Towards improved partnerships in the water sector in the Middle East: A case study of Jordan

by

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ABSTRACT

This dissertation focuses on the use of public-private partnerships (PPPs) in the water sector in Jordan, a Middle East pioneer with respect to experimenting with different approaches to delivering water services in both cities and rural areas. Jordan's efforts to decentralize water services began in the late 1990s at the prodding of the World Bank. A management contract was awarded to a private consortium to operate and maintain Amman's water system.

One major stumbling block has been finding the right organizational and legal arrangements. In this inquiry, I selected four cases that vary in terms of the institutional arrangement which I hypothesize impacts the effectiveness of partnerships. These were (i) the Greater Amman water supply and wastewater services management contract; (ii) the Northern Governorates Water Administration Managing Consultant contract; (iii) the water user cooperatives in the Jordan Rift Valley; and (iv) the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa. I selected four indicators to assess effectiveness: water quality, sustainability of the water supply, affordability and financial arrangements, and efficiency of the water services.

My initial expectations were confirmed: institutional arrangements did have a significant impact on partnership effectiveness. The factors that appear to have the most impact are the contracts, the structure of governance arrangements, and the legal context. Contracts embodying clearly defined targets are deemed crucial in ensuring accountability to customers receiving water services. However, sufficient flexibility in order to allow for a considered review and possible adjustments of initially set targets is also important. Contracts must also allow the service provider adequate autonomy to operate effectively. Second, in the case of governance structures, it is those which encourage consistent and inclusive participation of partners in decision-making and information sharing that bring a positive effect to bear on PPP arrangements. And third, relevant laws and regulations need to enhance accountability to customers in urban partnerships, and farmers as irrigation water users through cooperatives in rural partnerships. My findings also suggest that failure to implement knowledge transfer and the impact of troublesome historical relationships and events can thwart even well designed partnerships in the water sector.

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Biographical Note

Nancy Odeh is a Canadian citizen of Palestinian origin. She was born in Ottawa, Ontario, Canada. Nancy graduated with a Bachelor of Science in Physical Geography and Environmental Science from McGill University in 1997, and then went on to earn her Master of Science in Environmental Change and Management from Oxford University in 1999. These degrees were purposely complementary in that one focused on environmental science and the other on the policy dimensions of environmental management. Following her graduation from Oxford, Nancy worked for five years in the environment and international development field before starting her PhD program studies at MIT in 2004.

Over the course of her work-experience, Nancy's first position was with the United Nations Environment Programme (UNEP) in Jamaica. Here, she worked as a Communications Officer for six months writing about environmental developments in the Caribbean and maintaining the Caribbean Environment Programme website. Upon completion of this assignment, Nancy joined the Canadian federal government, specifically Environment Canada, where she worked as a Policy Analyst in the Climate Change Bureau for one year and half. Her tasks included preparing briefing notes related to Canada's position on international climate change and supporting the Canadian negotiating team at various international climate change conferences. Nancy's third field of endeavor was with the Stockholm Environment Institute - Boston Center (SEI-B), where she was a research associate for three years. Her responsibilities with SEI-B included working on projects related to climate change and adaptation in the Maghreb (i.e., Morocco, Algeria, Tunisia and Libya); coordinating a large global civil society project that culminated in a workshop at the World Summit on Sustainable Development (Johannesburg, South Africa, 2002); and developing publications and workshops on environmental impact assessments for small-scale infrastructure.

Nancy's decision to pursue a PhD in environmental policy in the Department of Urban Studies and Planning at MIT stemmed from her desire to better understand the theoretical underpinnings of policy evolution in the environment field. She also gained valuable teaching experience in planning and public policy while at MIT, and completed her doctorate in February 2009.

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"We have made from water every living thing."
- Surat Al-Anbuyya (*Sura* 21, *Aya* 30 in the Holy Quran)

"And Allah sends water from the sky and brings forth therewith fruit as a provision for you."
- Surat Al-Baqara (*Sura* 2, *Aya* 22 in the Holy Quran)

"And Allah has sent down the water from the sky and gives therewith life to the earth after its death."
- Surat Al-Roum (*Sura* 30, *Aya* 24 in the Holy Quran)

Table of Contents

List of Tables

List of Figures

Acronyms/Abbreviations

AGWA	Amman Governorate Water Authority
ASEZ	Aqaba Special Economic Zone
ASEZA	Aqaba Special Economic and Zoning Authority
AWSA	Amman Water and Sewerage Authority
AWC	Aqaba Water Company
CDM	Camp Dresser & McKee Incorporated
FTA	Farm Turn-Out Assembly
GIS	Geographic Information Systems
GTZ	Gesellschatt fur Technische Zusammenarbeit (German Technical Cooperation)
IUCN-WAME	The International Union for the Conservation of Nature - West Asia and Middle East office
JCC	Jordan Cooperative Corporation
JD	Jordanian Dinar (JD1 = US$1.4)
JVA	Jordan Valley Authority
KfW	Kreditantalt ur Wiederaufdau (German Development Bank)
LEMA	A private consortium in charge of the management contract in Amman (Suez **L**yonnaise des **E**aux, **M**ontgomery Watson **A**rabtech Jardaneh)
m^3	Cubic meters
MCM	Million Cubic Meters
MWI	Ministry of Water and Irrigation
NGWA	Northern Governorates Water Administration
NRW	Non-revenue water
PMU	Programme Management Unit
PRA	Petra Regional Authority
PPP	Public-private partnership
PS	Pumping station
PSP	Private Sector Participation
RIAL	Reuse for Industry, Agriculture and Landscaping Project
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan
Water sector	I define the water sector broadly to include drinking water supply and wastewater services, as well as irrigation water.
Water services	I define water service as providing drinking water, wastewater service, or irrigation water.

CHAPTER 1: Introduction

1.1 Subject and Background

The Hashemite Kingdom of Jordan (Jordan) occupies a landmass of some 92,000 km^2, which by comparison makes it slightly smaller than the State of Indiana. Its land boundaries extend a little over 1600 km, bordered by Iraq, Israel, Saudi Arabia, Syria, and the Palestine. Jordan is essentially landlocked, except for a minimal 26 km stretch of coastline at the northern extremity of the Gulf of Aqaba. As with most countries in this part of the world, the availability of water for all purposes remains an acute and growing challenge. Jordan, with its arable land base of 3.3%, finds itself sharing most of its sister Middle East-North Africa country challenges when it comes to the complexities that the water management mosaic in this part of the world.

In fact, anyone who has worked specifically in Jordan's water sector would be quick to add that it is one of the ten most water-poor countries in the world. Annual consumption of 1 billion cubic meters per year exceeds annual renewable freshwater and groundwater supplies of 867 million cubic meters (MCM) per year, with the over-pumping of groundwater providing the water consumed beyond renewable supply levels. Per capita water availability in 2009 is estimated at 149 cubic meters (m^3) per year[1] (MWI, 2009). This is far less than the 1700 m^3 per capita per year typically required to fulfill household, industrial, and agricultural needs in a lower-middle income country like Jordan. The country supplies water to its customers through a water rationing program (or water scheduling) which entails customers being able to access water for a certain number of hours over the course of a given week. The number of hours varies and based on this study's data, water is distributed through the municipal networks for 10 to 80

[1] A little over sixty years ago, in 1946, Jordan's per capita water availability averaged about 3600 m^3 per year (MWI, 2006).

hours per week. This dimension is further elaborated upon in Chapter 3. In short, the national water deficit is alarming. Surface water supplies contribute about 37% to Jordan's total water supply and groundwater supplies about approximately 54% (MWI, 2009). The unsustainable abstraction of groundwater is primarily a result of population growth and agricultural expansion. Jordan's population was 5.87 million in 2008 (MWI, 2009) and the country has a very high annual population growth rate, close to 3% (World Bank, 2006a). Jordan's water sector allocation - as minimal as it is - is not sustainable given a population of over 6 million. Some 72% of its water is devoted to agricultural, 24% to municipal (urban) and a marginal 4% to industrial uses (MWI, 2007). Jordan faces the stark reality of chronic water shortages coupled with the growing need to continue its economic and social development.

Most studies of water management in Jordan have focused on transboundary water management, water demand management, and water allocation efficiency (Dellapenna, 1996; Allan, 2001; Hof, 1998; Scott *et al.*, 2003; and Shatanawi and Al-Jayousi, 1995). Notwithstanding the importance of these technical assessments, it is crucial to note the paucity of research on the governance[2] of water resources in Jordan, and specifically the role of partnerships. A partnership in this study is defined as an alliance between two or more entities such as national agencies, private corporations, donor agencies, and localities. Haddadin *et al.* (2006) assert that the biggest water challenge for Jordan is effective water governance. Given the scarce water resources at play, the country must devise institutional arrangements that balance competing interests while ensuring participation and accountability. The idea is for Jordan, and other countries in the region, to "make the most of their water scarcity" (World Bank, 2007a) by

[2]'Governance' refers here to the concept of decision-making, specifically the "sum of many ways which individuals and institutions, public and private, manage their common affairs" (Vogler, 2003, p.34).

determining the types of institutional modifications that will put these countries on paths toward more sustainable water-resource management.

1.1.1 The path to partnerships in Jordan

Water partnerships in Jordan are a fairly recent phenomena, the first having been launched just 10 years ago in 1999. However looking back, it appears that there have been three waves in the country's efforts to decentralize water provision. First, were efforts made to decentralize the governmental system, which in turn was followed by movement back to centralization. Currently, in 2009, there is a decentralization focus linked to public-private partnerships (PPP). The first wave of decentralization began in the 1940s when Jordan's municipalities were responsible for the distribution of water, monitoring water quality, and collecting user fees. The mayors of many municipalities enjoyed close ties with residents, thereby making the collection of fees difficult. The thought of interrupting a user's water supply until back fees were paid, was not a politically palatable option. As the country's population swelled, particularly in the capital Amman, four significant bodies were added to assist in managing the countries water resources. In 1966, the Natural Resources Authority was created with a mandate that included exploration of water resources country-wide and the construction of needed infrastructure to enhance distribution networks.[3] In addition, the Amman Water and Sewage Authority was established in 1973, and it was later renamed the Amman Governorate Water Authority (AGWA). The Authority was charged with developing and managing water utility services in central Amman. And in that same year, the Water Supply Corporation [4] began supplying the balance of

[3] The Central Water Authority was another new entity that was formed in 1959, and eventually subsumed by the NRA. The Central Water Authority was a so-called autonomous government agency responsible for all water matters in Jordan except for the East Ghor Canal Project in the Jordan Valley (Haddadin, 2006). The Central Water Authority was created through the enactment of the *Organisation of Water Affairs Law No.51* (1959) (CESAR, 1997).
[4] Sometimes referred to as the Drinking Water Corporation, but herein referred to as WSC.

municipalities in the Kingdom,[5] with the exception of the Jordan Valley where water supply was the responsibility of the Jordan Valley Commission (the Commission was amalgamated into the Jordan Valley Authority (JVA) in 1977 under *Law No.18* [1977]). The JVA's mandate extends from the Yarmouk River in the north to the city limits of Aqaba on the Red Sea in the south. It is responsible for the social and economic development of this area, as well for the delivery and conservation of the area's water resources. It is noteworthy that while the JVA took over social and economic development responsibilities for the Jordan Valley, all projects continue to be transferred to the appropriate government agency once completed. An exception remains for irrigation projects, which remain under the control of the JVA (CESAR, 1997).

