisterns for one family set and then their neighbour. I commented to Nihad about how great it is that everyone will talk to me and she replied that Jordanians are like that but especially people in the village. When we were driving back to Amman, Feeraz asked about my day as he had asked about the previous days when I started this morning. I notice that Nihad calls this “our work” and says our work is good now, which I agree with. I want her to feel active in this process. I also notice, maybe now that I am reading Fernea’s book, that conversationally both genders seem equal but that Feeraz is given 2.5x the pay of Nihad, plus I noticed that she slipped him money for the gas today, and she gave him most of the green pepper and more of the yogurt sandwich. She shared her food with me. Hum...what is at work here? Inequality or just the idea that men eat more?

Date: November 24<sup>th</sup>, 2005

Place: Al-Fayah further down the road from Al-Faysaliyya

Household four: no-one was home; at least they didn’t answer the door.



Setting: Photographed the cistern. There was a collection terrace and a pipe from the bottom leading to the olive garden.

Date: November 27<sup>th</sup>, 2005

Place: At ACOR an interview with Basim Aziz, former director of ADRA Jordan, which had supported Project Rainkeep

I attempt to get an understanding of who he is by asking a bit about his educational background.

I ask if I can take notes but even though he says yes he watches me as I do so.

We talk about the beginnings of the project. He says that USAID denied helping this project because they were worried about how the project would control pollution and how could they guarantee that the people would not use the cisterns to fill up with pumped water. He says it straight out – “The project didn’t succeed”. USAID was right. The people used pumped water and then they started using the water liberally and using more than they needed. They never cleaned the cisterns. There were so many negatives with the project.

What was positive about the project? Well before the people used to collect water in barrels and with the project they used cisterns.

I am trying to find the sites but there is no information...yes, when ADRA closed in Jordan by law the Ministry of Social Development took the files and the project director was a civil engineer from Iraq lives in New Zealand now. I didn’t go to more than one of the sites myself.

(He looks over the list) You won’t find them in Naiyat because that area is almost empty now. The sheikh we helped is most certainly dead now as I visited him five years ago and he was very sick. I tried to find the cisterns in Bani-Hameda and couldn’t find them

myself. I know it was at the end of a village, one was for a school and the other one was across the street. There is another one on the way to Mount Nebo on a farm run by the Arab Woman's Society.

What about in Ma'in? Yes, it is in the village, on the side of a hill. But you see this was ten years ago and people won't know unless you find that person. The ones you found in Al-Faysaliyya are the easiest ones to find.

There was a list of 300 cisterns and thirty-two were chosen but some of the problems with the project was that the transportation was pricey and the project director lived in Amman and was hired for three-four months, which is a high salary. Plus we needed Syrians to replaster the cisterns because they were specialists in this craft so we had to find the people and we needed to clean the cisterns. The amount of work on some was more than on others. We had expected owner cooperation and we had the money from ADRA to spend in three months and then the families didn't want to help so they (the project) had to do the cleaning and it is terrible work. You have to come up every five minutes for some fresh air.

So then who started Project Rainkeep? Did it stem from Sten Labianca? No, I would say it was many people, the archaeology team in Madaba discovered that in Roman times the population in Jordan was higher than it is now and they were reliant on cisterns. They had found about 300 cisterns in the Madaba area. USAID wanted ACOR and ADRA to partner but ACOR wanted 42% of the budget. At that time they had applied for half a million so that was nearly 300,000 dollars, which is a lot of money. So then USAID didn't support the project but we had the money from ADRA.

Why didn't people clean the cisterns? They are lazy. And they use them for their gardens and animals. It is women who are doing the work but it is a man's job but the men don't want to do it.

And the project was just for people? Yes.

But I thought also for helping their animals. Yes, also to help their animals.

But not for their gardens. Yes, not for their gardens.

How did you select the thirty-two households from the list of three hundred? This was a pioneer project and we wanted to select villages far apart from one another. If it wasn't a pilot project we would have chosen one village and done the entire project in one area.

You won't find the cisterns. Jordan is a changing country. Let me tell you a story. The sheikh in Huwara told me that I could buy 1000 square meters for 1000 JD and now it is over 50,000 JD to buy land there. Jordan is developing and things are changed here now. If I buy some land and there is a small cistern on it – what I am going to do with it? (snorts). If someone has land that they bought for 500 JD then they won't sell it but if they get offered 30,000 - 40,000 JD then they sell it and move away. I think you will have a hard time finding the people. We know that 90% of village people move away every year so maybe you will find the cistern but not the people.

Yes, that is happening everywhere, in Canada too, people making a profit.

So who uses cisterns? Only in villages? Yes.

Another question I have is about placing the verse from the Qur'an on the cisterns, why was this important? The Qur'an verse reads "We created everything from water". There are three reasons why we did this. Number one – we wanted to show that this was not an American project, number two – the verse speaks about the importance of water to people, and number three – to prevent someone from damaging the cistern by showing who had worked on it.

I have read in Malcolm Russell's report that there were some disputes that arose from the project. After a cistern was restored someone else would appear and claim to own the land and the cistern then before the restoration work had begun...yes, that has to do with

land and inheritance. The children share the land and different brothers can show up and claim to own the land.

We have been going to the municipalities to ask them if they know where the cisterns are located...No, they won't know. I would say that there are no files because when ADRA closed the Ministry of Social Development, the minister, said if it has to do with water I don't care. So we had no approval from anyone. There is no file anywhere about the project. There were files with everything – the location, the person's name, etc – but no more.

I personally think what I am working on now with reproductive health is much more interesting. We have four things we do. Number one – we give out birth control, UID's, tablets, pills, and condoms. Each woman is contacted four times personally has a follow-up at six-week intervals by a local woman from the area (I asked how they get the women to speak about such personal matters to a strangers). We work in the whole country in 140 towns. The Qu'ran speaks about withdrawal and we talk to them give them condoms. Number two – preventive breast cancer checks. Number three – Pre and postnatal care, and number four – STD's.

Who funds this? USAID.

He gives me his home telephone number and mentions that his wife is traveling so he doesn't go home before 7:30 or 8:00 pm but if I call and no-one answers then I call back...

My reactions: wow, here is the city/village divide. They are lazy? How does he know how these people are behaving when he only went to one of the sites? I don't get it. Where is he getting his statements from? Didn't like him. He was crisp in his responses although it was great that he come here to see he and he had some juicy quotes. Again, I found that I had to check my politics at the door in order to be able to listen to him. Good to know the problems of this project but I would like to focus on the positives.

Date: November 28<sup>th</sup>, 2005

Location: Libb

Household Five: two women, one elderly, one elderly man, and three kids in the periphery to us. This cistern has no trough. We were brought into a lovely sitting room with red plush sofas and pillows. We were served rainwater coffee and rainwater tea. The elderly woman kept getting up and leaving the room.

Nihad explains who I am...and the interview starts. She confirms that it is okay that I write things down (almost seems like this is unimportant and by bringing it to people's attention makes it worse).

Do you remember when the project came? Yes, she was there. They came by themselves and said that they wanted to fix her cisterns. They came with workers.

Was she using the cistern previous to the project? Yes, for drinking.

To collect rainwater? Yes, before and after.

Can she collect enough rain or does she need tanks? Rain is enough. They don't need to buy water. Her neighbour can use the water if necessary.

How many households use the cistern? Eight but only to drink.

How do they get the water out of the cistern – with a bucket or a pump? With a bucket.

It is commented that this coffee is made from rainwater.

How big is the cistern? It is from Roman times. 25 meters deep and 7 meters wide.

Does it get filled up by the rain? Heavy rains yes. The first rain they don't open the lid to clean the area first (the channel here was filled with garbage) and then they collect the rain after it is clean and they leave the lid open until it fills.

How much water do they use? A filled cistern lasts how long? From winter to winter, one year.

When does it normally rain? When it starts raining, hard to predict. (Right, a stupid question gets a stupid answer!!)

What did ADRA fix? The lid.

Not the inside? No, just the lid.

After their cistern was fixed did their neighbours also want to fix a cistern? Their neighbours didn't say anything but ADRA fixed two others in the area. One was next to a school.

Does everyone in the area use cisterns? Don't know. Another family uses a cistern.

Are there pipes to the villages or do people have to use cisterns? There are pipes. Cisterns are only for drinking and piped water is used for cleaning the house and washing.

Is that because they prefer the taste of rain? Yes, it is more healthy and tastes better.

Do you ever have water problems? Nowadays no. In the past there wasn't enough water.

What has changed? Pipes came and the cistern water could just be used for drinking.

Can we ask about the inscription from the Qu'ran – why do they think it is important?

No-one can live without water, everyone needs water. ADRA did that by themselves, we didn't ask. It is important because it shows the importance of water.

Did ADRA do good work? Yes they did.

Should they do more work in the future? They like the idea of this work continuing in the future. They would be grateful.

Date: November 28<sup>th</sup>,2005

Place: Libb

Household Six: Two women, an older neighbour greets us, man from the municipality sits in on the interview. They are waiting to clean so the room is in slight disarray. A TV blares on in the background coming from the room next door. We are served tea, which they tell us is made from rain (after they told us that they don't collect rain)

Nihad introduces me and we begin. She says the usual it is okay you can ask anything.

Were they here when the project came? Yes.

Did the project come here or did they go to it? ADRA came to them.

Were they using the cistern before and after? Yes, both.

To collect rain? No, for piped water and tankers. The area is not clean enough to collect rain (this I would agree with as the cistern is RIGHT beside a road).

It has never been used to collect rain? No.

What did ADRA fix? Only the lid.

How big is the cistern? 6 meters deep and 4 meters wide.

How many families use it? Two families and anyone else can use it. The water is also used for trees.

Is this their main source? No, rooftop tank is filled with piped and trucked water.

Are they satisfied with ADRA? Yes, it is good work.

What about future work? They would like this. People need their cisterns fixed.

Do their neighbours have cisterns? Their neighbour has but not fixed by ADRA. They only fixed cisterns alongside roads.

What else should I ask...oh! What about the inscription? They put the inscription on by themselves. She doesn't know why. (I ask Nihad if we should tell them why – I am referring to what Basim said so that people would know that the project is not American..she hastily says no, that would not be a good idea).

Have they ever had water problems? Yes in the past but no problems now because they have pipes now.

Do the pipes always provide enough water? It comes one day a week. It is enough.

How do they know when the water is coming? Is it advertised in the newspaper? No, the water authority tells them. Each town has a specific day.

How many hours does the water get turned on for? Half a day.

Any questions for me? Yes, why am I asking about the cisterns? I explain because my boss asked me to. That he is an archaeologist who had discovered many cisterns and he wanted to help the people of Jordan (here I take on Hilda's advice to say that the project was for the people, which it was!).



One of the women comments that other people would like their cisterns fixed.

What did they use before as lids? Metal but it was not as good.

Did they buy the metal or find it? They bought it in a market.

I suppose it was missing the hinge? Yes, it had no hinge.

Nihad decides to ask- What exactly did they like about ADRA's work? That they put a lid on it. (She tells me that she asked this because the other families mentioned children's safety).

Do they use buckets or pumps to get the water out of the cistern? Bucket.

Oh, one last question. Where does the piped water come from? Larish and el-Walla.

Is el-Walla groundwater? No, it is spring water.

Tell them I apologize for interrupting their cleaning. No, it is okay because we are waiting for the water from the pipes to be turned on.

Oh, Monday is the day for water here? Yes.

She ends up by taking me outside and showing me the cistern. She scoops some water up and pours it dramatically back in to the cistern (it was a Kodak moment).

Date: November 28<sup>th</sup>, 2005

Place: Libb

Household Seven: Three women, two elderly. One with facial tattoos. The cistern area is very clean and the only one that I have seen with stairs. The rainwater is collected from

the roof of the neighbouring girls school roof. When we arrive one of the women is scooping out water and pouring it through a cloth into a bucket. There is a lock on the lid but when she closes it she just hooks in the lock and doesn't snap it shut.

We are given chairs outside in the shade, me, Nihad, Feeraz, and man from Libb municipality who had accompanied us all day. The old woman sits on the ground. I try to offer my chair but she refuses. I try again but she continues to protest so I sit down. I am unsure as to the protocol here, ie, how many times I should offer.

Nihad says you can ask her questions she has already been talking about the cistern. Oh, what did she say? She said that she collects rain.

Only rain in the cistern? They use the cistern for drinking for tea and coffee. And they used piped water to clean? Yes, for cleaning and washing.

Do they remember ADRA? Yes, use only rainwater in cisterns.