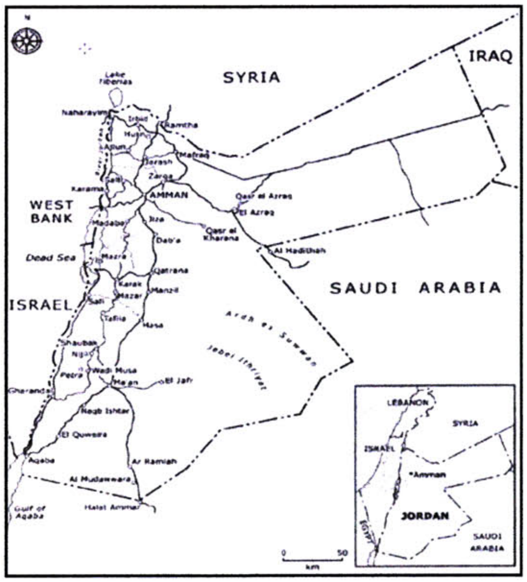
In 1983, the centralization process was initiated with the creation of the Water Authority of Jordan (WAJ) through the *Water Authority Law No.34* (1983) (CESAR, 1997). This law provided WAJ with "responsibility for all water matters in the Kingdom excluding irrigation projects … [and] all the water responsibilities of the municipal and village councils including the capital city of Amman. The law also added the responsibilities for sewerage systems and projects in the Kingdom to the new Water Authority" (CESAR, 1997, p.32). WAJ engulfed the Amman Water and Sewage Authority, the Drinking Water Corporation, the water-related directorates of the Natural Resources Authority (Water Studies Directorate, Excavation Directorate, Irrigation Directorate), and certain divisions of the JVA (Irrigations, Hydrology, and Dams Directorate). The municipal governments no longer had a role in the operation and maintenance of sewerage systems across the country as the organizational structure was now "strictly centralized" (MWI, 2007). The branches of WAJ in the governorates are fully dependent on WAJ headquarters for personnel, technical assistance, and billing. WAJ *Law*

[5] The Ministry of Municipal and Rural Affairs took charge of wastewater services outside Amman in 1977 (Haddadin, 2006).

No.18 (1988), specifically Article 25, further clarified WAJ's role with respect to the country's water resources: "All water resources available within the boundaries of the Kingdom, whether they are surface or ground waters, are considered State owned property and shall not be used or transferred except in compliance with this Law" (WAJ, 1988, p.23). In an attempt to integrate the enormous scope of work of both WAJ and the JVA, the Executive Branch of the government called for the establishment of a Ministry of Water and Irrigation (MWI) in 1992, so as to monitor the country's water sector and manage data. WAJ and the JVA became the two major arms of the new Ministry.

The third stage began as the government attempted experimentation with various forms of partnerships involving foreign and local companies, as well as with farmers who joined together to create water user cooperatives. This most recent turn of events began in the late 1990s when discussions with the World Bank led to the largest PPP in the water sector at the time. A management contract was awarded to Suez **L**yonnaise des **E**aux, **M**ontgomery Watson and a Jordanian company (**A**rabtech Jardaneh) (LEMA) to operate and maintain the capital's (Amman's) water system (Interview 53; LEMA, 2006a; MWI, 2006). This is arguably not a wave, but closer to the establishment of a more permanent path leading towards decentralizing water services throughout the country. Of Jordan's 12 governorates, six were decentralized by 2007. The four northern governorates (Ajloun, Jerash, Mafraq and Irbid) are under a Managing Consultant contract and have formed one entity; as of January 2007, the Governorate of Amman is run by Miyahuna, a public water company; and the Governorate of Aqaba established the Aqaba Water Company (AWC) in August 2004. At the time of writing, the Jordan Rift Valley has 16 water user cooperatives to help manage water distribution. Lastly, Jordan's geographically mid-country governorates of Madaba, Balqa, and Zarqa have been under study since 2007 in an attempt to determine an appropriate type of decentralization and partnership arrangement that would best meet their needs. Madaba currently has a micro-private sector participation contract for billing and revenue collection, which is discussed in greater detail in subsequent chapters.

Figure 1 - Map of Jordan



Source: Joffe, 2002.

1.1.2 Research Questions

How have institutional[6] arrangements - rules, norms and strategies - contributed to the effectiveness of partnerships in the water sector[7] in Jordan?

Relevant sub-questions include:

[6] Ostrom defines institutions as "[s]hared concepts used by humans in repetitive situations organized by rules, norms, and strategies (see Crawford and Ostrom, 1995). By rules, I mean shared prescriptions...that are mutually understood and predictably enforced in particular situations by agents responsible for monitoring conduct and for imposing sanctions. By norms, I mean shared prescriptions that tend to be enforced by the participants themselves through internally and externally imposed costs and inducements. By strategies, I mean the regularized plans that individuals make within the structure of incentives produced by rules, norms, and expectations of the likely behavior of others in a situation affected by relevant and material conditions" (Ostrom, 1999, p.37).

[7] The water sector is broadly defined here to include drinking water supply and wastewater services, as well as irrigation water.

- What are the institutional barriers that have undercut the effectiveness of partnerships in the water sector in Jordan?
- Why were particular partnerships initiated in the first place and why has Jordan been one of the few countries in the region to commit to these types of water partnerships?
- How did antecedent water management arrangements particularly in the rural sector, shape the design of newer types of partnerships and management arrangements?
- What kinds of historical events and factors influenced the success of the urban or rural partnerships in the water sector?
- What role, if any, did various water users play in shaping the evolution of water management and water policy in Jordan?

My hypothesis is that in Jordan, and water scarce countries, similar to Jordan, partnerships can be effective if institutional arrangements allow for the following: (i) contracts that give the service provider sufficient autonomy to be effective and efficient; (ii) governance structures that include end-users in decision-making and implementation; and (iii) polices, legal settings, and information channels that are adequately accountable to constituencies. I also propose that there are a number of intervening factors that could also play a role in influencing the effectiveness of a partnership in the water sector. Examples include knowledge transfer systems, historical influences, innovative organizational arrangements, a shift to a more commercially-oriented approaches, and empowerment.

Three possibilities could also influence the effectiveness of partnerships in Jordan's water sector, apart from institutional arrangements. First, Jordan's economic climate might shape the opportunity for both domestic and foreign investment in the country's water sector, and it is this economic climate that could have the most significant effect on the success of water partnerships. Second, the government's commitment to both economic development and its favorable attitude toward PPPs might be more important than the overall economic climate in determining the success or failure of water partnerships in Jordan. Third, the management or more importantly, the leadership of the specific partnerships is what accounts for their effectiveness. These notions are discussed in Chapter 5.

1.1.3 History of water management in Jordan

The account below highlights the manner in which water management has evolved, with a focus on the period between the early 1900s up to the 1980s. Underlined are the role of legislation; the attempts of Jordanian governmental entities and donor governments to better manage the country's water resources; and the importance of the Jordan Valley as the focal point for the need of professional water management policies and program initiatives.

Jordanian water sources were identified and have attracted human settlement since the Neolithic Age. A natural spring, known as *Ain Ghazal* in present day Amman, was discovered circa 6500 BC (LEMA, 2006a). The economy appears to have been primarily pastoral and dependent on the rainfed farming of wheat, barley, and legumes. The Early to Late Bronze Age (3000BC to 1200BC) witnessed the introduction of settlements in the Jordan Valley, where plants were cultivated through the use of irrigation. Milk production also started for the first time during this period, along with crops of olives, figs, pomegranates, and almonds being introduced in the Valley as well (Van Aken *et al.*, 2007).

Jumping ahead to1920 is when Amir (which means Prince in Arabic) Abdullah (of the Hashemite tribe) made his way from Mecca to Ma'an (a southern area in then Transjordan), and then further north to Amman (Robins, 2004). Robins explains that this occurred for two reasons: first, to stop the Hashemite dynasty's decline in what was then Transjordan; and second, to reinforce his own status within the Hashemite clan by promoting himself as a potential leader. Amir Abdullah's popularity with the people of Transjordan grew and the British agreed to allow Amir Abdullah to form his own government for a six-month trial period. Ultimately, Britain declared Transjordan a provisionally independent state under the Amir's rule in 1923 (Anderson, 2005).[8] However, it appears that Amir Abdullah inherited a land that "had familiarity with the statecraft" (Rogan, 1999, p.253). The Ottoman's succeeded in introducing the process of holding elected office, legal codes, and rigorous documentation (e.g., for loans, tax payments, receipts, births, deaths, etc.). The latter was the basis of Transjordan's bureaucracy, and is an aspect that remains quite apparent in Jordan's government of today.