Did ADRA come by themselves? Yes, they came by themselves.

How big is the cistern? Doesn't know. It is very deep.

How many families use the cistern? Twelve and anybody in the village who wants or needs water can take it if they need it.

But I noticed a lock on the lid....? That is to keep the children safe.

What did ADRA fix? Just the lid. They didn't fix the inside.

Can we ask about the Qu'ran inscription? It is a good thing because everyone needs water and that is what it says.

Did ADRA do a good job? Yes. Should they do work in the future? Yes, they would be grateful for work in the future.

Do they ever have water problems? No.

Tell them they can ask me anything. The youngest woman asks why I am asking about their cistern? I start to explain my boss etc and then I just say to Nihad you know why just tell them the answer (okay, we are both getting tired and this is lazy research but it is true!! Hopefully it doesn't set a precedent for Nihad to quit asking me, which I doubt. She is very good about telling me that I can ask anything and she asks all my questions even if I think that I have the answer myself and start to answer them..).

I ask Nihad what else we should ask. She says what about the steps? It is because it is high and it is easier to get water from the buckets.

Do they prefer to drink rainwater? Yes, they prefer it.

Do they know where piped water comes from? From the water authority.

Does the cistern ever get filled? Yes, in a good year when the rain comes. They only use it to drink from (meaning that is why there is enough water).

So all that cement work on the cistern was done before ADRA? No, it is ADRA's work.

So it was at ground level before? Yes, they did the lid. (I understand now – lid refers to everything about ground level and Nihad apologizes for not explaining this to me. I say it is no problem).

Date: November 28<sup>th</sup>, 2005

Place: Libb

Household Eight: The Qu'ran inscription is removed. Nihad says that is because they use the cistern for haram – the toilet. The top is closed off and there is a black pipe feeding into it from the house. We don't interview anyone here. We are tired and they are obviously not collecting rainwater!!

Some of my day's thoughts: Decided to tell Nihad about most of what Basim said but I left out the part about him saying village people are lazy because she is from a village herself and I found this to be such a ridiculous statement. I am also working on finding common grounds with her and surprisingly at the end of the day we got on the topic of tattoos and she said she really likes them and wishes that they were not haram in Islam. I tell her that I have three big ones but I keep them covered here because I know that they are haram and she nods in agreement but then laughingly says to me that I must show her my tattoos one day. I guess what I am starting to feel today is that the patterns of the interviews and responses along with the diversity that exists amongst the participants is appearing. One of the sentences that I find to be prescription is whenever I ask how many families use the cistern a number is given and then closely followed by but their neighbour/family/stranger/anybody can take the water too if they need it. How does this sentiment fit in with Islam? Or is it a survival strategy developed in a harsh climate?

The inscription from the Qu'ran – could ADRA have placed it there because they themselves are a religious organization?

The toilet and haram...I am starting to wonder if my frequent requests to use the bathroom is bordering haram. I have noticed that Feeraz never asks and that Nihad has asked only once and I was surprised.

Date: 01.12.05

Location: Al-Gyrat

Household Nine: This cistern was not by a house and across from an elementary school. When I asked the elderly man who had shown us the cistern he said it was owned by a

Mahammoud and his brother. I inquired if it belonged to the school (I needed to check because Basim had said that ADRA had restored one in this area for a school). No, it did not belong to the school but to these two men.

Who was it for? For the people and the houses nearest to the cistern.

But when we looked inside we found no water but Nihad speculates that this has to do with there being no rain lately. There were two rainwater harvesting holes in the ground beside the cistern that were covered with stones.

Date: 01.12.05

Location: Al-Gyrat

Household Ten: This was the first cistern I had seen with a pump. Omrad Breizat, the elderly man, Feeraz, Nihad, and myself with two very small interludes with two different women. No kids but goats in the background. We all sat outside in the hot sun (it must have been close to 28 degrees Celsius).

Nihad asks if she can explain who I am (the men are engaged in conversation). I tell her to go ahead. She has no qualms interrupting the men and directs her attention to Omrad.

She tells me that I can go ahead.

Did ADRA come here or did he go to them? ADRA came by themselves.

I have seen many cisterns in this area. Does he know why he was chosen? It depended on how many families were around the cistern.

How many families use this one? Ten and anyone else can use the cistern.

(Goats approach Feeraz's van, start to nibble at the passenger side mirror and door). The goats too? Yes. (we all laugh).

If the cistern is empty can anyone knock on the door of the house to get water from the pipes? Yes, he can help them with water from the rooftop tanker.

Do they use the cistern to collect rainwater? No, the water is piped in.

This is the first cistern that I have seen with a pump. What is it used for? It makes it easier to pump water to the rooftop tank.

There are lots of pipes around – the cistern is not used for irrigation? No, he doesn't have a farm.

What did ADRA fix? Lid and cement trough.

Before ADRA was it just a hole in the ground? Yes.

Are they satisfied with ADRA's work? Yes, even though it was easy work the cistern is now safer for the children.

Can we ask about the inscription from the Qu'ran and why he thinks they put it on the cistern? ADRA put it on there by themselves to show the importance of water because we cannot live without water.

Side commentary from the elderly man to me: Jordan is a safe country. Anyone can walk around. I ask about the ferocious dogs. Feeraz laughs and then the elderly man responds that I shouldn't go to Iraq or Afghanistan.

An elderly woman, I think she lives in the neighbouring house, comes over and peeks at what I am writing. She throws out the comment that she had heard ADRA maybe wanted

to finish their work. When Nihad asked her where she heard that the woman responded that she had heard it from the people here.

(The men are in a lively discussion)

Where does piped water come from? Wadi El-Haidon – it is pumped from there to here.

Nihad has a question – What do you use the cistern water for? For drinking, washing, cleaning, the animals.

(I realize I am being talked about by the old man when I hear the words ‘bint’ and ‘amrici’ ...Nihad doesn’t translate).

Is there ever a time when they didn’t have enough water? Yes, they had a problem two – three years ago because there was not enough from the pipes.

They don’t want to collect rain? Rainwater isn’t enough if they want to collect it as it is too irregular. There are three other cisterns on the property but ADRA didn’t fix them. Nihad explains that they probably leave the cisterns open for collection in case there is rain and if no rain they have the cistern that ADRA fixed.

(we share Arabic coffee from one cup, Omrad going around to each of us individually)

Are there other cisterns around here? The elderly man responds that there is one in El-Wasiyya just before we enter Al-Gyrat (this does indeed turn out to be restored cistern but not one done by PR, see Chart).

And a trip to the bathroom ends with the wife of Omrad? Inviting me to stay with them.

My thoughts: It would be an interesting experiment to test out the water-sharing strategy and spend the summer months going through villages asking for water...I think that we

were close to one of the other sites but Feeraz wouldn't go because the old man told him that there were no cisterns there, that wasn't the town. I might try and push it but it is also so far away, more than 1.5 hours from Amman so it may not be worth the hassle.

HUNGRY!!! Celebrating American Thanksgiving now at ACOR...

Date: December 4<sup>th</sup>, 2005

Location: Dlilat Amteyrat

Household Eleven: A teenage boy approached us when we got out of the van. Then a younger boy came over and a woman. It was the woman we spoke with. Feeraz was there too. We did a rapid-fire interview around the cistern with the sun beating down on us and yet another chained up dog snapping away, eager to come over and attack us (in my opinion)!!

Nihad has a conversation with the teenage boy and finds out that the water in the cistern is rainwater and piped water combined. The cistern is 10 – 15 meters deep and is used for drinking and goats. To my untrained eye, I think that there is little water in the cistern.

Nihad asks me if I want to start and I tell her that it is best she describes me and my work first to the woman and asks if I can interview her.

She does and I start...

Did ADRA come here or did they go to ADRA? They weren't here when ADRA did work.

Does the cistern belong to that house? (I point to the house she came out of) No, it belongs to their neighbour. The owner is Ahmed Arhyat. (Nihad says his last name many times before I manage to spell it). But then the owner sold the cistern to someone else who doesn't live here anymore.



So this new person just owns the cistern? And the land.

He lets everyone use the cistern? Yes.

Who fills it up with piped water (I refer to which household). She does.

Does she know where the water comes from? El-Larish.

Do women or men order the tanked in water? The men. (Here Nihad interjects that the teenage boy told us the wrong information that it is not piped water that is added to the cistern but tanks that are trucked in).

Do they ever not have enough water? Their cistern is almost empty alot.

How often do the tankers come? Every 20-30 days one tanker.

A tanker fills up the cistern? No, about halfway.

Is it a bad question to ask what that costs (I ask Nihad. She pauses and says no they mentioned the tankers so not). 20 JD (approx 200 NOK) for one tanker.

How many families use this cistern? Her family.

So not that house? (I point to the house that is also close to the cistern). No.

Does she find the water quality good? She says that because it is deep the cistern is not clean and it becomes mixed. So they wait until all the mix goes down and then they can drink the water.

So they don't use anything to filter it? No (the woman herself says no and laughs).

I ask Nihad if she has anything she want to ask..she says no.

Is there anything the woman wants to ask me? No.

The interview ends with the usual offer of tea, which Nihad declines as we have work to complete today. The teenage boy starts to scoop out some of the water with a bucket at the end of a rope. I think that the water looks clean enough...

Date: December 4<sup>th</sup>, 2005

Location: Dllat Amteyrat

Household Twelve: There was no one around this cistern and there were no houses. There was some new construction close by and I wondered if there used to be a house there? I don't understand why ADRA would fix this cistern. There were two collection holes on the ground but the hole closest to the cistern had a big pile of donkey dung. There was water in this cistern but no-one come out to talk to use while we were looking at it, which makes me think that there was no owner or user in the area. The lid was gone and in its place there was a sheet of metal and two stones. The trough seemed a bit larger than the others and was approximately three meters long.

Notes to myself: A distinction is made between piped and tanked in water...I wonder how often this was misunderstood at the other sites? I have requested to go back to El-Larish as I would like to speak so someone who works there, although, the site looked unmanned and as we drove back into Amman today we passed two water filling stations. The first one I noticed had only one above-ground tank and the second one had many hoses and a row of trucks filling their tanks. I have also noticed many times before the agricultural cisterns that are above ground pits, sometimes lined with plastic and pipes hanging over the edge. There were lots of cisterns in this area today.

Date: December 5<sup>th</sup>, 2005

Location: Huwara

Household Thirteen: This cistern is the first restoration work, formerly of the Sheikh Jazza Anoufad and now belonging to his son, Mohammed Jazza Anoufad. We didn't speak to anyone around here but this cistern was quite impressive as it was open and you could clearly see its size. Although it was empty. There was an initial barbed wire fence, then a brick wall that ADRA had made, and then the cistern in the middle. Located in a field not close to any houses.

Date: December 5<sup>th</sup>, 2005

Location: Huwara

Household Fourteen: This cistern had the same design as the other one but it had algae water in it and the brick fence was constructed more closely to the cistern hole. ADRA had clearly fixed the brick wall, the collection trough, and the sides of the cistern. Again, this one was in a field with no-one around.

Two men approach us and Feeraz introduces me. He asks Nihad where I am from again (I understand that much of the conversation!).

The men tell us that the two cisterns are owned separately. This one is owned by someone called Zial Nyif. Feeraz goes on to explain the project, ie where we have been, while there is the noise of a tractor plowing the field in the background. Nihad and I stand on one side of the cistern while Feeraz conducts the interview (I am fine with this as I want them both to be involved....only later as I get dropped off does this work against me as Feeraz uses this as an argument for increasing his pay as he is doing more work with asking and driving far. I explain that some days we quit earlier so that it balances out but I ask Nihad to get an amount out of Feeraz, fearing the worst. He just wants for gas...an extra 5 JD (50 NOK) so I will give him an extra 10 JD (100 NOK) to keep him happy – hopefully! As I get out of the van I hope that I handled that situation correctly).

I ply Nihad with questions to ask the two men.

Is this cistern used? No.

Is it just rainwater in it? Yes.

Do they know the last time it was used? It has never been used. Sometimes it fills up with rain and still no-one uses it. What makes the water level decrease is evaporation during the summer months.

Does he know why ADRA fixed it if no-one uses it? Oh, says Nihad, they gave us some wrong information. They did use it for their animals a long time ago.

How did they get the water out than? With pumps (I see no evidence of pumps or pipes but they did say a long time ago...)

Feeraz points out that ADRA fixed the sides of the cistern too.

The men mention the cistern is 9 meters deep.

And tell us that one year there was snow and the cistern got filled up with snow.

Do they know of any other cisterns in Huwara? No, not in Huwara.