The specter of water shortage in Jordan reared its head as early as the 1920s. From 1924 onwards, it became obvious that "the assumption that drought was a potential hazard rather than a chronic problem might have been true in earlier time" (Amadouny, 1994, p.134), but that a state of chronic drought now had to be accounted for in the development of the country. In Van Aken's (2003) anthropological study of the people of the Jordan Valley over the course of the 21st Century, he also explains that the 1930s and 40s was a time of successive droughts and crop failures. An indicator of the gravity of the situation, as explained by Van Aken, is that many landowners in the Jordan Valley were forced to borrow from urban moneylenders. Many of these landowners ultimately had to cede their lands in an effort to shed their debt, a financial burden which inevitably grew during times of drought and low productivity. Van Aken further explains that this shifting and settlement of land titles opened the door to a land market and an

[8] Britain's Mandate of Transjordan lasted from 1920 to 1946. Between the 1870s and the end of First World War, Transjordan was under the rule of the Ottoman Empire.

influx of farmers to the Jordan Valley, and into the country as a whole for that matter. Amadouny (1994) explains, in his account of infrastructural development under the British Mandate (1921-1946), that the thinking at the time was that agriculture would fuel Transjordan's economic growth. However, with insufficient and unreliable annual rainfall affecting harvests year after year, Amir Abdullah was called on to set up an Economic Committee in 1933 to improve Transjordan's economy, which subsequently translated into government interventions aimed at helping improve agricultural activities. Amadouny (1994) notes that many of the government's activities were only marginally successful for at least three main reasons. First, there were bureaucratic delays in opening up new water sources on the desert fringe. The timely delivery of new wells would have accelerated the sedenterization of the nomadic populations by providing them with water for their crops and livestock. The sources of delay were a mix of faulty equipment and excessive demands for water quality testing. Second, the government grew steadily more dependent on the private sector to supply important agricultural inputs such as seeds for potentially profitable crops, and agricultural machinery. The latter was problematic in that only the wealthiest cultivators could afford the machinery that was only accessible from abroad, while the balance of producers continued using traditional hand-made ploughs, forks and threshing boards. Third, during the Mandate period, less than 20% of the land under cultivation was actually irrigated. This was in large part because there was no upgrading of the irrigation system which was composed of deteriorating earthen canals, resulting in a continuous high rate of seepage.

Amoudouny (1994) attributes the lack of progress on any irrigation improvements in the Mandate period to four main issues: lack of water rights legislation; small size of the Department of Development which was created in 1937 to oversee irrigation; the British High

Commissioner of the day, who did not attach a meaningful priority to irrigation reforms; and the Rutenberg Concession of 1921. The Rutenberg Concession was an agreement between the British government and Pinhas Rutenberg (an engineer and Zionist leader). It granted the Palestine Electric Corporation priority rights to use the waters of the Jordan and Yarmouk Rivers. This meant that Palestine controlled the Jordan River on its course into Lake Tiberias. Therefore, Transjordan's farmers could no longer fully benefit from the Jordan and Yarmouk Rivers.

In 1946, the British Mandate rule of Transjordan ended and the Jordanian parliament proclaimed Amir Abdullah as King of the Hashemite Kingdom of Jordan. The post-British Mandate period (i.e., 1946 onwards) also saw the development of significant water-related regulation and legislation. According to Haddadin's (2006) description of the evolution of water administration and legislation in Jordan, the Projects Department within the Department of Lands and Survey (under the Minister of Finance) took *de facto* charge of Jordan's water resources in 1946-47. Water rights for irrigation were linked to ownership rights of the land to be irrigated. The source of water rights was the Islamic *Sharia.*[9] An important task of the Department of Lands and Survey was to issue new title deeds for lands already irrigated with water from springs, streams or rivers to replace deeds that dated back to the Ottoman period. The actual amount of water needed to irrigate the deeded land also had to be indicated. This procedure involved creating

[9] Under the applied interpretation of Sharia law, there are three priorities for water use: (i) the right of humans to quench their thirst; (ii) the right of drink for cattle and household animals; and (iii) the right of irrigation (Faruqui, 2001). In terms of irrigation one must distinguish between lakewater which can be used for all irrigation purposes without any objection; riverwater which can be used for irrigation provided that it does not harm the community; and rainwater which falling on land without an owner is at the disposal of any cultivator for irrigation (the owner of the nearest plot has first priority) (Caponera, 2001). Water resources for trading purposes fall into three categories: (i) a private good (water in private containers, private distribution systems, and reservoirs) in which the owner can use, trade, sell or donate it; (ii) a restricted public good (lakes, water streams, and springs) such that the owner has special rights and privileges over other users; and (iii) a public good (rivers, lakes, glaciers, aquifers, seas, snow and rainfall) that can be used by anyone for drinking, agriculture, and industrial purposes so long as the environment and public welfare are not adversely affected. 'Public good' water cannot be sold or bought for private interests unless it becomes a private good by adding value to it, e.g., through treating, storing, or transport (Kadouri *et al.*, 2001).

"water rights schedules", which is a procedure that dates back to 1937 and became the responsibility of the Department of Lands and Survey (Ghneim *et al.*, 2005).[10] To this end, the Kingdom's first water law was enacted in 1946 - the *Law of Settlement of Land and Water Rights*. As Haddadin (2006) explains, water rights were linked to irrigable land because irrigation was the primary use of water resources. Thus, the *Law of Settlement of Land and Water Rights* came into effect in 1952. The following year, the *Water Supervision Law* transferred responsibility to the Director of the Department of Lands and Surveys to construct and manage irrigation projects. The key condition saw landowners that required irrigation would bear two-thirds of the capital costs involved. In terms of groundwater management, the Ministry of Public Works created a well-drilling department to administer and manage groundwater. The management of future well drilling and the abstraction of groundwater were especially important because groundwater influences the base flow of *wadis,*[11] which farmers oftentimes use for irrigation.

It was in the 1950s that critical steps were taken in the planning and development of the Jordan Valley and the Yarmouk River. The Jordan Valley has always been a major consumer of water, and it collects almost two-thirds of the country's surface water (Van Aken, 2003). In 1952, with a very large number of Palestinian refugees finding themselves in the Jordan Valley as a result of Israel's war of independence in 1948, Jordan initiated talks with Syria about the construction of a dam near Maqarin on the Yarmouk River (the largest tributary of the Jordan river and originating in Syria). Negotiations culminated in a bilateral treaty in 1953 which allowed Jordan to utilize

[10] "Water rights schedules" is an approach to dividing water shares according to land size. The Department then prepares a water rights schedule that is made public in the village for 30 days, during which landowners can voice objections before the schedule is approved and made official (Ghneim *et al.*, 2005).

[11] *Wadi* is a dry riverbed that contains water during times of heavy rain. Sub-surface water is sometimes available in *wadi*s.

the Yarmouk for irrigation water and would subsequently enable electric power generation for both states (Haddadin, 2006). Israel, as another co-riparian of the Yarmouk, opposed the financial assistance that the United Nations Relief and Works Agency for Palestinian Refugees and the Technical Corporation Agency of the United States offered for the construction of the Maqarin Dam and demanded to be included in any plans to develop the water of the Yarmouk. Construction plans were temporarily halted (Haddadin, 2006). In an effort to promote cooperation between all riparian right-holders of the Yarmouk, U.S. President Eisenhower appointed Eric Johnston as a special Ambassador to mediate between all four riparians (i.e., Jordan, Israel, Syria and Lebanon) and to formulate a plan for the Jordan Valley (Hof, 1998). In brief, the Jordan Valley Unified Water Plan submitted by Johnston in 1955, placed Jordan as the principal beneficiary of the Yarmouk River, based on its irrigation needs. Although in reality Jordan received just over one-third of the Yarmouk waters, it was allocated mainly as a result of Syria's not respecting the allocations specified in the Johnston Plan[12] (Hof, 1998).

The East Ghor[13] Canal's construction began in 1958 and lasted until 1966. The canal runs parallel to the Jordan River and diverts water from the Yarmouk River to irrigate the eastern Jordan River Valley in Jordan. Van Aken (2003) describes the canal as "...the largest and most important development project ever taken in Jordan and the biggest U.S. investment in the Middle East" (p.29). In 1959 the *East Ghor Canal Law*, which outlined irrigated-land reform in the Jordan Valley created the East Ghor Canal Authority. The land to be irrigated by the canal was subdivided into farm units of three to four hectares for redistribution to owners and landless farmers, which included Palestinian refugees. In 1973, the Authority was renamed the Jordan

[12] The Maqarin Dam (also referred to as Al Wehdah Dam) became operational in early 2006.To date, it has only reached 7.5 MCM of its 110 MCM storage capacity (FOE, 2007).
[13] *Ghor* is the Arabic word for valley.

Valley Commission, and then the JVA in 1977 (Haddadin, 2006). This new regional authority owned the water resources and oversaw their management and distribution, essentially replacing tribal management of water resources in the area through its new land reform. This trend of doing away with tribal water management persisted through the 1980s, in Van Aken's words "…all trace of the former tribal water management and open irrigation canals has generally disappeared, physical signs of other forms of political organization and different relations to land" (Van Aken, 2003, p.214). Further, a substantial turning point in irrigation technology took place in 1973. Upon strong recommendation from the World Bank, the Jordan Valley Commission decided to overhaul the design of its water distribution network from the East Ghor Canal from open concrete-lined canals to pressure pipe networks. The intent was to greatly increase irrigation efficiency (Haddadin, 2006).

In the late 1970s, the capital city of Amman required additional water resources. This resulted in a first significant transfer of water from remote areas to the capital. Further, in the absence of a dam on the Yarmouk River, the East Ghor Canal would not be able to carry sufficient water to meet irrigation needs in the Jordan Valley, coupled with growing municipal needs. Thus, an official decision was made to reuse treated wastewater in the agricultural sector in the Jordan Valley, in part to make up for the water that would be transferred from the East Ghor Canal to Amman (Haddadin, 2006). The situation with municipal water shortages worsened and the task of supplying water to both Amman and Irbid (Jordan's second largest city) from the Jordan Valley was relinquished to the JVA in 1982.