As we leave I notice some light drawings/graffiti on the side of the cistern.

Date: December 5<sup>th</sup>, 2005

Location: Bunayat

Household Fifteen: A man comes out and a kid to talk to us, this is the new house of Umm Abdullah, the woman's name we were using to find the cistern. I am amazed that we find it here as this is a large suburb area of Amman. This is also a weird location as it

is quite far away and different from the other restoration sites. Turns out that a road is being built through the path of the cistern so it is not used. The trough has already been taken away and replaced by a ring of stones. When we look inside we find a ladder, a helmet, and an odd assortment of unidentifiable junk. What makes it possible to identify it as ADRA'S work is the inscription from the Qu'ran.

I ask if they used to use it? Yes. To collect rain? Yes. Do they have other cistern now? (I am wondering about the cistern I saw in their front yard but he thinks I mean another ADRA one so he points us in the right direction and we leave).

Date: December 5<sup>th</sup>, 2005

Location: Bunayat

Household Sixteen: We speak with an elderly woman while standing around the cistern. A kid comes over as well and Feeraz goes back to his van. The woman goes to open the cistern but it is firmly tied shut. There is a space between the lid and the cement encasement. I don't see any collection holes on the ground, which I am mildly glad for as the area has mud and garbage all around it. When I asked to take a photo at the end of the interview, the elderly woman swept away some of the mud with her bare hands and then posed! The first time anyone has been willing to be photographed on his or her own initiative.

We start...

There is water in this cistern – does she use it? When it is clean for drinking. When it is dirty for the animals and it will be used for the olive farm they are building.

Is it dirty right now? It is not clean (I am relieved).

Does it collect rainwater? Yes and they buy tankers.

How much is the tanked water? A big tank is 40 JD (400 NOK).

And that fills up the cistern? No this cistern needs four tankers to fill up.

Does she know why ADRA fixed her cistern? She says because she is a widow and needs the water.

There are seven raised bumps behind the lid on the top of the cistern. I ask what they are for? She demonstrates that they are to rest the lid in an upright position so that it will remain open when she gets water.

She mentions that the cistern has enough water for her and her neighbours to drink when it is clean.

Can you ask her about the inscription from the Qu'ran – why ADRA put it there? ADRA did this by themselves and the inscription is there because no-one can live without water.

Does Islam tell people how to use water? (Nihad says yes and then there is a discussion about Islam where I can pick out Allah being mentioned a few times...this does not get translated). She lets anyone use the water.

Is that connected to a hadith in the Qu'ran because everyone is saying that...It is politeness and kindness from the owner of the cistern to allow anyone to use it and maybe one day they will need help.

Is it her that owns the cistern? Yes, she owns it.

The interview ends and we are offered to come in for tea but Nihad declines (no tea for us today and I am thirsty!).

My thoughts: Nihad made a comment that ADRA's work was weird, in reference to what sites they chose, and I agree. I think about how I had asked Basim this and he said that

because it was a pilot project they wanted to spread out the sites but I still don't find that to be a sufficient answer. I know that supposedly sweat equity was important – I need to remember to ask about this. The interviews happen so fast that I know I am forgetting things. The two in Huwara were obviously about making connections/appealing to the right power sets as the one has never been used and they are both obviously agricultural cisterns, which is not what this project was for!! Too bad that ADRA left Jordan because it would have been great to see the original files. Can't say that Dorothy's project notes we have been working off of are that useful. There is even one cistern mentioned but no town!!! And these areas are incredibly spread out. I find it miraculous that we have found 16 out of the supposed 32 restored.

Date: December 6<sup>th</sup>, 2005

Location: Al-Manara

Household Seventeen: It looks like it is water delivery day for this area. The olive trees are glistening. At first the cistern appears to not be attached to any household and we wonder the purpose of fixing it. Two camels graze in the background. Feeraz wants to check with the house across the street if they know who the owner is and they do! As I jump out of the van Nihad gently tells me to pull down my shirt....An interview is done with the elderly woman and she is the most animated talker we have met thus far. The interview is conducted in between pauses of her long monologues. I feel like I have to let this one just run its course, especially considering her dissatisfaction with ADRA.

The owner of the cistern is Masheed Maydeep Azabeh I am told as we sit down in the four white plastic chairs offered for us by the elderly woman.

She mentions that the cistern is not good.

There is a long discussion and Nihad tells me that in the past they used to drink the water from the cistern but when the pipes came they stopped using it. They used to have sheep but now no because everyone is busy with their work and don't have time.

We are offered the small shared cups of Arabic coffee. Nihad leans over to tell me that this is tradition.

Was she here when ADRA came? Yes.

Did they come to them or did they approach ADRA? They came by themselves.

Before ADRA the cistern was good but the worker who did the work is not good.

What did he do wrong? The lid is not good and they did not use enough cement.

Feeraz and the woman discuss our search in Huwara (I think that is what they are discussing).

Nihad suggests that I ask how many families use the cistern and I say that I want to first ask if she knows why ADRA picked them? She doesn't know why.

There is a long discussion between the woman and Feeraz. Nihad translates briefly that the woman is telling about her sons when they were younger. (I am starting to think that we have found a talkative and lonely old woman..this interview is not happening).

We are served tea.

Nihad asks how many families used the cistern? She says her house and that anyone can use it.

When did they stop using it? When the pipes came? Before ten years (I don't understand this answer).

After the cistern was fixed then? Yes. (ah...the advent of modernity)



And they get enough water from the pipes? No not enough. Sometimes the water authority doesn't allow enough water through the pipes so they have to buy a tanker.

Would they consider using the cistern again? Yes, if it is fixed again and fixed well they would use it.

She says that the problem is with the lid (remember that lid is defined as the entire above-ground cement encasement) because it is cracked.

She doesn't think that ADRA did a good job then? (we laugh and Nihad asks me if I want to ask her that because she has already mentioned in the beginning that ADRA did bad work..I say no that is okay).

She says that this is the only one in the area that ADRA has fixed.

Do any of her neighbours use cisterns? (her and Feeraz are talking so I tell Nihad to ask this when it is a good moment). They can use it whenever.

But there's no other houses in the area that use cisterns? She mentions that there is another cistern in the area but ADRA did not fix it.

Maybe we can ask someone else if there is a cistern in Al-Manara that ADRA fixed, suggests Nihad. (I agree as we have experienced that some people do not always know but in this case the woman turns out to be right and the notes we are using are wrong once again).

Does she want to ask me anything? No, she said they came here 12 years ago in 1995 (interesting that would be ten years in my books, different calendar system I guess).

Feeraz leaves and starts the van.

When ADRA came did their family help at all with the work? They didn't help actually but they brought them food, water, and tea because ADRA brought their own workers. They think that they can fix this cistern by themselves now.

Did it rain last night? No, it did not rain.

What about the inscription from the Qu'ran? (Nihad reframes the question back to me before asking by saying 'did they ask ADRA to do this'? and I start to wonder if Nihad has been using these words, which would set up the answer....). They put it there themselves and she doesn't know why.

Does she think it is important? She says it doesn't make any difference (I agree!!).

The interview ends, we shake hands and jump in the van. We try to find the other cistern in the area but give up and drive back to Amman.

My thoughts: Nihad is very good about just translating what I want and not answering the questions herself, which I have heard can be a problem with translators. This makes up for her potential language limitations. I feel bad about the wage discussion I had with Feeraz yesterday. I asked Nihad if everything is okay and if he is mad at me and she answers no, Feeraz is a good man...I tell her that it is hard for me and I want to be a good boss and she says yes I am a good person so I should worry but it seems as though she doesn't want to discuss this any further so I drop it.

This last household was a good one. She was honest and negative about the project. This must be the house I had heard about where PR had actually destroyed a cistern in their fumbling handiwork. And her few comments about pipes replacing cisterns will fit nicely into my expert interview tomorrow.

Date: December 7<sup>th</sup>, 2005

Location: Al-Faysaliyya

Returned to Household One: We went back to get a GPS reading of the cistern. We were invited into the breakfast tent, still warm from the fire coals in the middle. We (myself and Nihad) were offered the only two white plastic chairs. This time there was additional woman and two more small boys present. Feeraz hung around by his van. We were brought tea and I finally learned to say islamo and not shukran with the presentation of the tea!!

Hum...what didn't I ask from before I thought out loud. Did anyone here help to clean or build the cistern? We didn't help because ADRA brought their own workers but we brought them food and water. (I explain to Nihad that ADRA had 'sweat equity' as a precondition for receiving restoration work and this is weird that no-one helped....)

Do they know why ADRA picked them? No.

What about the inscription? Why is it there? They don't know why but ADRA did this by themselves. (The teenage girl mentions) that it is because water is important and that everything needs water.

I tell Nihad that she can tell them that ADRA has left Jordan; she does.

The discussion strays away from water (as I feel like I have nothing else to ask) and leads into my marital status. Upon hearing that I am not married the elderly woman wonders why I am not married when I have such a good face. She offers to marry me to someone in the village. (we all laugh). The maid also says that I have a good face.

Date: December 7<sup>th</sup>, 2005

Location: Al-Faysaliyya

Returned to Household Two: We are greeted by the two oldest brothers. One of their younger brothers moves around in the sitting room from place to place. Feeraz is there as well.

I tell Nihad that she can tell them that ADRA has left Jordan. The older brother thanks me (I had promised him that I would find out what happened to ADRA).

They mention that there are many cisterns in the area but they are not in good shape.

Is there anyone around here who knows how to fix the cisterns? (Nihad and I discuss that maybe it is better to hire locally rather than from the outside like PR did with the Iraqi engineer). There's no-one like ADRA around to fix the cisterns (this wasn't quite my question but I resign that I just need to learn Arabic in order to do continued work here).

What about the raised section of the trough? What is this for? To make it easier when pulling water out of the cistern because it is not as high as the rest of the trough.

Feeraz explains the GPS unit and I show it to the eldest brother.

Do they know why their family was chosen for ADRA's work? One day they were sitting outside with their sheep and ADRA thought they needed their cistern fixed because they had so many sheep.

Are they using the cistern right now? Only for housework like washing and cleaning.

Do they think in the future there'll be enough water in Jordan? (Nihad tells me good question while Feeraz jumps in to explain and discuss the question). He thinks in the future there will be less water.

Do people see the government responsible for providing water? Uh...(oh-oh I am treading on politics and I can tell this is a more sensitive topic as there was a silence after the question) the government is responsible for water and it is their job to bring water but if

Jordan doesn't have enough water naturally what can they do? (Nihad asks if I understand her use of the word natural). All the piped water comes from the water authority.

I ask Nihad if she has any questions? No, she tells me that I have asked everything.

Feeraz and the brother discuss water shortages in Jordan as being a problem due to an increasing population. (Nihad and I discuss the role of Israel taking more than their share of water between Jordan, Syria, and Lebanon. I tell her that is the discussion outside of Jordan). I ask Nihad to ask if they blame Israel for taking more than their share? (Nihad explains the question. Feeraz jumps in the discussion too). The eldest brother answers that yes this is one of the reasons. I ask Nihad that she explained to them this is what we hear outside of Jordan? (I want to make the politicized discussion seem innocent – it is – but I am worried people might think that I am spy, as they might in Yemen, according to Eirik).

Feeraz talks about Jordan's lack of sea and coastline – the Dead Sea is unusable and the Red Sea is too small.

The eldest brother mentions that another problem is the climate. It is too hot, last year there was rain at this time but not this year.

We leave and I ask Nihad if it was okay that I asked about the government. She tells me that it is sensitive and people don't always like to talk about it with strangers.

Date: December 7<sup>th</sup>, 2005

Location: Al-Fayah

Returned to Household Three and Household Four: There is still no-one home at Household Four. We leave and call Dr. Nawar Sunna to hear if we can come early and to get directions, she says yes.

Date: December 7<sup>th</sup>, 2005

Location: Wadi-El-Seer at the Ministry of Water and Irrigation, Dr. Nawar Sunna, director

(this interview was a bit messy as I spent the first bit trying to sort out who she was and what she could answer)

She also tries to sort me out. Like Bakir Hamed she asks if I am doing my PhD. I briefly explain PR and the interview process. She is interested and tells me how her focus is wastewater and cess pits. I show her a photo of a cistern on my camera. We understand then that we are talking about two different things – water management and wastewater management. I tell her that Bakir had recommended her so we try to muddle through what she can answer. I ask her for an organization chart after she gives me a breakdown of the ministry and, as I haven't yet, I ask if I can write things down since I know that I will not retain this information.