It is important to note the significance of foreign international development donor activity in Jordan, especially from the 1950s onwards. The far-reaching influence of donors in Jordan's development seems to remain true today. This is particularly so in the water and agricultural sectors based on the number and size of initiatives, as well as the diverse donors implementing projects (e.g., the U.S., Italy, France, Germany, Japan, etc.) in these two sectors.[14] Kingston's (1994) chapter titled "Breaking the Patterns Mandate" provides a careful analysis of state formation in Jordan in the 1950s, including the role of donors. Kingston explains that up until the 1950s, the British spearheaded most of Jordan's development agenda focusing on institutional capacity building, especially in the agricultural sector. The focus was on building up the state in this regard, because only then could it support economic growth. The British also created and controlled the Jordanian Development Board through which they tried to centralize all development decision-making powers. The Jordanians also looked to the U.S. for development support in the hopes of a large influx of capital that would help spur a nationalist agenda. The United States was represented in Jordan by both their embassy and a new program known as Point Four, which focused on technology transfer in developing countries. In the end, the U.S. did not deliver the large capital infusion sought. Rather, they launched a number of smaller technical assistance programs, which included new agricultural technology which promised to make "the desert bloom" (Kingston, 1994, p.192). The strategy of transferring advanced agriculture-related technology to a developing country like Jordan was ill suited to the recipient's limited capacity to maintain the costs and administration of such projects. As Kingston states "[o]ne of the factors that made the politics of development interesting in Jordan is the degree to which foreign donors had the freedom to implement their own agendas" (1994,

[14] Since 1952, total U.S. economic aid through USAID (across a range of sectors such as water, agriculture, tourism, education, environment and infrastructure) has exceeded US$4.4 billion (USAID, 2007a). This represents a little over a third of Jordan's GDP (World Bank, 2006). U.S. support to Jordan's water sector is pinned at USUS$ 50 to 80 million a year, the largest amount of all the donors (Van Aken *et al.*, 2007).

p.193). He additionally argues that this trend is a result of both a weak political centre and a weak opposition movement in the 1950s.[15]

Kingston (2004) describes a relevant example, illustrating the extent to which development efforts were uncoordinated in Jordan, is the series of debates over the development of irrigation facilities in Jordan in the early 1950s. The British suggested a pilot irrigation project based on the construction of a diversion weir on the Yarmouk River. This was subsequently overshadowed by a larger, more ambitious U.S. proposal. In the end, the Jordanians questioning the feasibility of both but with no financial assistance from any donors, decided to round up their own experts and implement a more realistic pilot project. This proposed project was administered by the Jordan Development Board and financed by the government. The results were very impressive: by the mid-1950s dams had been built on all nine of the East Ghors *wadi*s draining into the Jordan River, except for Wadi Shuaib. This effort led to a dramatic increase in irrigable land in the Jordan Valley, and it was also a testament to Jordan's pool of skilled technicians, one of whom went on to become the manager of the East Ghor Canal. In sum, it appears clear that water has, and will continue to significantly influence the direction of Jordan's socio-economic development.

This dissertation focuses on a puzzle concerning the use of partnerships in the water sector. Jordan is a Middle East pioneer with respect to experimenting with different types of partnerships in the water sector. Throughout the wider Middle East-North Africa region, at least 50 different types of partnerships have been tried in the water sector including municipal water providers, irrigation water arrangements, and industrial water provision (Hall *et al.*, 2002;

[15] The weak political centre that emerged in the 1950s was caused mainly by the increased involvement of educated Palestinians in politics, as well as the uncertain relationships between the new King Hussein and his grandfather's close political allies.

Tardieu *et al.*, 2004). While Jordan does not host a majority of these partnerships, it has experimented with numerous models. One major stumbling block has been finding the right organizational and legal arrangements (i.e., contracts, policies, laws, governance structures, and channels of information). With water scarcity intensifying, population and urbanization relentlessly increasing, and public utilities remaining largely inefficient,[16] there is a need to keep "pushing the envelope" in the water sector. And it is this context that frames the key question of how do we get the institutional arrangements right?

The goal of this research is to identify the attributes of effective partnerships in the water sector by examining several case studies that have achieved a modicum of success in Jordan. The four partnerships examined are all PPPs. That is, the public component in each instance is a governmental entity and the private component is either a private corporation or a grouping of farmers. As a result, this research moves slightly beyond a conventional definition of PPPs (i.e., usually defined as a joint effort between the public sector and a corporate actor) by extending the definition of private to include non-governmental entities such as a farmers' water user cooperative. The literature tends to use the term PPPs and private sector participation (PSP) interchangeably. Here, the term PSP is mainly used in Chapter 3 because interview respondents described the two case studies presented in Chapter 3 as cases of PSP (although they could have been also referred to as PPPs).

1.2 Research Design

The field research in Jordan was divided into three segments over two years. The initial exploratory phase involved conducting informal open-ended interviews with more than 50 water-

[16] In 2000, WAJ's accounts receivable (monies owed to the company by a customer) reached US$ 35.3 million. It has a total of 8000 employees, an accumulated deficit of more than US$ 706 million, annual losses of over US$ 52.3 million, and an enormous amount of unaccounted-for-water (OMS 2000).

resource professionals in local non-governmental organizations, international environmental organizations, public sector offices, and consultants. These afforded an overview of the most pressing water policy-related issues in the Kingdom. Instrumental to the undertaking of this early research phase was the opportunity presented for an in situ assignment with the then newly created International Union for Conservation of Nature - West Asia and Middle East (IUCN-WAME) headquartered in Amman. The IUCN-WAME is a regional office that is part of IUCN's extensive and highly respected global network of offices. This regional office has designated water as one of its core themes and houses experts who are familiar with both Jordan and the region. The IUCN-WAME Director recommended key interviewee candidates in this domain. Contacting these individuals from the relatively neutral IUCN office proved helpful in gaining access to junior- and senior-level professionals involved directly or indirectly with related disciplines and fields of pragmatic expertise. This proved particularly valuable to my study in terms of the grounding gained from the outset on the many practical dimensions and challenges inherent within the region in the development and application of coherent, holistic water management policies.

Supported by this indoctrination, a number of relevant potential case studies emerged for consideration. These were further explored in a second visit to Jordan. Through an additional 25 semi-structured interviews during this second phase, case study selections were finalized. A third visit involved conducting 100 semi-structured interviews at the specific case sites (i.e., Amman, Irbid, Wadi Mousa, and various locations throughout the Jordan Rift Valley). Appendix A includes the interview guide used for all four case studies. Voluminous documentation was also assembled (i.e., progress reports, minutes of meetings, contracts, policy papers, etc.).

Water, particularly decision-making about water, is a highly politicized and sensitive topic in Jordan, and indeed throughout the region as a whole. Visiting three times over a two-year period allowed me to build relationships with key individuals involved in Jordan's water sector, all of whom were supportive of the research effort throughout its conduct. Moreover, the ability to conduct interviews in Arabic without requiring translator-support, as well as knowledge of the local culture enabled me to far-more freely approach individuals whose assistance was required. I also translated original documents that were not available in English.

Near-all interviewees gave permission to voice-record their conversations conditional upon their anonymity being protected. Therefore, they are only referred to by their position-title rank in this dissertation.[17] Appendix B contains a list of all interviewees by job title only.

1.2.1 Case study design

This research adopts a case study strategy to explore the question as to how do institutional arrangements influence the effectiveness of partnerships in the water sector in Jordan.[18] In this instance a multiple-case design (as opposed to a single-case) was chosen. I considered the multiple-case design preferable because analytic conclusions independently arising from two or more cases will be more reinforcing than those originating in a single case analysis. Another strength of the multiple case study approach is that when the contexts of respective case differs somewhat, and any consistent patterns emerge across the band of these investigated cases, the validity findings is further enhanced (Yin, 2003). Whereas, internal validity tackles the issue of how research findings match reality (Merriam, 1998). Investigators can employ several

[17] I was required to apply to the MIT Committee on the Use of Humans as Experimental Subjects and obtained approval for the research design prior to initiating field research.

[18] As Yin (2003) states, "case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (p. 1).

strategies to augment internal validity, with one of the most common being data triangulation. Data triangulation is used in order to corroborate the same facts from different accounts and ultimately strengthen the study (Patton, 1990).

1.2.2 Case study selection

The reader's attention is drawn to the list of Acronyms/Abbreviations provided on page 17. It is hoped that this list will prove of assistance given the number of recurring organizational and other acronyms and abbreviations throughout this dissertation. The unit of analysis in the case studies is a specific partnership in the water sector. Cases selected for purposes of this investigation are relatively similar, but do differ insofar as the structure and management of the partnerships are concerned:

- One of the partners in all four cases is a government entity, either a national entity like WAJ, or a local entity such as the Petra Regional Authority (PRA).
- Each partnership focuses on the provision of water for municipal or agricultural, but not industrial, usage. The focus of interest is on partnerships that seek to serve a cross-section of socio-economic groups.
- Each partnership is either ongoing (or only recently terminated) to enhance the chances of collecting relevant data and locating the key individuals involved.
- Each partnership has clearly defined goals that are stipulated in either a contract or a project work plan; and
- Each partnership operates entirely within Jordan and does not involve any other country. This study examines the dynamics of intra-state water governance as opposed to transboundary water governance. The four cases selected did fulfill all five of these criteria.

The four include: (i) the Greater Amman water supply and wastewater services management contract; (ii) the Northern Governorates Water Administration (NGWA) Managing Consultant contract; (iii) the water user cooperatives in the Jordan Rift Valley; and (iv) the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa. The first two are urban partnerships dealing with municipal water supplies. The latter two are rural partnerships and focus on irrigation water. Table 1 provides a brief description of each.

Table 1 - Overview of the four case studies in this study

	Greater Amman water supply and wastewater services management contract	NGWA Managing Consultant contract	Water user cooperatives in the Jordan Rift Valley	Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa
Location	Urban: Greater Amman governorate	Urban: Four governorates (Ajloun, Irbid, Jerash, Mafraq)	Rural: Jordan Rift Valley	Rural: Wadi Mousa (in Ma'an Governorate)
Sector	Municipal water	Municipal water	Irrigation water	Irrigation water
Number supplied/involved	360,000 customers (residential and commercial)*	210,000 customers (residential and commercial)**	Approximately 900 members in total***	Approximately 107 members in total
Prior organizational framework	Local branch of national public water authority	Local branch of national public water authority	JVA oversaw all water distribution, no involvement of farmers	Farmers relied on rainfed agriculture
Primary public partners	WAJ	WAJ	JVA	PRA
Primary private partner (s)	LEMA	Severn Trent Water International and Consulting Engineering Center	Farmers	Farmers
Type of contract	Management contract	Managing Consultant contract	Donor project contract with government	Donor project contract with government
Cost	US$55 million over 7 years	Approx. US$6.5 million over 3 years	Approx. US$3.2 million over 8 years	Approx. US$468 thousand over 3.5 years
Main purpose	Manage/operate/ maintain water and wastewater facilities	Improve the water and wastewater services	Improve efficiency of irrigation water distribution	Use treated wastewater as source of reclaimed water for irrigation

* Amman's population is approximately 2.1 million; 99% are connected to the drinking water supply and 80% are connected to the sewerage system (data as of the end of 2006).
** The population of the four governorates is over 1.6 million in total; 95% are connected to the drinking water supply and 65% are connected to the sewerage system.
*** This total is of May 2009.