She tells me about a project they have through MEDA and USAID that is teaching school children about wastewater management through the implementation of cesspits at school in a focused area.

What are the main sources of water for Jordan? Groundwater and the only renewable groundwater source is the Disi aquifer, which supports Aqaba and agriculture. The Za water treatment plant is the only surface water.

How much water is available for drinking? (She gets out the water authority yearly report) two eighty-seven million cubic meters in product and two seventy-five million in distribution.

What about the areas that are not provided with piped water? Are there plans in the future to provide these areas with piped access? There is 99% coverage in Jordan and some of the areas fall outside of the district area and there is the problem with transport as some places are very far away (Nihad and I nod in agreement!). She continues, there is the priority to provide everyone but not everyone lives there legally. Some people build illegally. These people rely on tanked in water.

What about the Water Information System? This is the water master plan yes and is used to speculate into the future the water use until 2015 (I think she said 2015).

So this system allows for the water authority to regulate provision? No it is not operational, it is used of policy-making. Each governate is responsible for the extraction and distribution. We are working on a plan to digitalize all the information and combine the master plan with the operationalize aspects of each governate.

So when I have seen the water filling stations each governate is responsible for them? Yes. Some of it is the private sector that we have given licenses to if they meet the health standards.

Ah, so your department issues licenses.... Yes. We are not giving any licenses for private wells. Sixty-five percent is used by agriculture and we are trying to reduce this number by implementing wastewater treated water to be used in agriculture

I worked at the water district in Norway this summer and they definitely do not use demand management. Yes, they have enough water.

I have discussed demand management theory with Bakir Hamed - is that what is used by the water authority? It is managed from a different department than here but yes that is the policy.

How is water delegated for each sector? The fees increase with increased usage, they are per cubic meter. What is it that the individual needs? (she asks herself). I think the number is 40 cubic meters a month.

So are the fees based on their intended usage? Yes, agriculture is the most expensive at 1 JD (10 NOK) per cubic meter.

Domestic is the cheapest? Yes, drinking water is the cheapest. We try to uphold minimum health standards.

Do you agree with the water-scarcity index of 1000 cubic meters per person per year that is set by the United Nations and World Bank? Or are these figures set to western consumption patterns? Yes, I agree with them. These figures are very low. There is limited water here. The households only get water one day a week and they don't have very much that they can use.

We are developing a new wastewater plant for agricultural water in the Jordan Valley.

Are there any plans to use wastewater for drinking water, I read an article that Saudi Arabia has started doing this. No, there is no plans for that.

In agriculture do olives use the most water? No, they don't take much. We are very glad for the olive trees because they can survive on rain from five years ago. What takes the most is bananas and fruit in the Jordan Valley but it is important to have an agricultural sector.

From outside Jordan the lack of water is a big focus, is there any international support by foreign involvement to develop water projects in Jordan? Yes, the three big ones are GTZ, German, USAID, and JAKKA, Japanese. The Canadians through IRDC but they are mainly interested in agriculture. The biggest donors are the first three.

I thank her and we leave.



My thoughts for the day: If this project was to be funded once again I would want to focus on this area of Al-Faysaliyya because these people have mentioned two key things: that they are poor and that there are many cisterns in the area.

In terms of how I conduct interviews, I have noticed that it is harder for me to take notes when I am interviewing the experts. I also feel more pressure to continually ask questions. I have to prompt discussion more than when I am out in the villages.

I had two meeting type of interviews. The Canada Fund meeting was helpful in that it was explained to me that the Fund was leaving CIDA and was going to fall under the jurisdiction of the Foreign Affairs department starting in 2006. The new priorities were going to be human rights and democracy and should water be accepted as a human right then the chances were good. Water has been declared a human right by the United Nations. I am to contact the Canada Fund in March 2006.

The other meeting was more of an explanation. Hilda and I watched the water conservation videos produced by the Royal Society for the Conservation of Nature together and I asked her to explain in detail the message. This is what I got.

The main message character is a drop of water drawn in the cartoon format; he speaks with a Lebanese dialect Hilda tells. The first ad in the series sets the storyline. A boy flying a kite in a green landscape quickly changes to a dry, dusty, desert environment. The message is that with this boy there will be a house and with water the landscape will become green. This infers that without water there will be no house = no boy. An Arabic expression is used 'beit bjemar' meaning house with family to convey the connotation of family. This first ad sets up the series. These ads are sponsored by the Canada Fund? Hilda tells me that agency names don't always translate well..hum..nor does most of the language I think!

Man can't sleep ad:

The message - The noise of the running water keeps him awake. The drop of water tells him that the problem can be solved not by ignoring the problem but by installing a seal.

The end of all the ads where the drop of water holds hands with the boy and walks towards the viewer out from a dark and shadowy forest and says: "Think of me and save water"

Toilet flushing ad:

The message - The best way to save water is with a bottle in the tank of the toilet. You will end up saving a tank of water.

Tooth brushing ad:

The message – Why don't you change your habit and turn off the tap. You could save water to brush your teeth for four times the amount.

Dishwashing ad:

The message – Put a plug in the sink. This will save water.

Car washing ad:

The message – The use of hose goes through water for 10 cars and you can get the same result with a bucket for your car.

Lawn watering ad:

The message – It is not good to water your plants when it is too hot out because the water will just evaporate.

When I ask Hilda what she thinks of the ads she says that they are good. She doesn't watch TV so this is the first time she has seen them but she heard about them. She remembers people saying that they were interesting and well planned ads.

I am having troubles sourcing these ads. I have no year, no producer other than the RSCN.

Date: December 24<sup>th</sup>, 2005

Location: At ACOR Nihad and her sister, Withaina

How did you describe me to the families? I said you were a student from Norway doing research on ADRA's work with the cisterns.

Did you always mention that I was connected to ADRA? Yes, that you were doing research on their work.

Did the families sometimes ask if I was connected to ADRA? Yes.

Did they all ask this? Yes, every single one.

Did you say that I was working for ADRA. No, not working with but that you were a student doing research for your masters.

Why did they need to know if I am connected to ADRA? Because that was your focus so they should know that you weren't asking about other cisterns but those ADRA fixed.

What was the most important thing to tell them about me? That I was a student and that I was not working for ADRA.

Did me being a foreigner, single, a woman, non-Muslim or a guest influence how people would tell me things? What did any of these roles mean for how I was treated? Was there

something people didn't want to tell me? They were not comfortable with the political issues about the Jordan River. That is the only thing that I noticed. Yes, it is because you are a foreigner that is the main reason. It is hard to talk to foreigners about politics.

Do you feel that the families answered me honestly? Would you have gotten different answers if you had gone alone? I think they did. No, the answer would be the same.

What are some important qualities for a person to gain respect in Jordan? I have been told to always accept the offers of tea and coffee, for example. That is a part of the manners – hospitality. You don't always have to say yes, like I said no to the breakfast because we didn't have the time, but people might be hurt if you say no.

Should I have taken gifts with me, like fruit, to the households? No this would have been unnecessary. People need help as you saw, they need their cisterns fixed. This is more important than the gifts. That's why they were welcoming to your research – they need more help. That is also why they are asking about ADRA still doing work. The most important thing they need is help.

Would you agree with me that Al-Faysaliyya is a good area for Phase II? Yes, this area is good because the houses with the cisterns are close together not like in Bani Hamida. I think that maybe they can do more in other areas too.

Did you notice a difference between what ADRA told me and told the villagers? Yes. ADRA broke promises and didn't finish their work. They just left Jordan.

Do you think that rainwater harvesting is important to do in Jordan? I think yes but very hard as it needs a lot of money.

What does it need money for? Ah, are you thinking of cloud formation that Israel did? Yes. No no I think about Israel making rain. Yes, we should collect rainwater. No it is not expensive.

What do you think the water availability will be like in the future? People increase every year. I think we will have little water in the future. There is no solution for the water problem (here Withaina jumps in for the first time).

Are you kept informed about water solutions by the government through the Ministry of Water or Ministry of Irrigation? On TV they tell us that there is little water and that we should be more responsible when using it. I know that we have agreements with Syrian and Egyptian governments to allow Jordan to have more water.

Are these ads to conserve water affective? Do people listen to them and change their behaviour? People in the countryside before the ads acted like this anyway. Not in the cities. In the countryside the water is especially a problem in the summer.

So is Hisban considered the countryside? Yes.

So you both have grown up doing this? Did your mom teach you? (this illicit giggles from them both) Yes, “we live in the problem” so we should be more careful. We have to be. We complain in the summer – we call – but this doesn’t work.

Do people buy tankers then in the summer in the countryside? Yes, sometimes we do.

Tanked water is much more expensive? Every week we buy 6-8 meters of water. This is 10 or 12 JDs.

Are the tankers privately owned? Yes, the government has the pipes.

Are people using more water? (Resounding) yes!! They wash cars, swimming pools. The cities are using more.

Then do you have less in the countryside because of the cities? The cities know that they have alot of water for all the day and we get in the pipes only one or two times a week in the countryside so people in the villages use less.

Is this a source of conflict between the cities and the countryside? Sometimes they think that they more educate, high class. Sometimes they look to people in villages as less civilized. Sometimes they know specific traditional foods, like mansaf, and think that we eat it every Friday. Truly they are mistake.

So they think everyone eats mansaf? Yes, every day we only eat mansaf!! (they laugh)

But what about water? Do people in Hisban talk about people in Amman using too much water? Yes, everyone knows this.

You don't want to live in Amman? No I see no need. Only in summer when we have lack of water!

Who should get more water? Industrial, agriculture, households, or tourism? It should be equal. Ever section needs water and should get what they need. Everything needs water.

According to the United Nations and others, Jordan is defined as water-scarce. Is there a term or concept that the government uses to convey this? (Here ensues a long discussion where I try to explain that water-scarcity is a part of an index that makes it so all foreigners can agree on what is being talked about...I am not sure that this was understood but this is a language/cultural context thing...we proceed anyway). The government tells us to be careful to allow for the next generation.

Do they say water shortage? Yes, all the time. The people in the countryside know this problem. We call this problem "tragedy of water" because we know this problem and are aware of it. We are scared when we hear water shortage.

How do you define a cistern? They are very important, especially for us outside the cities. It is like a support to us especially in the summer instead of pipes.

But the cistern is filled by tankers and not rain? Yes, usually tankers but sometimes rain too.

The cistern is the entire physical structure? Yes, trough, lid, hole.

But in Roman times it was just the hole? Yes. People are starting to use cisterns now again.

Do you have friends that have? Yes, a cousin.

Before that they didn't have one? No, we used to share ours with them.

Would it be a good idea for people to collect rainwater in the cities from their roofs? I don't know. They never use them this way. The rooftop tanks are filled with piped water.

But would it be possible to rainwater harvest from the roof? They don't use it like this. If they want to collect rain they need a cistern in the ground not on the roof. In the ground they can make a canal from the roof and can collect more. The rooftop tank is too high.

So they need a catchment system? Yes.

Does Islam have anything to say about water sharing? Yes, it is very important for everyone who needs water. For me, if I see someone I imagine that I am in that situation.

It is mentioned in the Qu'ran? Yes and the Prophet Muhammad said we should be aware and careful with water even if we have alot. He said that even if you live next to a river and have plenty that you should be careful.

My thoughts: Some great quotes – we live in the problem and tragedy of water in particular. I still always feel like we are on two separate pages when it comes to the meaning as our worlds are so different.

Date: December 28<sup>th</sup>, 2005

Location: GTZ/Ministry of Water and Irrigation, first Philipp Mageria and then Ali Shubat

Setting: I, of course, went in through the wrong door, which I presume was the ministry of water side. The ambience was shabby, the people all male, and the vibe not friendly for the estranged western female. When I got to the sixth floor a man immediately asked me if I needed help, which I did, and he kindly instructed me and walked me over to the GTZ side, in the process telling me that many people get lost here when looking for GTZ. And then it struck me, that this immediate response to offer assistance is something that I will miss, and that is unique to the cultural behaviour of people here in Jordan.

I explain to Philipp that I haven't been able to look through all the files he sent me because the server where I am staying is so slow. And this is very true. He first asks me to explain my project, which I am getting better at doing and I have noticed that I now use words like revitalization and phase two, almost rolling off my tongue!

I only have five questions to ask you because I know that the link you sent me was quite comprehensive.

To clarify, GTZ provides consultancy and IT database support in the form of the Water Information System towards the water policy making of Jordan's National Water Plan? What role does GTZ play in the water policy? We offer a program approach and have four components that are involved in policy and operational. GTZ is a implementing agency as agreed upon by the governments of Germany and Jordan in accordance to bilateral agreements.