(i) *The Greater Amman water supply and wastewater service management contract.* In 1999, a Management Contract was signed between WAJ and a private consortium, known as LEMA (the management contract ended on December 31, 2006). LEMA are the operators and they are responsible for managing, operating, and maintaining the facilities in cost-effective manner with reduced cost and increased profitability in the water and wastewater operations of the service area. Although the two entities in this partnership are WAJ and LEMA, the case study will probe the role and significance of the Programme Management Unit[19] (PMU), a body within WAJ which was created to monitor the progress of the Greater Amman Water Supply Programme. This included both the management contract and the Capital Investment Program for the water supply system of Greater Amman, which aim to restructure and rehabilitate the water supply facilities in Amman.

The Governorate of Amman service area is the largest domestic water market in the country. The operator's compensation for the performance of its obligation under the contract is/was based on its ability to reduce operating expenditures while increasing revenues from the provision of water and wastewater services. The operator is paid an annual "performance incentive compensation", which permits the operator to retain a percentage of the gains in profitability over the term of the contract.

The responsibilities of the private operator included the following tasks (WAJ, 1999b):

- transferring water to the water treatment plants and then distributing the treated water and supplying drinking water to subscribers;
- collecting wastewater and getting it to wastewater treatment plants and then transporting the treated wastewater to the receiving bodies;
- maintaining the facilities at specified standards of maintenance and developing a comprehensive maintenance management program;

[19] This is an important body within the context of the management contract because the PMU was established in 1997 as an entity within WAJ whose task it is to coordinate and monitor the Greater Amman water supply and wastewater service management contract, as well as oversee the Capital Investment Program for Amman and prepare other governorates for commercialization of their water utilities and PSP (PMU, 2007). The PMU will be discussed in more detail in Chapter 3 .

- rehabilitating and repairing the facilities as required; and
- taking responsibility for billing, collections and customer service related to subscribers in the service area and cooperating with WAJ's implementation of its Capital Investment Program.

There are over 60 measurable targets against which LEMA's performance has been evaluated. There are regular evaluation reports which were produced between 1999 and 2006, as well as LEMA's annual reports, that focus on additional issues not covered in the targets, the external technical auditor reports.

(ii) *The NGWA Managing Consultant contract.* In 2004, WAJ through the PMU conducted an open competition to hire an experienced water and wastewater operations firm as a "Managing Consultant." The objective was to assist NGWA in increasing the efficiency of its water and wastewater services. NGWA is a water utility that provides services to 210,000 customers (residential and commercial) in the four northern governorates (Ajloun, Irbid, Jerash and Mafraq) of the country. Thus, the partnership in this case is one between WAJ (specifically the PMU) and the Managing Consultant. The latter is a joint venture of the British water operator Severn Trent Water International and a local engineering firm, Consulting Engineering center.

The Managing Consultant undertook a three-year contract with WAJ, effective May 1, 2006. WAJ remains responsible for service delivery, general management and custodianship of facilities and personnel matters, all financing requirements of service delivery, asset ownership, as well as legal responsibility for all administrative activities. However, NGWA's history dates back further than May 2006. In fact, the decision to hire a Managing Consultant followed the failure of an earlier effort to find a private management consultant in 2004. The Managing

Consultant's primary responsible was to provide advisory services to the new utility - NGWA - and help NGWA breakeven financially to become an operating company (a public water company) within three years (i.e., April 2009).

The Managing Consultant's role includes (among other objectives): operating the water and wastewater facilities; carrying out leak detection and repair; carrying out day-to-day responsibilities for non-revenue water (NRW)[20] reduction; maintaining the facilities and developing a comprehensive maintenance management program; carrying out all billings, collections and customer relations and service functions; and most importantly, reaching the defined objective of an operating ratio (or cost recovery) of 105%[21] and a balanced cash-flow, and achieving all of the criteria necessary for WAJ to ultimately assign responsibility for the management of water and wastewater services to an operating company.

The contract value is approximately US$6.5 million and is co-financed with KfW (the German Development Bank). These improvement projects are supervised and monitored by the PMU, which created a performance indicator and benchmarking system for NGWA.

(iii) *Water user cooperatives in the Jordan Rift Valley.* The chief objective of creating water user cooperatives is to improve the efficiency of irrigation in the Jordan Rift Valley (i.e., an area between Lake Tiberias to the Red Sea). The specific areas where the water user cooperatives are located is the Jordan Valley (i.e., the area between Lake Tiberias and the Dead Sea), as well as

[20] NRW is the metered volume of water that is not producing revenue, so it is the difference between water produced and water billed. NRW has three main components: physical (real) losses (i.e. leaks, overflow at storage tanks); commercial (apparent) losses (i.e. water theft through illegal connections, customer meter under registration, and data-handling errors etc.); and unbilled authorized consumption which is water used by the utility for operational purposes e.g. firefighting and water provided for free to certain customer groups (World Bank, 2006b).

[21] An operating ratio of 105% means operating revenue exceeds operating costs by 5%. Sources of operating revenue include: water sales in the service area, sewerage and drainage fees, meter subscriber fees, water sales to other governorates, water connection fees, sewage connection fees, water sales by NGWA tankers. Operating costs include salaries, electricity, etc. (Interview 38).

the area south of the Dead Sea known as the Southern Ghors. This effort is funded by the German Technical Cooperation (GTZ, the German international cooperation enterprise for sustainable development), and started in 2001. The larger project titled "Water Resource Management in Irrigated Agriculture" (which includes a second and separate component dealing with managing groundwater for irrigation in the Highlands of Jordan) has a budget of approximately US$3.2 million.

The philosophy underlying the involvement of water users - the farmers - of the Jordan Rift Valley is that their participation in managing irrigation systems might reduce inefficiencies in water distribution. The new partnership involves building relationships among individual farmers, as well as between farmers and the JVA. A further equally important reason to form water-user cooperatives is that the *JVA Law* in 2001 allowed the Authority to engage any entity in the private sector to implement any of its projects in the Jordan Valley. This has been interpreted to mean a "water-focused" private sector corporate entity, or a group of farmers. The irrigation inefficiencies noted above occur in the end branches of the network i.e., on-farm losses are high, some studies peg them at nearly 60% (GTZ, 2000).

This high degree of irrigation inefficiency is due to three main factors. First, farmers were not involved in the planning of modernizing the irrigation system. There was little technical assistance provided to help farmers adapt their farming practices to a pressurized system. Farmers resisted having a slower flow of water (which is critical to the optimal functioning of a pressurized system). The JVA succumbed to this resistance and raised the rate of flow, thereby allowing farmers to continue with their surface irrigation methods. Second, being accustomed to open-channel systems, farmers did not receive sufficient training to manage the new pressurized system properly, which caused both physical damage to the network and water loss. Third, farmers were not content with the water delivery in a pressurized system and they felt compelled to overwater their fields through the illegal use of water, by tampering with water meters and flow limiters. As a result of these three factors, both the infrastructure and the relationship between farms and the JVA deteriorated rapidly (Sanfilippo, 2006).

(iv) *Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa.* This pilot project is part of a much larger effort called the Reuse for Industry, Agriculture and Landscaping Project (RIAL), funded by the United States Agency for International Development (USAID). The project's aim was to integrate reclaimed water resources in Jordan's national water planning. The term "reclaimed water" refers to "wastewater (sewage) that has been treated and purified for reuse rather than discharged into a body of water" (CDM, 2007a, p.20). In this case study, the treated wastewater is being reused as irrigation water for agriculture. RIAL started in June 2004 and its overarching goals are to: help establish permanence of water reuse in Jordan; improve regulatory capability for monitoring and management of reuse activities; and improve acceptance of water reuse. The implementation of all RIAL activities has been commissioned to an international consulting firm - Camp Dresser & McKee (CDM). CDM's involvement in the RIAL project ended in January 2008. There are various partners in this initiative including the members of the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa (located in the Petra Archaeological Park which is in the southern governorate of Ma'an), USAID, CDM, the PRA, WAJ, and the Hashemite Fund for the Development of the Badia. This case study investigates the role of each stakeholder, with a focus on the partnership among the members of the cooperative, as well as between the cooperative and the government (where the government in this case refers to the PRA and WAJ), and the cooperative and CDM and the Hashemite Fund for the Development of the Badia.

The irrigation system at Wadi Mousa comprises 40 individually owned farms connected directly to the wastewater treatment plant. Approximately 107 hectares of land are being cultivated with alfalfa mainly in addition to fruit trees and a mix of winter crops (notably barley, wheat, and corn). Using treated wastewater in agriculture is already widely practiced in Jordan. CDM and its counterparts are expected to establish sustainable irrigation system operations and maintenance procedures that will expand irrigated and landscaped areas in a sustainable fashion.

There are a number of performance indicators that have been used to evaluate the success of this project. These range from agricultural benefits as measured by yields, to water reuse factors, to both environmental and economic impacts, and to the satisfaction-levels of users. There is no evidence of water reuse activities in Wadi Mousa prior to this project, and farmers practiced rain fed farming only. Thus, before the RIAL project, treated wastewater from the Petra Regional wastewater treatment plan was simply discharged into the *wadis.*

1.2.3 Data collection and analysis

Three data sources were mined in order to prepare each case: (i) publicly available documents such as national water master plans, terms of references of various contracts, project evaluation documents, and Jordanian print media; (ii) classified documents such as contracts, minutes of meetings, or audit reports that were made available; and (iii) semi-structured interviews. The interview process employed a non-probability sampling method. Specifically, "purposeful sampling" is best suited for studies which aim to explore issues and gain insight from a sample of informants that the researcher can learn the most from (Merriam, 1998). In addition to purposeful sampling, the initial sample was increased in size when certain participants referred to other relevant individuals. This is termed "snowball sampling" (Merriam, 1998). The sample included a panel of key informants. These "informants" were comprised of local and national government officials, farmers, representatives from donor agencies, university professors, and representatives from non-governmental organizations and multinational water companies working in Jordan (both expatriate staff and local senior staff in the newly formed utilities for both of my urban case studies were interviewed).

Data triangulation was used to corroborate facts provided by sources (Patton, 1990). Key informants from organizations not directly involved in the four case studies selected were also interviewed. Pilot interviews were used to test the clarity of the draft questions, *ex ante* the interview guide being fully deployed for field use. The data analysis involved transcribing interviews and coding them. The analysis of the interviews was carried out using qualitative analysis software called Atlas Ti 5.0.

1.2.4 Measuring effectiveness of partnerships and institutional arrangements

Collectively, these four case studies support the building of an understanding as to what works, and the reasons why they so work, in effective water partnerships. To assess the effectiveness of the four partnerships, four indicators were selected for investigation: water quality, sustainability of supply, affordability and financial arrangements, and efficiency of the service. The same questions were posed in all four cases being analyzed, bearing in mind certain questions might have had slightly different meanings and/or contexts in urban versus rural settings. For example, questions about the affordability and efficiency of service in urban settings ask about the proportion of unconnected households, or the proportion of end-users with unreliable water supply or wastewater services. In the rural cases, questions about affordability and efficiency addressed membership in water user cooperatives or the reliability of irrigation water. Table 2 lists the measures of effectiveness and the principal themes that the interview questions addressed.

Table 2 - Measures of effective water partnerships

Dependent variables	Key themes investigated
Water quality	•Salinity of the water (total dissolved solids) •Total suspended solids •Pathogens (*e.coli* or others) •Trace metals •Public health
Sustainability of supply	• Ratio of amount of water taken from supply to annual renewal • Conservation policies
Affordability and financial arrangement	• Water tariff • Cost recovery • Capital investment
Efficiency of service	• Revenue collection • Connectivity of households • NRW • Sufficient and reliable service

Effectiveness in all four cases context translates to the water quality, sustainability of supply, affordability of the water service,[22] and efficiency of service. Data was gleaned through evaluation reports generated by the partners in each case study as well as through interviews. Evaluations of partnerships in the water sector have been done before (Sohail and Cavill, 2001a; Leach *et al.*, 2002). Very few studies have collected both baseline and post-project data. As suggested by Leach *et al.*, 2002, a surrogate for actual impacts can be a measurement of the stakeholders' perception of the given partnership's impact.

In this inquiry it is the institutional arrangements - namely, the formal and informal rules spelled out in contracts, policies, legal requirements, and understandings between groups and individuals - that constitute the independent variables. These are the factors that I hypothesize account for different levels of effectiveness of water partnerships. I selected a robust institutional arrangement as the explanatory variable given the growing belief in academic circles that institutional arrangements strongly influence the quality of governance, and water governance in particular (Sohail and Cavill, 2001a and 2001b; Sohail *et al.*, 2005; Surjadi, 2003; Davis *et al.*,

[22] In this study, water service refers to providing drinking water, wastewater service, or irrigation water.

2001; UNESCO, 2006; Moench *et al.*, 2003; World Bank, 2003a and 2007; Rogers, 2006; Elhance, 2000; Spiller and Savedoff, 1999).

Institutional arrangements constrain or encourage accountability, flexibility, and participation. These, in turn, alter the prospects for effectiveness in the provision of water services. Accountability of providers to service users is of prime importance. Government and service providers need to know that there are clear penalties for unsatisfactory performance. For this to happen, transparency is required so that the public knows what to expect and to be in a position to subsequently measure what has been achieved. Flexibility in institutional arrangements refers to the ability in modifying elements of a contract so as to reflect a shift in the social or economic context or the government's revised needs or objectives. Flexibility also involves having in place policies that strive for solutions that might not achieve the ideal initially, but at least lend themselves to eventual modification, even if on an incremental basis. Participation refers to giving stakeholders a role in government decision-making. To this end, government can employ various tools to facilitate participation such as user assessments of water/wastewater provision or forums for public involvement.

I selected the four cases with my independent variable - institutional arrangements - in mind. As King *et al.* (1994) explain, selecting case studies according to the key causal explanatory variable (the independent variable) causes no inference problems. In this way, the selection procedure does not predetermine the outcome of the study, because if the researcher chose cases according to a dependent variable(s), they would be restricting the degree of possible variation in that same dependent variable(s). For this reason, four cases were selected that vary in terms of the institutional arrangement hypothesized to impact the effectives of the partnership. For example, two models of partnership are investigated in the Greater Amman management contract case study: the use of a management contract to operate and maintain a water and sanitation service system, and upon its completion a newly created "corporatized" water company (this is essentially a publicly owned water company that operates on commercial principles). In the other urban case study, a Managing Consultant was used. In the two rural case studies, the partnership involved water user cooperatives. Table 3 lists the five facets of institutional arrangements investigated.

Table 3 - Measures of an institutional arrangement

Five facets of an institutional arrangement (independent variable)	Measures
Contract	•Longevity of the partnership •Initiation of the partnership •Revisability of contract •Informal or formal contract •Parties involved
Governance structures	• Decision-making bodies • Involvement of end-users • Static or dynamic decision-making structure • Conflict resolution mechanism
Policies	• Relevant policies • Influence of policy-making process • Policies related to subsidies
Legal setting	• National laws related to water • New laws as a result of the partnership • Penalties for wrongdoing and enforcement • Regulatory body • Laws to regulate operation of a public company
Information channels	• Communication between service user and service provider • Readily available public information about water scarcity, billing, water tariffs • Channel for complaints or comments

1.3 Contribution to theory and practice

I hope that this research will contribute to both scholarship and practical learning in three ways. First, I am trying to provide a framework for analyzing partnerships in order to enhance their effectiveness for providing water services in the Middle East. Second, the research should contribute to environmental governance theory. I am looking at how both state and non-state actors tackle collaborative initiatives that can have lasting impacts on the provision of water services. Third, my research should provide an in-depth analysis that demonstrates how the success of various kinds of partnerships is dependent on institutional arrangements. There is a chance that these findings might inform on how best to design partnerships in the water sector in other parts of Jordan or in other countries in the region as well. This last point, I believe, is particularly significant because there are very few strong voices in Jordan examining the impact of partnerships in the water sector. This is in contrast to other parts of the world where non-governmental or community organizations have a history of numerous opportunities to express their views and be active in their respective water sectors' management.

Examples of the inclusion of non-government actors in the water sector is the way in which an alliance of professional associations and civil society organizations led protests and articulated its criticisms against a 40-year concession for water services in Cochabamba in Bolivia. This ultimately resulted in cancellation of the concession a mere one year after it was granted (Nickson and Vargas, 2002). A second example is how water reform in poor areas of Recife, Brazil, allowed for active engagement of citizens with in the planning of the actual infrastructure that would provide these citizens much needed water and sewerage services (Ostrom, 1996). And a third illustration is how community organizations in Orangi (a poor township in Karachi, Pakistan) have cooperated in using a traditional method of supply and storage that increases the supply of water to homes in the face of drastically insufficient piped water that is often contaminated (Sohail and Cavill, 2001a).[23]

I also hope to contribute an analysis of the extent to which current partnerships in the water sector are defined by a range of historical relationships. To this end, each case was probed to determine how relationships embedded in the partnership were the product of prior organizational interactions. My aim was to contextualize each story. Partnerships like many other socio-economic constructions are path dependent. It cannot be assumed that water partnerships were created entirely "from scratch." The current versions of partnership overlay antecedent organizational interactions and histories of various kinds. These must have had some influence. The historical analysis offered should help clarify the question of how institutional reform actually begins.

1.4 Dissertation Outline

Chapter 2 of this dissertation focuses on what others have written about partnerships in the water sector. Underscored are what appear to be the main challenges facing partnerships of various kinds, and how what is known about water partnerships frames the situation in Jordan. Chapter 3 presents two urban water partnership case studies: the Greater Amman water supply and wastewater services management contract and the NGWA Managing Consultant contract. Chapter 4, by contrast, advances two rural water partnership case studies: the water user

[23] In Bolivia, the alliance referred to was the *Coordinadora del Agua y de la Vida.* It became the most pro-active stakeholder in the conflict over this concession. Through consistent demands, and pinpointing real deficiencies in the concession (e.g., the main one being that the contract did not assure the implementation of a project that was supposed to use the River Misicuni for electricity, general irrigation, and water resources), the group gained "legitimacy among consumers. It also made use of public consultation exercises" (Nickson and Vargas, 2002, p.114). In Brazil, the idea was to replace conventional, large-scale designs of sanitation systems with much smaller feeder lines that are then connected to larger trunk lines. More importantly, local residents had the skills to construct and maintain these feeder lines, which are a fraction of the cost of conventional designs (Ostrom, 1996). In Pakistan, the traditional method of supply and storage is to use what are called Awami tanks, which were often built on residents' land and are supplied with water by the government, the Karachi Water and Sanitation Board. When supplies are still insufficient, residents pool their funds to pay for a commercial tankerload of water.

cooperatives in the Jordan Valley and the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa. Chapter 5 considers the four case studies horizontally, tries to account for similarities and differences, and analyzes what seem to be the most important obstacles to using PPPs to improve water services in Jordan. Finally, Chapter 6 offers more general policy recommendations regarding the use of water partnerships in settings similar to Jordan's.

CHAPTER 2: The challenges of promoting effective partnerships in the water sector – A literature review

2.1 Overview

This chapter has two sections. The first offers an overview of how partnerships in the water sector have performed and explores the promise and challenges of PPPs. The literature points to the importance of institutional arrangements on partnership effectiveness. The second section focuses on how Jordan has approached PPPs in the water sector, and highlights the policies and strategies it has pursued over the past decade.

2.2 Principles and practice of partnerships in the water sector

2.2.1 Public-private partnerships

In the context of the water sector, PPPs usually refer to contractual agreements through which private companies assume greater responsibility and risk through various forms of governmental contracts. Studies of PPPs suggest that public entities can work with the private sector to improve service delivery, as each sector assimilates various roles consistent with its own comparative advantage (Fowler, 1998; Gold, 2004). While PPPs are typically described in terms of the private sector and government, I define them more broadly. I think in terms of a range of partnerships, including two (or more) of the following groups: international development donor countries; national governmental entities; farmer communities and their organizations; or national/multinational companies.