How long has GTZ been in Jordan? I know that they are also in Yemen in water projects as I have a colleague doing work there who has been in contact with your counterparts in Yemen. Yes we have a big water project in Yemen. The Ministry of Water is the newest



ministry in Jordan, which came about in 1993, but GTZ has been involved with the other JVA, JWA since the 1970's. They of course have been here since before then.

Is it possible to get a digital version of what you sent me in a more complete version? Is what you sent from the 1994 National Water Master Plan or is it more recent? Well it is from the website and that is what the Ministry says we can give is what is on the website. If you need more information please from a certain volume then please feel free to contact me. This version is from 2004.

Numerous authors refer to unaccounted-for-water (UAW) losses being as high as 56% in Jordan. Is this figure a part of the water budget? This is not a current figure; it is about 47% but even less in Amman. Some governorates it is higher and some lower. This is hard to measure. Yes it is a part of the master plan assumptions. It has to be calculated in as the water that has to be provided and if 47 of 100 of the supply is lost but it has still been supplied in the first place. The planning horizon for this plan until 2020 aims to have 16 or 17% UAW losses but this is optimistic. This is a shared loss. There are already loss reduction programs in Jerash, Kerak, and Amman supported by foreign development.

Does virtual water, food imports, play a role in the policies of the National Water Plan? Could the desire to be food self-sufficient lead to an increased allocation to agriculture? Do you know Tony Allan? He writes about this? Yes, I know Tony. In my personal opinion unfortunately for Jordan food self-sufficiency cannot be reached here. That is a sad reality. Jordan already imports 2.5 times their water availability through food. There are one billion unconventional sources expected to cover the demand. Politically motivated statements like food self-sufficiency is not possible.

When did demand management become a part of policy making? I want to place it in a historical frame of reference – could it have its roots in the green environmental movement of the seventies and then later the Brundtland sustainability commission? Did you look at the website under the strategies and policies section? Already in 1997

I thank him for his time and leave. My thoughts: The quest for information never ends. I made two contacts today and both of them could have led to much more. Damn and this is my last day!

## Appendix 4.4. Coding Strategy

### Coding Strategy Template

Key themes to be analyzed:

1. How is water accessed? From where? By whom? How is it consumed?
2. How is water as resource perceived? Scarce? Is it shared?
3. Have pipes had an impact on cistern use?
4. What effect did the Islamic inscription have?
5. What and how did ADRA impact these villages?

How to analyze? Narrative analysis, i.e., taking the respondents answers at face value.

Research questions:

1. How does a household negotiate access and usage to a necessary but non-abundant resource?
2. How does knowledge about – and the practice of – water-management at the domestic level shift in accordance to expert and local perspectives?
3. How is water-management affected by the advent of pipes and development aid in a predominantly water-scarce and Islamic region?

How do all of these overlap?

Codes:

ADRA/Development [AD]

1. Project history [AD-H]
2. Fixed by ADRA [AD-F]
3. Rainwater harvesting previous to ADRA [AD-R]
4. Comments about ADRA [AD-C]

5. Sweat equity involvement [AD-S]
6. Islamic inscription [AD-I]

#### Cistern [C]

1. Usage [C-Ua/b]
  - a. in use b. not in use
2. Rainwater harvesting [C-R a/b]
  - a. yes b. no
3. Clean [C-Ca/b]
  - a. clean b. not clean
4. Size of cistern [C-S]
5. How they collect rainwater [C-RC]
6. How do they access the water in the cistern [C-A]
7. Ownership [C-O]
8. Households per cistern [C-H]
9. Purposes [C-PUa/b/c/d]
  - a. drinking b. animals c. cleaning d. farm
10. Preference for cisterns [C-P]
11. Do neighbours have cisterns [C-N]
12. Cistern has been improved [C-I]
13. Impact of modernity on cistern use [C-M]
14. Future desire to use [C-Fa/b]
  - a. yes b. no

#### Water [W]

1. Water availability [W-Aa/b]
  - a. sufficient b. insufficient
2. Water provision [W-Pa/b/c]
  - a. rainwater b. pipes c. tanks
3. Water used [W-U]
4. Water source [W-SO]

5. Water survival techniques [W-ST]
6. Water sharing [W-S]
7. Water quality [W-Q]
8. Water temperature [W-T]
9. Water cost [W-C]
10. Water labour [W-L]

#### Appendix 4.5. Thematic field notes

Fieldnotes organized thematically:

ADRA [AD]

##### 1. Project history [AD-H]

Was the cistern here before PR? Yes it was already present. [AD-H:1]

How did they find out about PR? Neighbour heard about PR and went and asked for help and told PR that their neighbour needed help as well. [AD-H:1]

Do they know why ADRA picked them? No. [AD-H:1]

Do they know why their family was chosen for ADRA's work? One day they were sitting outside with their sheep and ADRA thought they needed their cistern fixed because they had so many sheep. [AD-H:2]

Doesn't remember PR so well because it was 10 years ago (the second oldest son says, he was only a teenager then as he pts to one of his younger brothers) [AD-H:2]

How did you here about PR? ADRA came here by themselves. The cistern was a disaster before PR. [AD-H:3]

The cistern was a disaster before PR? What was wrong with the cistern? It was not safe for children and it wasn't clean. [AD-H:3]

Do you remember when the project came? Yes, she was there. They came by themselves and said that they wanted to fix her cisterns. They came with workers. [AD-H:5]

Were they here when the project came? Yes. [AD-H:6]

Did the project come here or did they go to it? ADRA came to them. [AD-H:6]

Were they using the cistern before and after? Yes, both. [AD-H:6]

Do they remember ADRA? Yes, use only rainwater in cisterns. [AD-H/R:7]

Did ADRA come by themselves? Yes, they came by themselves. [AD-H:7]

Did ADRA come here or did he go to them? ADRA came by themselves. [AD-H:10]

Before ADRA was it just a hole in the ground? Yes. [AD-H:10]

I have seen many cisterns in this area. Does he know why he was chosen? It depended on how many families were around the cistern. [AD-H:10]

Did ADRA come here or did they go to ADRA? They weren't here when ADRA did work. [AD-H:11]

Does he know why ADRA fixed it if no-one uses it? Oh, says Nihad, they gave us some wrong information. They did use it for their animals a long time ago. [AD-H:14]

Does she know why ADRA fixed her cistern? She says because she is a widow and needs the water. [AD-H:16]

Was she here when ADRA came? Yes. [AD-H:17]

Did they come to them or did they approach ADRA? They came by themselves. [AD-H:17]

Nihad suggests that I ask how many families use the cistern and I say that I want to first ask if she knows why ADRA picked them? She doesn't know why. [AD-H:17]

## 2. Fixed by ADRA [AD-F]

What did PR contribute? The safety lid and they built the trough for animals to drink from. [AD-F:1]

Was PR good? Yes, it is good for the children's safety and keeps objects out (the lid) and the trough building is good for the animals. [AD-C/F:2]

What did they use before PR to cover the cistern? They bought covers like a piece of metal to protect the children. [AD-F:2]

Best thing about PR? Yes, main thing was the lid and trough. [AD-F:2]

Why? Before ADRA the lid was made from stones then ADRA came and replaced the lid with an easier one. [AD-F:3]

Everything about ADRA? Yes, but they only made the lid. [AD-F:3]

Not the trough? Yes, they did that one too. [AD-F:3]

What did ADRA fix? The lid. [AD-F:5]

Not the inside? No, just the lid. [AD-F:5]

What did ADRA fix? Only the lid. [AD-F:6]

Nihad decides to ask- What exactly did they like about ADRA's work? That they put a lid on it. (She tells me that she asked this because the other families mentioned children's safety). [AD-F:6]

What did ADRA fix? Just the lid. They didn't fix the inside. [AD-F:7]

So all that cement work on the cistern was done before ADRA? No, it is ADRA's work. [AD-F:7]

So it was at ground level before? Yes, they did the lid. (I understand now – lid refers to everything about ground level and Nihad apologizes for not explaining this to me. I say it is no problem). [AD-F:7]

What did ADRA fix? Lid and cement trough. [AD-F:10]

Feeras points out that ADRA fixed the sides of the cistern too. [AD-F:14]

3. Rainwater harvesting previous to ADRA [AD-R]

Did it collect rain before PR? Yes. [AD-R:3]

Was she using the cistern previous to the project? Yes, for drinking. [AD-R:5]

To collect rainwater? Yes, before and after. [AD-R:5]



#### 4. Comments about ADRA

Was PR a good thing? Yes, it was a good thing because it protects their children. [AD-C:1]

How do you feel about foreigners working with PR? Grateful. [AD-C:1]

What about the Iraqi engineer? I heard he made some mistakes. No, his work was good and there are no problems. [AD-C:1]

In the future, would it be good to have another project? Yes, this would be a good thing. [AD-C:1]

How many families use this cistern? Four and they have one old cistern here and they asked for help from PR but they said “their work is done here”. [AD-C:1]

Is PR a good thing? Yes. [AD-C:2]

ADRA promised better cisterns for people and animals in the future but never came back and didn't do anything. ADRA promised pumps from cisterns to tanks and troughs for the animals. [AD-C:2]

Are you mad at ADRA? No, his grandfather had hope for him and his neighbour to have pumps. [AD-C:2]

Why did ADRA do this? We are grateful but don't know why they didn't come back. [AD-C:2]

He suggests that someone should come back every five years. [AD-C:2]

Are they happy with ADRA's work? Yes, they are happy. It will be good if ADRA does more work in the future. [AD-C:3]

(Nihad says she wants to ask a question) Was ADRA good? Yes. [AD-C:3]

Should they do more work in the future? They like the idea of this work continuing in the future. They would be grateful. [AD-C:5]

Did ADRA do good work? Yes they did. [AD-C:5]

Are they satisfied with ADRA? Yes, it is good work. [AD-C:6]

What about future work? They would like this. People need their cisterns fixed. [AD-C:6]

Do their neighbours have cisterns? Their neighbour has but not fixed by ADRA. They only fixed cisterns alongside roads. [AD-C:6]

Did ADRA do a good job? Yes. Should they do work in the future? Yes, they would be grateful for work in the future. [AD-C:7]

Are they satisfied with ADRA's work? Yes, even though it was easy work the cistern is now safer for the children. [AD-C:10]

An elderly woman, I think she lives in the neighbouring house, comes over and peeks at what I am writing. She throws out the comment that she had heard ADRA maybe wanted to finish their work. When Nihad asked her where she heard that the woman responded that she had heard it from the people here. [AD-C:10]

Before ADRA the cistern was good but the worker who did the work is not good. [AD-C:17]

What did he do wrong? The lid is not good and they did not use enough cement. [AD-C:17]

She doesn't think that ADRA did a good job then? (we laugh and Nihad asks me if I want to ask her that because she has already mentioned in the beginning that ADRA did bad work..I say no that is okay). [AD-C:17]

## 5. Sweat Equity [AD-S]

Hum...what didn't I ask from before I thought out loud. Did anyone here help to clean or build the cistern? We didn't help because ADRA brought their own workers but we brought them food and water. (I explain to Nihad that ADRA had 'sweat equity' as a precondition for receiving restoration work and this is weird that no-one helped....) [AD-S:1]

ADRA contributed the lid and trough and made the family dig (I try to explain sweat equity, which Nihad finds weird) [AD-S:2]

Do they think it was weird to have do dig? No, they think it was a good thing. [AD-S:2]

When ADRA came did their family help at all with the work? They didn't help actually but they brought them food, water, and tea because ADRA brought their own workers. They think that they can fix this cistern by themselves now. [AD-S:17]

## 6. Islamic inscription

What about the inscription? Why is it there? They don't know why but ADRA did this by themselves. (The teenage girl mentions) that it is because water is important and that everything needs water. [AD-I:1]

Can we ask about the inscription from the Qu'ran – why do they think it is important? No-one can live without water, everyone needs water. ADRA did that by themselves, we didn't ask. It is important because it shows the importance of water. [AD-I:5]

What else should I ask...oh! What about the inscription? They put the inscription on by themselves. She doesn't know why. (I ask Nihad if we should tell them why – I am referring to what Basim said so that people would know that the project is not American..she hastily says no, that would not be a good idea). [AD-I:6]

Can we ask about the Qu'ran inscription? It is a good thing because everyone needs water and that is what it says. [AD-I:7]

Can we ask about the inscription from the Qu'ran and why he thinks they put it on the cistern? ADRA put it on there by themselves to show the importance of water because we cannot live without water. [AD-I:10]