The spectrum of PPP arrangements varies from no capital investment responsibility or commercial risks assumed by private sector operators, to private sector involvement whereby full responsibility and most risks are assumed. My typology includes, at one end, management/service contracts in which all operational responsibility is transferred to the private sector while ownership of all assets and capital investment responsibility (and commercial risk) remains with the public sector. Then there are leases, concessions, and build-operate-transfer agreements in which capital investment responsibility or commercial risks increasingly shift to the private sector. At the other end of the spectrum, there are divestures (i.e., full privatization) where assets and capital investment responsibility or commercial risks are fully transferred to the private sector. Another arrangement worth noting involves small-scale independent providers who deliver water to over seventy percent of poor urban households worldwide (Collignon and Vezina, 2000). The PPP arrangements described above can pertain to partnerships in both the urban and rural water sectors (World Bank, 2003b; 2007c). However, one PPP arrangement that is unique to the rural sector, and precedes a more involved kind of PPP arrangement (e.g., service or management contract), is the water user cooperative in which farmers band together in order to initially manage the water delivery in the secondary distribution lines i.e., the section of the irrigation network between the source of the irrigation water and the farmers' fields. Table 4 provides a brief overview of these various arrangements.

Table 4 - Various models of PPP arrangements

PPP arrangement	Average duration (years)	General terms of contract	Responsibility for capital investment	Commercial risk
Water user cooperatives	1-5	Most are established voluntarily and are governed through a majority vote of a general assembly. Irrigation management of the secondary lines (distribution lines) is usually their key function. Most common legal right is to enter into contracts with third parties and hold bank accounts. Irrigation management transfer* is the next step following the creation of a water user cooperative.	Public	Public
Service and management contracts	1-5	Service contract: the private sector assists in specific tasks (e.g., reading meters, repairing pipes, etc.). Management contract: management of operation and maintenance are transferred to private sector. Asset ownership: public.	Public	Public
Lease**	15	Private operator is responsible for the operation and maintenance of the infrastructure but not required to fund investment. Asset ownership: public.	Public	Public
Build-operate-transfer (and variations)	20	Infrastructure investment shifts to private sector. Usually limited to a single facility. Assets jointly owned by public and private sector.	Private	Private
Concession	25	Long term right to use all utility assets conferred on operator. Assets revert to government at end of concession.	Private	Private
Divesture	35+	Sale of assets and transfer of the operation's responsibility to the private sector. Full privatization.	Private	Private
Independent Service Provider	--	Supply services on a commercial basis in the form of vendors on carts or bicycles, tanker trucks, or households selling water from private connection. Assets jointly owned by private and public sector.	Private	Private

Adapted from Davis, 2005; PPIAF, 2002; Tardieu *et al.*, 2004; World Bank, 2003b; Garces-Restrepo *et al.*, 2007.
* Irrigation management transfer is a concept that refers to the transfer of management and financial responsibility of the irrigation system out of government's and into users' hands.
** Another type of arrangement that is similar to a lease is *affermage*. The difference between them is that under a lease the operator keeps revenue collected from customers and makes a lease payment to the contracting authority. Under an *affermage*, the operator and contracting authority share revenue from customers. The operator pays the contracting authority an *affermage* fee and keeps the remaining revenue. Under both arrangements, the operator's profits depend on utility's sales and costs (World Bank, 2006c).

Compared to other regions in the world, PPPs in the water sector (both municipal and irrigation sectors) in the Middle East and North Africa are fairly new. They have been adopted in a handful of countries in the region including Egypt, Jordan, Morocco, and Palestine, the latter beginning in the late 1990s (Budds & McGranahan, 2003). Table 5 describes sthe nature of PPPs in the region. Historically, governments have played the central role in providing urban water and sanitation services, and irrigation and drainage services, especially in developing countries. In many urban centers, particularly in the developing world, the government believes that a single entity, run and owned by the government, will achieve the highest efficiency in providing these services. As a result, the public has grown accustomed to the provision of these services and perceives them as a "public service" or "social good" (PPIAF, 2002). The public sector has in recent years begun inviting the private sector to play a more significant and diverse role in water supply and sanitation services. The intentions in this regard are: to increase investments in infrastructure; manage both infrastructure and services more efficiently; and increase access to services (Davis 2005).

Table 5 - Examples of PPPs in the water sector in the Middle East and North Africa region

Morocco:
In 2001 the water services in the city of Tangiers and some surrounding rural areas came under a concession contract whereby a consortium of international and national companies would act as the operator (AMENDIS, a group of Veolia Environnement assumed 50% of the operator responsibilities). There is no donor financing. The *comité de suivi* comprised of local and national governments makes decisions about work programs and investments through consensus.
Egypt:
Dina Farm is a large irrigated private farm on the West ridge of the Old Nile Delta. The farm was created by a local private company in 1987 and today, at 4400 ha, it is considered an exemplary public-private partnership in agro-business. The government is involved because it is keen to help develop economic activity outside the Nile Valley and Delta. The government has offered Dina Farm a free groundwater supply that averages 20 000m^3 of water/hectare/year.
Palestine:
CH2M Hill (a multi-national engineering firm) partnered with the USAID and the Palestinian Water Authority, to promote integrated water resource management in the West Bank. This included watershed management, design of a wastewater treatment plant, technology transfer, operations and maintenance capacity building, and training programs among other activities.

Source: Chemonics, 2005; Tardieu *et al.*, 2004; World Bank, 2006c.

The literature reflects an ongoing controversy about the merits of private sector participation. One set of views (e.g. Shiva, 2002; PSIRU, 2005) expresses grave concern that the economic motives of the private sector will greatly disadvantage the poor, as well as jeopardize broader principles enshrined in global declarations such as the United Nation's Articles on the Right to Water, and the United Nation's Millennium Development Goals. The former Articles bestow responsibility on the state to provide an array of water services (UN, 2002), while the goals of the latter include halving the proportion of people without sustainable access to safe drinking water in both urban and rural areas by 2015 (UNSD, 2000).

Another set of views, expressed primarily by multilateral development banks, including the World Bank and the International Finance Corporation, continue to favor private sector participation in infrastructure, including water-related infrastructure. These agencies have financed the vast majority of private-sector participation projects worldwide. During most of the twentieth century, national governments supplied water at zero or low cost to consumers, and water was viewed as a basic "entitlement" (Bakker, 2003). Bakker notes "the inability of many local states to mobilize revenues from users of the existing water supply system ... is one of the widespread failings of municipally owned water utilities in developing countries" (Bakker, 2003, p.334). The premise of the World Bank's (and other proponents) support for private-sector participation is the assumption that the market is more efficient than government at providing basic services.

For purposes of my research, one of the most significant factors influencing the success of PPPs in the water sector is the redefinition of the role of government. Such partnerships do not mean a holus-bolus exit of the state. Rather, the role of government shifts to that of a regulator, which involves monitoring, and enforcement of the requirements it places on companies regarding efficiency, investment, environmental protection, and services to the poor (Davis, 2005).

There is an extensive literature on how PPPs have fared around the world. This body of work highlights the capacity of different organizational forms to provide water services. My investigation will contribute to the discussion of the significance of PPPs in Jordan, which is one country in the Middle East that is attempting to reform the manner in which water is being managed and provided. The following is a snapshot of the evaluations that have been made of PPPs in the water sector in various regions.[24] In Stutterheim, South Africa, a PPP arrangement in the form of a 110-year *affermage* contract (similar to a lease) started in 1993, in which a water company, Aqua Gold (i.e., a joint venture between a local and international company) became responsible for management, operation, and maintenance (Plummer, 2000). The private company was able to make a number of improvements including marginal upgrades to efficiency thanks to day-to-day maintenance of the infrastructure and an ongoing pipe replacement program. Leaks declined by 70%, bursts in the network decreased by 20-30%, sewerage blockages dropped by over 40%, and unaccounted for water steadily declined to reach 24% by 2000. However, one noteworthy shortcoming of this PPP arrangement was that in the contract, the standards for water quality are prescribed by legislation, but there are no legal mechanisms defining the standards for the operation of the network. The contract therefore does not outline Aqua Gold's operational responsibilities in quantifiable terms, so they might be monitored. Not being able to judge the private sector's performance exposes the municipality to an important level of risk.

Colombia's first experience with a PPP in its water and sanitation sector was a joint venture in 1995 between the Municipality of Cartagena, and the Spanish water company Aguas de Barcelona. The new company, Aguas de Cartagena, signed a 26-year contract to operate and

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[24] I was unable to locate detailed evaluations on PPPs in the water sector in the Middle East and North Africa. As a second-best proxy alternative, I chose to review evaluations from various other regions of the world.

maintain the water and sanitation services (Nickson, 2001a). It is reported that Aguas de Cartagena made progress on a number of fronts: the water deficit was eliminated by reducing unaccounted for water from 60% to 40% between 1995 and 1999; the reliability of water supply rose to from 80% to 99% over the same time frame; new pipeline was added to the network; close to 30,000 new connections were made; and the employee/connection ratio is down to four employees per 1000 connections. Despite this progress, the non-payment of bills by customers was proving to be a serious and growing problem.

In 1997, the Provincial Government of Cordoba in Argentina signed a 30-year concession contract with Aguas Cordobesas for the delivery of water supply to the Municipality of Cordoba (Nickson, 2001b). A performance report of the first few years of the contract indicated : 140,000 new inhabitants were added to the network; the number of connections rose by over 15 000; and service coverage for water reached close to 87% whereas sewerage was at only 40%. One common thread to these three examples is the reported need of municipal capacity building, ranging from insufficient basic knowledge of financing arrangements (e.g., issues of affordability and willingness to pay), to the limited understanding of risk management (e.g., the risk posed by the high level of unpaid bills), to the strategic management of the contract (e.g., the ability to renegotiate the contract so that it meets the redefined objectives of the municipality).

One other PPP example in the water sector are the two 1997 concession agreements between Manila's governmental water supply agency and a joint international and national water company for the West and East Zones of Manila. Manila Water, the company servicing the East Zone enjoyed more success than Maynilad in the West Zone; NRW has substantially decreased, service connections and reliability have increased; water prices have been controlled; and there have been specific initiatives to provide water to the urban poor (Neville, 2006). There are many factors that explain the differences in the East and West Zone experiences. However, one significant managerial difference witnessed Manila Water in the East Zone working on changing the culture of the utility and restructuring the organizational format of the company. This was achieved through devolving responsibility to decentralized service units, and bestowing greater responsibility and autonomy to these local units.