Can you ask her about the inscription from the Qu'ran – why ADRA put it there? ADRA did this by themselves and the inscription is there because no-one can live without water. [AD-I:16]

Does Islam tell people how to use water? (Nihad says yes and then there is a discussion about Islam where I can pick out Allah being mentioned a few times...this does not get translated). She lets anyone use the water. [AD-I:16]

Is that connected to a hadith in the Qu'ran because everyone is saying that...It is politeness and kindness from the owner of the cistern to allow anyone to use it and maybe one day they will need help. [AD-I:16]

What about the inscription from the Qu'ran? (Nihad reframes the question back to me before asking by saying 'did they ask ADRA to do this'? and I start to wonder if Nihad has been using these words, which would set up the answer....). They put it there themselves and she doesn't know why. [AD-I:17]

Does she think it is important? She says it doesn't make any difference (I agree!!). [AD-I:17]

## Cisterns

1. Usage a. in use b. not in use [C-U a/b]

Is this cistern used? No. [C-U b:14]

Do they know the last time it was used? It has never been used. Sometimes it fills up with rain and still no-one uses it. What makes the water level decrease is evaporation during the summer months. [C-U b:14]

2. Rainwater harvesting a. yes b. no [C-R a/b]

Does it catch rainwater? No never, rainwater is dirty. [C-R b:1]

Does the cistern collect rainwater? No, it is too high off the ground to collect rain. [C-R b:2]

Now does it collect rain? We clean it every year, collect rain, and use the water for drinking and water for our trees. [C-R a/C-PU a/d:3]

Can she collect enough rain or does she need tanks? Rain is enough. They don't need to buy water. Her neighbour can use the water if necessary. [C-R a:5]

To collect rain? No, for piped water and tankers. The area is not clean enough to collect rain (this I would agree with as the cistern is RIGHT beside a road). [C-M/C b/R b:6]  
It has never been used to collect rain? No. [C-R b:6]

Nihad says you can ask her questions she has already been talking about the cistern. Oh, what did she say? She said that she collects rain. [C-R a:7]

Do they use the cistern to collect rainwater? No, the water is piped in. [C-R b:10]  
They don't want to collect rain? Rainwater isn't enough if they want to collect it as it is too irregular. There are three other cisterns on the property but ADRA didn't fix them. Nihad explains that they probably leave the cisterns open for collection in case there is rain and if no rain they have the cistern that ADRA fixed. [C-R b:10]

Is it just rainwater in it? Yes. [C-R a:14]

Does it collect rainwater? Yes and they buy tankers. [C-R a/M:16]

3. Cistern is clean a. clean b. not clean [C-C a/b]

I have never had rainwater! This tea is made from rainwater. This water is very clean. [C-C a:3]

Is it dirty right now? It is not clean (I am relieved). [C-C b:16]

4. Cistern structure (size, age, depth) [C-S]

How much water does your family use? A filled cistern will last about 20-30 days in the summer and longer in the winter. [C-S:1]

How deep is this cistern? 7 meters. [C-S:1]

This cistern is forty years old and was made by exploding a hole. [C-S:2]

How much rain is collected? Depends on the rain, If good, the cistern fills up. [C-S:3]

How big is the cistern? 20 meters wide and twelve meters deep. [C-S:3]

How big is the cistern? It is from Roman times. 25 meters deep and 7 meters wide. [C-S:5]

How much water do they use? A filled cistern lasts how long? From winter to winter, one year. [C-S:5]

How big is the cistern? 6 meters deep and 4 meters wide. [C-S:6]

How big is the cistern? Doesn't know. It is very deep. [C-S:7]

But I noticed a lock on the lid...? That is to keep the children safe. [C-S:7]

Does the cistern ever get filled? Yes, in a good year when the rain comes. They only use it to drink from (meaning that is why there is enough water). [C-S:7]

The men mention the cistern is 9 meters deep. [C-S:14]

5. How does one collect rainwater? [C-RC]

In collecting the rainwater they can't open the lid for the first and second time when it rains because it is not clean. You have to wait until the third or fourth time it rains to collect the water. [C-RC:3]

(I clarify. The rain washes the area around the cistern which cleans it). [C-RC:3]

Does it get filled up by the rain? Heavy rains yes. The first rain they don't open the lid to clean the area first (the channel here was filled with garbage) and then they collect the rain after it is clean and they leave the lid open until it fills. [C-RC:5]

6. How does one access the water in the cistern? [C-A]

What about the raised section of the trough? What is this for? To make it easier when pulling water out of the cistern because it is not as high as the rest of the trough. [C-A:2]

How do they get the water out of the cistern – with a bucket or a pump? With a bucket. [C-A:5]

Do they use buckets or pumps to get the water out of the cistern? Bucket. [C-A:6]  
She ends up by taking me outside and showing me the cistern. She scoops some water up and pours it dramatically back in to the cistern (it was a Kodak moment). [C-A:6]

I ask Nihad what else we should ask. She says what about the steps? It is because it is high and it is easier to get water from the buckets. [C-A:7]

This is the first cistern that I have seen with a pump. What is it used for? It makes it easier to pump water to the rooftop tank. [C-A:10]

How did they get the water out than? With pumps (I see no evidence of pumps or pipes but they did say a long time ago...) [C-A:14]

There are seven raised bumps behind the lid on the top of the cistern. I ask what they are for? She demonstrates that they are to rest the lid in an upright position so that it will remain open when she gets water. [C-A:16]

7. Ownership of cistern mentioned [C-O]

How is it shared? Houses around the cistern can use them and across the street the same for them and their neighbours. [C-O:2]

Does the cistern belong to that house? (I point to the house she came out of) No, it belongs to their neighbour. The owner is Ahmed Arhyat. (Nihad says his last name many

times before I manage to spell it). But then the owner sold the cistern to someone else who doesn't live here anymore. [C-O:11]

So this new person just owns the cistern? And the land. [C-O:11]

He lets everyone use the cistern? Yes. [C-O:11]

The men tell us that the two cisterns are owned separately. This one is owned by someone called Zial Nyif. [C-O:14]

Is it her that owns the cistern? Yes, she owns it. [C-O:16]

#### 8. Households per cistern [C-H]

How many families use the cistern? We will share with our neighbour if they don't have water. [C-H:1]

Are your neighbours in your family? Yes, we are all in the same family. [C-H:1]

How many families use the cistern? Four to five families and they allow others if they have a water-shortage. [C-H:2]

How many families use this cistern? Four, all brothers and we allow anyone passing by to take water. [C-H:3]

How many households use the cistern? Eight but only to drink. [C-H:5]

How many families use it? Two families and anyone else can use it. The water is also used for trees. [C-H/C-PU d:6]

How many families use the cistern? Twelve and anybody in the village who wants or needs water can take it if they need it. [C-H:7]

How many families use this one? Ten and anyone else can use the cistern. [C-H:10]



How many families use this cistern? Her family. [C-H:11]

So not that house? (I point to the house that is also close to the cistern). No. [C-H:11]

Nihad asks how many families used the cistern? She says her house and that anyone can use it.[C-H:17]

9. Purposes of cistern water a. drinking b. animals c. cleaning d. farm [C-PU a/b/c/d]

Is the cistern the main source for water? Yes, for people and animals. [C-PU a/b:1]

Cistern is used for cleaning and animals, they don't use the water for drinking because the cistern is not clean enough. Things fall in like stones when they open the lid. [C-PU b/c:2]

The rooftop tank is used for drinking water. [C-PU:2]

Sometimes we drink the water in the cisterns if there is nothing else. [C-PU:2]

Are they using the cistern right now? Only for housework like washing and cleaning. [C-PU c:2]

It is commented that this coffee is made from rainwater. [C-PU a:5]

Only rain in the cistern? They use the cistern for drinking for tea and coffee. And they used piped water to clean? Yes, for cleaning and washing. [C-PU a:7]

Nihad has a question – What do you use the cistern water for? For drinking, washing, cleaning, the animals. [C-PU a/b/c:10]

There is water in this cistern – does she use it? When it is clean for drinking. When it is dirty for the animals and it will be use for the olive farm they are building. [C-PU a/b/d:16]

10. Preference for cisterns [C-P]

Do you prefer piped or rain water? Rain. Rainwater tastes better. [C-P:3]

Is that because they prefer the taste of rain? Yes, it is more healthy and tastes better. [C-P:5]

Do they prefer to drink rainwater? Yes, they prefer it. [C-P:7]

11. Do neighbours have cisterns? [C-N]

Do all the neighbours have cisterns? One used to have an old cistern but it is covered now. Neighbours don't have cisterns. One neighbour has a new cistern that he made two years ago. [C-N:2]

They mention that there are many cisterns in the area but they are not in good shape. [C-N:2]

After their cistern was fixed did their neighbours also want to fix a cistern? Their neighbours didn't say anything but ADRA fixed two others in the area. One was next to a school. [C-N:5]

Does everyone in the area use cisterns? Don't know. Another family uses a cistern. [C-N:5]

Are there other cisterns around here? The elderly man responds that there is one in El-Wasiyya just before we enter Al-Gyrat (this does indeed turn out to be restored cistern but not one done by PR, see Chart). [C-N:10]

Do they know of any other cisterns in Huwara? No, not in Huwara. [C-N:14]

She says that this is the only one in the area that ADRA has fixed. [C-N:17]

Do any of her neighbours use cisterns? (her and Feeraz are talking so I tell Nihad to ask this when it is a good moment). They can use it whenever. [C-N:17]

But there are no other houses in the area that use cisterns? She mentions that there is another cistern in the area but ADRA did not fix it. [C-N:17]

12. Cisterns have been improved [C-I]

The cistern is better than before because it is safer. [C-I:3]

What did they use before as lids? Metal but it was not as good. [C-I:6]

She mentions that the cistern is not good. [C-I:17]

She says that the problem is with the lid (remember that lid is defined as the entire above-ground cement encasement) because it is cracked. [C-I:17]

13. Impact of modernity on cistern use [C-M]

The water system is from pumped groundwater (El-Larish) to cisterns – rooftop tanks – pipes in the house. [C-M:1]

Is the cistern filled up with piped water? If the rainfall is not good then we use piped water. [C-M:3]

Are there pipes to the villages or do people have to use cisterns? There are pipes. Cisterns are only for drinking and piped water is used for cleaning the house and washing. [C-M/PU a:5]

What has changed? Pipes came and the cistern water could just be used for drinking. [C-M:5]

Is this their main source? No, rooftop tank is filled with piped and trucked water. [C-M:6]

Have they ever had water problems? Yes in the past but no problems now because they have pipes now. [C-M:6]

Nihad has a conversation with the teenage boy and finds out that the water in the cistern is rainwater and piped water combined. The cistern is 10 – 15 meters deep and is used for drinking and goats. To my untrained eye, I think that there is little water in the cistern.

[C-M/S/PU a/b:11]

There is a long discussion and Nihad tells me that in the past they used to drink the water from the cistern but when the pipes came they stopped using it. They used to have sheep but now no because everyone is busy with their work and don't have time. [C-M:17]

When did they stop using it? When the pipes came? Before ten years (I don't understand this answer). [C-M:17]

After the cistern was fixed then? Yes. (ah...the advent of modernity) [C-M:17]

14. Future desire to use cistern a. yes b. no [C-F a/b]

Every year the family grows so there is a bigger need for more cisterns. [C-F a:1]

People don't have a lot of money so they need help. [C-F a:1]

Is there anyone around here who knows how to fix the cisterns? (Nihad and I discuss that maybe it is better to hire locally rather than from the outside like PR did with the Iraqi engineer). There's no-one like ADRA around to fix the cisterns (this wasn't quite my question but I resign that I just need to learn Arabic in order to do continued work here). [C-F a:2]

Do they need more cisterns as their families grow? They are satisfied with this cistern. It will remain the four families here as one gets married they build a new house and they have a need for their own cistern then. [C-F a:3]

One of the women comments that other people would like their cisterns fixed. [C-F a:6]

Would they consider using the cistern again? Yes, if it is fixed again and fixed well they would use it. [C-F a:17]

Water

1. Water availability a. sufficient b. insufficient [W-A a/b]

When do they have water-shortages? From the end of May to the beginning of October.  
[W-A b:1]

Do they think in the future there'll be enough water in Jordan? (Nihad tells me good question while Feeras jumps in to explain and discuss the question). He thinks in the future there will be less water. [W-A b:2]

Feeras and the brother discuss water shortages in Jordan as being a problem due to an increasing population. (Nihad and I discuss the role of Israel taking more than their share of water between Jordan, Syria, and Lebanon. I tell her that is the discussion outside of Jordan). I ask Nihad to ask if they blame Israel for taking more than their share? (Nihad explains the question. Feeras jumps in the discussion too). The eldest brother answers that yes this is one of the reasons. I ask Nihad that she explained to them this is what we hear outside of Jordan? (I want to make the politicized discussion seem innocent – it is – but I am worried people might think that I am spy, as they might in Yemen, according to Eirik). [W-A b:2]

Feeras talks about Jordan's lack of sea and coastline – the Dead Sea is unusable and the Red Sea is too small. [W-A b:2]

The eldest brother mentions that another problem is the climate. It is too hot, last year there was rain at this time but not this year. [W-A b:2]

Do you ever have water problems? Nowadays no. In the past there wasn't enough water.  
[W-A a:5]

Do the pipes always provide enough water? It comes one day a week. It is enough. [W-A a:6]

Do they ever have water problems? No. [W-A a:7]

Is there ever a time when they didn't have enough water? Yes, they had a problem two – three years ago because there was not enough from the pipes. [W-A a:10]

Do they ever not have enough water? Their cistern is almost empty alot.[W-A b:11]

And they get enough water from the pipes? No not enough. Sometimes the water authority doesn't allow enough water through the pipes so they have to buy a tanker. [W-A b/P b/c:17]

2. Water provision a. rainwater b. pipes c. tanks [W-P a/b/c] – already answered in the cistern section

Who fills it up with piped water (I refer to which household). She does. [W-P b:11]

3. Water amounts used [W-U]

Maybe this is a weird question...How much water do you drink as a person? As an individual? They can't answer how much for one person. (Nihad suggests asking about for the month. I explain that where I come from everything is measured, which she translates to them). Maybe one liter, five liters for tea for the household per day. [W-U:3]

What type of farm do you have? Olives and grapes. [W-U:3]

What uses the most water? Olives.[W-U:3]

How often do the tankers come? Every 20-30 days one tanker. [W-U/P c:11]

A tanker fills up the cistern? No, about halfway. [W-U:11]

And that fills up the cistern? No this cistern needs four tankers to fill up. [W-U:16]

4. Water source [W-SO]

When does the water truck come? Have to go and order water from the pumping station at El-Larish. This is where the water trucks fill up on water from the ground. [W-SO:1]

The water gets pumped every Wednesday. [W-SO:1]

Do people see the government responsible for providing water? Uh...(oh-oh I am treading on politics and I can tell this is a more sensitive topic as there was a silence after the

question) the government is responsible for water and it is their job to bring water but if Jordan doesn't have enough water naturally what can they do? (Nihad asks if I understand her use of the word natural). All the piped water comes from the water authority. [W-SO:2]

How do they know when the water is coming? Is it advertised in the newspaper? No, the water authority tells them. Each town has a specific day. [W-SO:6]

How many hours does the water get turned on for? Half a day. [W-SO:6]

Oh, one last question. Where does the piped water come from? Larish and el-Walla. [W-SO:6]

Is el-Walla groundwater? No, it is spring water. [W-SO:6]

Tell them I apologize for interrupting their cleaning. No, it is okay because we are waiting for the water from the pipes to be turned on. [W-SO:6]

Oh, Monday is the day for water here? Yes. [W-SO:6]

Do they know where piped water comes from? From the water authority. [W-SO:7]

Where does piped water come from? Wadi El-Haidon – it is pumped from there to here. [W-SO:10]

Does she know where the water comes from? El-Larish. [W-SO:11]

## 5. Water survival techniques [W-ST]

How do people survive with water-shortages? They wait to do the chores like washing until the water trucks come. [W-ST:1]

## 6. Water sharing [W-S] – connect to Cistern and Households as ppl tended to mention these two things in conjunction with one another

Hum, this is something I hear a lot. How often does this happen that a stranger takes water? Often, people are passing by often but more in the summer. [W-S:3]

Who was it for? For the people and the houses nearest to the cistern. [W-S:9]

If the cistern is empty can anyone knock on the door of the house to get water from the pipes? Yes, he can help them with water from the rooftop tanker. [W-S:10]

She mentions that the cistern has enough water for her and her neighbours to drink when it is clean. [W-S:16]

7. Water quality [W-Q] link this one to temperature comments

What is the water quality like? It is filled with piped water, so the quality is good. [W-Q/P b:1]

Water quality is good because the water is warm in the winter and cold in the summer, must have something to do with nature. [W-Q/T:1]

Does she find the water quality good? She says that because deep deep the cistern is not clean it becomes mixed. So they wait until all the mix goes down and then they can drink the water. [W-Q:11]

So they don't use anything to filter it? No (the woman herself says no and laughs). [W-Q:11]

8. Water temperature [W-T]

Water is cold in summer and warm in winter, this is good. [W-T:2]

The water is warm in the winter, this is good. [W-T:3]

Why is this? Because it is so deep in the ground. [W-T:3]

9. Water cost [W-C]



Is it a bad question to ask what that costs (I ask Nihad. She pauses and says no they mentioned the tankers so not). 20 JD (approx 200 NOK) for one tanker. [W-C:11]

How much is the tanked water? A big tank is 40 JD (400 NOK). [W-C:16]

#### 10. Water labour [W-L]

Men are responsible for ordering the water – that is men’s work, women can’t go there. [W-L:1]

Who takes the water from the cistern? Woman. [W-L:1]

Do women or men order the tanked in water? The men. (Here Nihad interjects that the teenage boy told us the wrong information that it is not piped water that is added to the cistern but tanks that are trucked in). [W-L:11]

بسم الله الرحمن الرحيم

THE HASHEMITE KINGDOM  
OF JORDAN  
MINISTRY OF TOURISM & ANTIQUITIES  
Department of Antiquities  
Amman



المملكة الأردنية الهاشمية  
وزارة السياحة والآثار  
دائرة الآثار العامة  
عمان

Ref. No .....  
Date .....

الرقم ..... ٤١١٢ / ٥ / ١٨  
التاريخ ..... ٢٠٠٥ / ١١ / ٢٦  
الموافق ..... ١٤٢٦ / /

لن يهمله الامر ✓

يرجى التفضل بالعلم بان السيدة سونيا جنسن من المركز الامريكي للابحاث الشرقية في عمان ستقوم بزيارة المواقع (جلول ، حواره، المناره، دليلات المطرات مادبا، ماعين ، الفيصلية-مادبا) خلال الفترة الواقعة ما بين ١١/٢٦ - ٢٠٠٥/١٢/١٠ راجياً تسهيل مهمتها خلال فترة الزيارة.

واقبلوا الاحترام

د. فواز الخريشه

مدير عام دائرة الآثار

نسخة/عطوفة محافظ مادبا  
نسخة/مفتش اثار مادبا

هاتف : ٤٦٤٤٣٣٦ ، ٤٦٤١٢٧٥ ، ٤٦٤٤٣٢٠ ، فاكس : ٤٦١٥٨٤٨ - ص.ب : ٨٨ ، عمان - الأردن  
Tel. : 4644336 , 4641275 , 4644320 , Fax : 4615848 - P.O.Box : 88 , Amman - Jordan

#### Appendix 4.6. Permission

## Bibliography

Aase, Tor

- 1997 Interpretation of Categories: Observation, concept and category. Siri Pedersen, trans. Oslo: University Press.

Allan, J.A. and M. Karshena

- 1996 Managing environmental capital: the case of water in Israel, Jordan, the West Bank and Gaza, 1947 to 1995 *In Water, Peace and the Middle East: Negotiating Resources in the Jordan Basin*. J.A. Allan and J.H. Court, eds. London: I.B. Taurus Publishers.

Allan, Tony

- 2000 Contending Environmental Knowledge on Water in the Middle East: Global, Regional, and National Contexts. *In Political Ecology: Science, Myth, and Power*. London: Arnold Press.
- 2001 The Middle East Water Question: Hydropolitics and the Global Economy. London: I.B.Tauris.

Amery, Hussein A.

- 2001 Islam and the Environment *In Water Management in Islam*. Naser L. Faruqui, Asit K. Biswas, and Murad J. Bino, eds. Toyko: United Nations University Press.

Angioni, Guilio

- 2003 Indigenous Knowledge: Subordination and Localism *In Nature Knowledge Ethnoscience, Cognition, and Utility*. Glauco Sanga and Gherardo Ortalli, eds. New York: Bergham Books.

Aruri, Naseer H.

- 1972 Jordan: A Study in Political Development (1921-1965). The Hague: Martinus Nijhoff.

Bakir, Hamed

- 2005 Water Demand Management and Pollution Control: Key to securing and safeguarding the water supplies of MENA in the 21<sup>st</sup> Century. Electronic document, <http://www.emro.who.int/publications/CEHA-ESCWA.pdf>, accessed September 18, 2005.

Bakri, Sa'ad Eng.

- 2004 Introduction. *In* National Water Master Plan: Water Resources in Jordan. Pp. 5. Amman: Ministry of Water and Irrigation.

Barlow, Maude and Tony Clark

- 2002 Blue Gold: The fight to stop the corporate theft of the world's water. New York: The New York Press.

Battiste, Marie and James (Sa'ke'j) Youngblood Henderson

- 2000 Protecting Indigenous Knowledge and Heritage: A Global Challenge. Saskatoon: Purich Publishing Ltd.

bint Talal, Basma

- 2004 Rethinking an NGO: Development, Donors and Civil Society in Jordan. London: I.B.Taurus.

Blaikie, Piers and Harold Brookfield

- 1987 Land Degradation and Society. London: Methuen.

Briggs, Charles L.

- 1992 Learning how to ask: A sociolinguistic appraisal of the role of the interview in social science research. Cambridge: Cambridge University Press.

Bulliet, R. W.

- 2004 The case for Islamo-Christian civilization. New York: Columbia University Press.

Caponera, Dante A.

- 1954 Water Laws in Moslem Countries. Rome: Food and Agriculture Organization of the United Nations.

Caponera, Dante A.

- 2001 Ownership and transfer of water and land in Islam *In Water Management in Islam*. Naser L. Faruqi, Asit K. Biswas, and Murad J. Bino, eds. Tokyo: United Nations University Press.

Chambers, Robert

- 1983 Rural Development: Putting the last first. London: Longman.

Chatel, Francesca de

- 2004 Solving Jordan's Water Problems By the People, For the People. Electronic document, <http://www.islamonline.net/english/science>, accessed April 5, 2005.

Cosgrove, William J. and Frank R. Riksberman

- 2000 World Water Vision: Making Water Everybody's Business. London: Earthscan Publications Ltd.

Crewe, Elisabeth and Emily Harrison

2004 Whose Development? An Ethnography of Aid. London: Zed Books.

Cunningham, Robert B. and Yasin K. Sarayrah

1993 Wasta: The hidden force in Middle Eastern society. Westport: Praeger Publications.

Davidson O'Connell, Julia and Derek Layder

1994 Methods: Sex and Madness. London: Routledge.

De Villiers, Marq

2001 Water wars: Is the world's water running out? London: Phoenix Press.

Derman, Bill

1998 Development and Hydropolitics in Contemporary Zimbabwe *In Water, Culture, and Power: Local struggles in a global context.* Barbara Rose Johnston and John M. Donahue, eds. Washington, D.C.: Island Press.

Dolatyar, Mostafa and Tim S. Gray

2000 Water Politics in the Jordan River Basin *In Water Politics in the Middle East: A Context for Conflict or Cooperation?* Great Britain: Macmillian Press.

Ennis-McMillan, Michael C.

2006 A Precious Liquid: Drinking Water and Culture in the Valley of Mexico. USA: Thomson Wadsworth.

El-Naser, Dr.Hazim

- 2004 Foreword. *In* National Water Master Plan: Water Resources in Jordan. Pp. 3.  
Amman: Ministry of Water and Irrigation.

Escobar, Arturo

- 1995 Encountering Development: the making and unmaking of the Third world.  
Princeton, N.J.: Princeton University Press.

Falkenmark, Malin with Jan Lundqvist and Carl Wudstrand

- 1990 Water Scarcity – an Ultimate Constraint *In* Third World Development:  
A reader on a Forgotten Dimension in Dry Climate Tropics and Subtropics.  
Report, 14. Sweden: University of Linköping, Department of Water and  
Environmental Studies.

Falkenmark, Malin and Gunnar Lindh

- 1993 Water and economic development *In* Water in Crisis: A guide to the world's  
freshwater resources. Peter H. Gleick, ed. London: Oxford University Press.

Falkenmark, Malin and Johan Rockström

- 2004 Balancing Water for Humans and Nature: The New Approach in  
Ecohydrology. London: Earthscan.

Faruqui, Naser

- 2001 Introduction and Chapter One: Islam and Water Management: Overview and  
Principles *In* Water Management in Islam. Naser L. Faruqui, Asit K.Biswas,  
and Murad J. Bino, eds. Toyko:United Nations University Press.

Fischer, Frank

- 2000 Citizens, Experts, and the Environment: The Politics of Local Knowledge. Durham and London: Duke University Press.

Friedman, Thomas

- 2000 The Lexus and the Olive Tree. New York: Anchor Books.

Giddens, Anthony

- 2000 Runaway World: How Globalization is Reshaping Our Lives. New York: Routledge.

Gleick, Peter H.

- 1993 Water in the 21<sup>st</sup> Century *In Water in Crisis: A guide to the world's freshwater resources.* Peter H. Gleick, ed. London: Oxford University Press.

Goehring, Brian

- 1993 Indigenous Peoples of the World: An Introduction to their past, present and future. Saskatoon: Purich Publishing Ltd.

Greaves, Tom

- 1998 Water Rights in the Pacific Northwest *In Water, Culture, and Power: Local struggles in a global context.* Barbara Rose Johnston and John M. Donahue, eds. Washington, D.C.: Island Press.

Gubser, Peter

- 1983 Jordan: Crossroads of Middle Eastern Events. London: Croom Helm.



Hassoun, Rosina

- 1998 Water Between Arabs and Israelis: Researching Twice-Promised Resources  
*In Water, Culture, and Power: Local struggles in a global context.* Barbara  
Rose Johnston and John M. Donahue, eds. Washington, D.C.: Island Press.

Hilhorst, Dorothea

- 2001 Village Experts and Development Discourse: “Progress” in a Philippine  
Igorot Village *In Human Organization*, Vol. 60, No. 4, 2001.

Hunt, Constance Elizabeth

- 2004 Thirsty Planet: Strategies for Sustainable Water Management. London: Zed  
Books.

Iskandarani, Maria

- 2001 Water Market Participation and Effective Water Prices in Jordan presented at  
Globalization and Water Resources Management: The Changing Value of  
Water, August 6 -8, AWRA/IWLRI – University of Dundee International  
Specialty Conference 2001.

Johnston, Barbara Rose and John M. Donahue

- 1998 Introduction. *In Water, Culture, and Power: Local struggles in a global  
context.* Barbara Rose Johnston and John M. Donahue, eds. Washington,  
D.C.: Island Press.
- 1998 Conclusion. *In Water, Culture, and Power: Local struggles in a global  
context.* Barbara Rose Johnston and John M. Donahue, eds. Washington,  
D.C.: Island Press.

Just, Richard E with Sinaia Netanyahu and John K. Horowitz

- 1997 The Political Economy of Domestic Water Allocation: The Cases in Israel and Jordan *In* Decentralization and Coordination of Water Resource Management. Douglas D. Parker and Yacov Tsur, eds. Kluwer Boston: Academic Publishers.

JVL (Jewish Virtual Library)

- 2006 Israel's Chronic Water Problem. Electronic document, <http://www.jewishvirtuallibrary.org/jsource/History/scarcity.html>, accessed May 23<sup>rd</sup>, 2006.

Kadouri, M.T. with Y.Djebbar and M.Nehdi

- 2001 Water Rights and Water Trade: An Islamic Perspective *In* Water Management in Islam. Naser L. Faruqi, Asit K.Biswas, and Murad J. Bino, eds. Tokyo: United Nations University Press.

King Hussein (KH),

- 2006 Geography and Environment of Jordan. Electronic document, [http://www.kinghussein.gov.jo/geo\\_env1.html](http://www.kinghussein.gov.jo/geo_env1.html), accessed May 25<sup>th</sup>.

Knudsen, Ståle

- 2004 I Midtøsten er det Islam, ikke <<innfødt kunnskap>>. Norsk Antropologisk Tidsskrift, Vol. 15, No. 1-2, pages 56-70.

Köbben, André J.F.

- 1973 Comparativists and Non-Comparativists in Anthropology *In* A Handbook of Methods in Cultural Anthropology, Raoul Naroll and Ronald Cohen, eds. Chapter 30, pages 581-596. New York: Natural History Press.

Labianca, Dr. Oystein S.

- 1994 Project Rainkeep: A Plan for Increasing On-Site Retention and Utilization of Rainwater in Jordan. Electronic document, <http://www.rainkeep.org>, accessed November 12, 2004.
- 1994 On-Site Water Retention Strategies: Solutions from the Past for Dealing with Jordan's Present Water Crisis. Electronic document, <http://www.rainkeep.org>, accessed November 12, 2004.
- 2005 Bergen Proceedings: Local Level Water Management and the Progress of Civilizations in the Ancient Near East. Unpublished paper. Andrews University, Berrien Springs Michigan.

Lancaster, William and Fidelity Lancaster

- 1999 People, Land and Water in the Arab Middle East: Environment and Landscapes in the Bilâd ash-Shâm. Australia: Harwood Academic Publishers.

Lecture series

- 2004 Blending Indigenous and Expert knowledge in Planning Water-related Development Projects in Water 305. LECTURE presented by Oystein LaBianca at Senter for Miljø-og Ressurser. University of Bergen Norway. October 6, 2004.

Levitt, Kari Polanyi

- 2005 Globalization, Development, and Economic: Reflections on the History of Development Thought. Canadian Journal of Development Studies, Vol. Xxvi, No. 3, pages 517-526

Lindholm, Helena

- 1995 Water and the Arab-Israeli Conflict In Hydropolitics: Conflicts over water as a development constraints. Leif Ohlsson, ed. Pgs 55 – 90. London: Zed Books.

Linton, Ralph

1936 *The Study of Man*. New York: D. Appleton-Century Company.

Lonely Planet

2006 Website <http://www.lonleyplanet.com/worldguide/destinations/middle-east/jordan>. Accessed April 20, 2006.

Lowi, Miriam and Jay Rothman

1993 *Arabs and Israelis: The Jordan River In Culture and Negotiation: The Resolution of Water Disputes*, Guy Olivier and Jeffrey Robin, eds. California: Sage.

Mallat, Chibli

1995 *The Quest for Water Use Principles: Reflections on Shari'a and Custom in the Middle East. In Water in the Middle East: Legal, Political and Commercial Implications*. J.A.Allan, Chibli Mallat, Shai Wade, and Jonathon Wild, eds. Pp. 127-137. London: Tauris Publishers

Mansfield, Peter

1991 *A History of the Middle East*: New York: Penguin Books.

Merling, David and Lawrence T. Geraty, eds.

1994 *Hesban after twenty-five years*. Berrien Springs, Michigan: Institute of Archaeology Andrews University.

Ministry of Water and Irrigation (MoWI)

- 1993 Review of Water Resources Development And Use In Jordan. Final Report, Volume I. Amman: Ministry of Water and Irrigation
- 2004 Environmental and Social Assessment Disi-Mudawarra to Amman Water Conveyance System. Electronic document, <http://www.wds.worldbank.org>, accessed July 20,
- 2006 Ministry of Water and Irrigation homepage. [www.mwi.gov.jo](http://www.mwi.gov.jo)

Naff, Thomas and Joseph Dellapenna

- 2002 Can there be confluence? A comparative consideration of Western and Islamic fresh water law *In Water Policy* 4: 465-489.

National Water Master Planning Directorate (NWMPD)

- 2004 National Water Master Plan: Water Resources in Jordan Brochure 2 & Water Uses and Demands Brochure 3. Amman: Ministry of Water and Irrigation.

Noor, Queen Her Majesty Al Hussein

- 2003 Leap of Faith: Memoirs of an Unexpected Life. New York: Miramax Books

Nuaimat, Khaled

- 2006 Northern farms' water supply to be limited – Alem. Jordan Times, March 10.

Ohlsson, Leif and Anthony R. Turton

- 2000 The Turning of a Screw: Social Resources as a Bottle-neck in Adaptation to Water Scarcity. Report, 1. Sweden: Stockholm International Water Institute (SIWI), Stockholm Water Front Forum for Global Water Issues.

Robbins, Paul

- 2004 Critical Introductions to Geography: Political Ecology. Oxford: Blackwell Publishing.

Russell, Malcolm

- 1996 Policy Implications of Cistern-based Water Conservation in Jordan. Electronic document, <http://www.rainkeep.org>, accessed November 12, 2004.
- 1995 Affluence, International politics and Cistern-Based Water Conservation in Jordan. Electronic document, <http://www.rainkeep.org>, accessed November 12, 2004.

Saleh, Hassan A.K.

- 1991 Water Resources and Food Production *In* Politics and the Economy in Jordan, Rodney Wilson ed. London: Routledge.

Schiffler, Manuel

- 1995 Sustainable Development of Water Resources in Jordan: Ecological and Economic Aspects in a Long-Term Perspective *In* Water in the Middle East: Legal, Political, and Commercial Implication. J.A. Allan and Chibli Mallat w/Shai Wade eds. London and New York: IB Tauris Publishers.

Schubert, Jon

- 2005 Political Ecology in Development Research: An Introductory Overview and Annotated Bibliography. Bern: NCCR North-South.

Scott, James C.

- 1976 The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia. New Haven: Yale University Press.

Sheridan, Thomas E.

- 1998 The Political Ecology of the Central Arizona Project *In Water, Culture, and Power: Local struggles in a global context*. Barbara Rose Johnston and John M. Donahue, eds. Washington, D.C.: Island Press.

Shue, Henry

- 1980 *Basic Rights: Subsistence, Affluence, and U.S. Foreign Policy*. Princeton: Princeton University Press.

Silverman, David

- 2003 *Analyzing Talk and Text In Collecting and Interpreting Qualitative Materials*. N.K. Denzin and Y.S. Lincoln, eds. London: Sage Publications.

Stonich, Susan C. and Jerrel H. Sorensen and Gus W. Salvador

- 1998 *Water, Power, and Environmental Health in Tourism Development: The Bay Islands, Honduras In Water, Culture, and Power: Local struggles in a global context*. Barbara Rose Johnston and John M. Donahue, eds. Washington, D.C.: Island Press.

Suzuki, David

- 2006 Keynote speaker, autobiography book tour. Courtenay, B.C. Canada. May 17th.

Turton, A.R. and L. Ohlsson

- 1999 *Water Scarcity and Social Stability: Towards a Deeper Understanding of the Key Concepts Needed to Manage Water Scarcity in Developing Countries*. Electronic document, <http://www.soas.ac.uk/geography/waterissues/occasionalpapers>, Accessed April 2005.

United Nations (UN)

- 1992 The Dublin Statement and report of the conference. International conference on Water and the Environment: Development Issues for the Twenty-First Century, Dublin Ireland, January 26 – 31. New York: United Nations.
- 2003 Water scarcity in the Arab world. New York: United Nations.
- 2005 Statistics Division: Progress Towards the Millenium Development Goals, 1990 – 2005. Electronic document, <http://www.un.org/waterforlifedecade/links.html>, Accessed July 20, 2005

Wadel, Cato

- 1991 Feltarbeid i egen kultur. Flekkefjord: Seek A/S.

Walker, Peter A.

- 1998 Politics of Nature: An overview of political ecology. Capitalism, Nature, Socialism. Vol. 9. No. 1, pages 131-144.

Watson, Richard P, G.W. Burnett, and Lars Wahlin

- 1998 Hisban Water Harvesting Survey: Methods and Techniques. Electronic document, <http://www.rainkeep.org>, accessed November 12, 2004.

WHO (World Health Organization)

- 2005 General Comments on the Right to Water, Electronic document, [http://www.who.int/entity/water\\_sanitation\\_health/rtw2.pdf](http://www.who.int/entity/water_sanitation_health/rtw2.pdf), accessed September 18, 2005.



Wittfogel, Karl

1957 Oriental Despotism. New Haven: Yale University Press.

Wolf, Margery

1992 A Thrice Told Tale: Feminism, Postmodernism and Ethnographic Responsibility. Stanford: Stanford University Press.

World Bank

2003 Private Solutions for Infrastructure in Mexico: Country Framework Report for Private Participation in Infrastructure *In A Country Framework Report*. Washington, D.C.: The World Bank.

Zaslavsky, Dan

2000 Definition of Israel's Water Problems or Water as a Metaphor presented at Efficient Use of Limited Water Resources: Making Israel a Model State at Bar-Ilan University, June 14. Bein-Sadat Center for Strategic Studies