In sum, the above account provides a flavor for the range of PPP evaluations that have been conducted. It is possible to identify a few chief concerns about the impacts of PPPs in the water sector almost anywhere in the world. One concern is that a private sector partner usually prefers to invest and provide water services in a formal context where risk can be limited e.g., it is constrained to provide services only to legal housing and legal water connections (Plummer, 2002). It is often the poor that are unable to afford the full price of piped water supply and wastewater services. As a result, the poorest communities often have to rely on independent service providers (see Table 4), and the cost of water from these water vendors or tanker trucks is often significantly higher than the cost of water from a private or public water utility (Connors, 2007). Another concern is that sometimes local urban communities and NGOs resist certain PPPs in the water sector (primarily concession contracts), that profoundly alter the way locals manage their water resources. This may sometimes lead to ending a PPP contract, but it can also result in a more fragmented water supply system where the government dominates and focuses on providing water services to its wealthier customers (Bakker, 2008). This is what happened as a consequence of the failed privatization of Cochabamba's (Bolivia) water supply system. Intense street protests pushed out the private operators in Cochabamba. However, the social movement that organized the resistance to the concession contract obtained only partial "representation" on the board of directors on the water utility, which was returned to government control. The reality on the ground is that "two tiers of service with vastly unequal levels of state support" exist (Bakker, 2008, p.239). The more affluent areas of Cochabamba receive government subsidized services of high quality, while areas where poorer residents live need to rely on donors and volunteer labor to create a more expensive water system whose operating costs are borne by the poor as well. Also, a major concern with PPPs in the water sector is that the private operator will prioritize running an efficient operation, and will consequently often reduce the number of staff in the water utility as much as it can to save on costs. Whereas, a water utility run by the government will tend to employ more staff and emphasize job creation.

My study examines three different PPP arrangements: two water user cooperatives in the rural sector; a management contract in the urban sector; and a Managing Consultant contract in the urban sector. These examples focus on PPPs' ability to supply drinking water and wastewater services (the two urban partnerships in my study fall in this category). The PPP that is usually the first to develop in the irrigation sector are water user cooperatives (Garces-Restrepo *et al.*, 2007; World Bank, 2007b), and the two rural partnerships used in this study are examples of water user cooperatives. The literature typically refers to water user "associations", not water user cooperatives (I use the word cooperatives in my case studies because the two rural partnership case studies are cooperatives based on their registration with the Jordan Cooperative Corporation as I explain in more detail in Chapter 4). As Vermillion (2006) explains "[a] water users' association is a group of water users that organize themselves together for the purpose of governing an irrigation system and overseeing its management and, to some extent, its financing" (p.2). As I discuss in more detail in Chapters 4 and 5, establishing water user associations (or cooperatives in Jordan's case) is also the "cornerstone" of the irrigation management transfer process (Garces-Restrepo *et al.*, 2007). This process centers on shifting the management of an irrigation system from government's hands into those of the users (Groenfeldt, 2004). Increased involvement of farmers in managing irrigation systems, most often through the creation of water user associations, is captured by a concept known as "participatory irrigation management."

It is useful to differentiate between different types of participatory irrigation management. There are basically three levels: (i) transfer of assets and management to the farmers; (ii) transfer of management but not assets to the farmers; and (iii) strengthening farmer management capacity without management transfer (Groenfeldt, 2004). A prime example of the first kind of participatory irrigation management (i.e., transfer of assets and management to the farmers) is found in New Zealand. In this case, the government no longer plays a role in the management of irrigation facilities and occupies only a regulatory function. The government has also forfeited any future claim to the irrigation infrastructure that it built, owned, and managed. This is essentially a form of privatization where farmers themselves become owners of the system (Groenfeldt, 2004).

The second type of participatory irrigation management (i.e., the transfer of management but not assets to farmers) is the more common model found worldwide. This approach basically sees the legal transfer of irrigation management roles such as the collection of fees, operation and maintenance, water scheduling, conflict resolution, infrastructure rehabilitation, and the like, while the government retains ownership of the infrastructure itself (Garces-Restrepo *et al.*, 2007). For example, water user associations in Morocco are some of the oldest in the region. After Morocco's independence in 1958, a general law was passed to encourage the creation of associations in an attempt to promote participation in all areas of development (Bennis and Sadeq, 2007). A more specific law in 1990 created Agricultural Water User Associations. The stated objective of the 1990 law was to allow these associations to manage the government-built irrigation network. However, the government did not loosen its grip on irrigation management as intended and continued to closely oversee all of the various associations' operations (Bennis and Sadeq, 2007). Water distribution, which refers to scheduling and no other specific role, is typically the singular responsibility of these associations (Peabody and Jabarin, 2008). Their very limited mandate does not allow them to fulfill their potential in consolidating farmers' insights and concerns and promoting more sustainable irrigation management (Peabody and Jabarin, 2008). Another example is the water user associations in Turkey. In the early 1990s, Turkey began converting its state-run irrigation systems into locally operated systems run by water user associations (Groenfledt, 2004). These associations have a substantially broader mandate than their counterparts in Morocco's as Peabody and Jabarin (2008) explain. In Turkey, the water user associations are autonomous units: they fully fund operation and maintenance costs; collect revenue to cover repairs or replacements for the infrastructure; and also repay the government's cost of rehabilitation work that it cannot do itself. They are registered and audited by the Ministry of Interior. The one problematic issue with these water user associations is they have the authority to set tariffs at levels that would generate sufficient funds to cover the cost of using and maintaining what are typically very old irrigation infrastructure systems (30-50 years old). However, most associations do not impose the high tariff that would enable them to reserve funds for rehabilitation (and modern water-saving technology) of the network because they believe that members cannot afford a high tariff. The result is an irrigation system that is need of much improvement, but little action is being taken to address this problem. In Mexico for example, irrigation management transfer had enjoyed a fair amount of success. By the end of 2000, Mexico's irrigation management transfer initiative has transferred irrigation infrastructure covering 3.2 million hectares to 474,000 water user associations (Groenfeldt, 2004). The associations are responsible for numerous tasks: legal procedures, agricultural inputs, financial management, training, etc. They also cover nearly 75% of the cost of operation and maintenance of the irrigation system. However, similar to the water user associations in Turkey, the Mexican associations struggle most with keeping up maintenance of the irrigation system as a result of the difficulties they encounter in collecting enough revenue from members.

The third participatory irrigation management model does not focus on transferring management of the irrigation network to farmers; rather, it centers on improved farmer participation in joint-management and capacity building (Groenfeldt, 2004). In Thailand for example, the early 1970s saw the creation of legal water user associations with the following main aims: to introduce users' participation in the water allocation and maintenance of canal systems; to mediate water-sharing conflicts among farmers; to help farmers purchase various agricultural inputs (Molle *et al.*, 2002). Two of the major reasons these water user associations have not lived up to their promise centre on a lack of social cohesion among farmers and the difficulty in empowering farmers. The social cohesion issue stems from the fact that there is a big range in the extent to which farmers depend solely on irrigated agriculture for their livelihoods. Part-time farmers are not willing to invest the time and effort in an association with the resulting consequence being that they inevitably envisage little gain in undertaking such collective action. Empowering farmers' communities through a water user association is complicated in Thailand because the user-community understandably extends well beyond farmers in this country's economically vital tourism sector. For example, there are also large developers vying for these same water resources (e.g., building golf courses, hotels, and other leisure/recreation facilities) and local leadership is often challenged by such entrepreneurs who manage to get elected to senior positions within the water user association. In Uzbekistan for instance, the government decided to create water user associations in 1996 with the objective of having them take over the former state and collective farms' role as service provider for the irrigation system, which was steadily deteriorating (Wegerich, 2000). By contrast in nearby Kyrgyzstan, the first water user association was formed by water users themselves in 1995 among the former state and collective farms. Experiences in both countries have been mixed. The problems include weak legal "property" frameworks in both countries. In Uzbekistan for example, agricultural land is only leased to farmers (i.e., not sold). Farmers therefore do not have the legal backing for the much-needed investments in rehabilitating the irrigation network. A change in the legal framework might encourage more farmers to join a water user association and take initiative in the necessary repair and rehabilitation. Democratic principles in the water user associations in both cases are also weak. In Uzbekistan, many of the former state farm managers are intervening. In Kyrgzstan, former leaders are not being held accountable for their decisions and leaders' actions are not transparent. This hinders any real "participatory bottom-up movement" within the water user associations (Wegerich, 2000, p.22).

These experiences illustrate the array of environmental, economic, and political factors that water user associations must grapple with. The body of literature on the experiences of water user associations is relatively small but growing. This is most likely because of the potential positive impact that participatory irrigation management, and water user associations specifically, could have on improving irrigation management. I believe my two case studies on water user cooperatives in Jordan contribute to the literature in that they not only provide a detailed account of the cooperatives' experience so far, but also dissect what makes them successful partnerships, and what hinders them as well. Table 6 lists examples of countries that fall under each of the three categories.

Table 6 - The three models of participatory irrigation management

Models	Examples of when countries started participatory irrigation management
Transfer of assets and management to farmers	• New Zealand (1990)
Transfer of management but not assets to farmers	• Jordan (2001); Morocco (1990); Mexico (early 1990s); Turkey (early 1990s); India (Andhra Pradesh, 1997); U.S. (Columbia River Basin, 1969).
Strengthening farmer management capacity without management transfer	• Philippines (mid-1970s); Madagascar (1995); Thailand (early 1970s); Kyrgyzstan (1995); Uzbekistan (1996); Egypt (2004); Sri Lanka (1988).

Sources: Groenfeldt, 2004; Bennis and Sadeq, 2007; Peabody and Jabarin 2008; Molle *et al.*, 2002; Wegerich, 2000; Gastineau, 2007.

2.2.2 State-society synergy

The current literature on PPPs falls short of capturing the full range of dynamics at play in the various partnerships that have been established in Jordan's water sector. Published work has focused more on the dichotomy between the private and public sector, but has not shed much light on how these sectors can actually influence and support one another. The literature on state-society synergy complements that of PPPs because it explains the way state actors and non-state actors (e.g., local communities or civil society organizations) work together to promote sustainable development. Evans (1997) underscores that through this synergy, civic engagement can strengthen state institutions and effective state institutions can create an environment for civic engagement to thrive. Ostrom (1997) applies this concept to the "coproduction" of goods or services by both citizens and the government. Synergistic development efforts combine the strengths of non-state and state actors (Sanyal, 1994). Managing resources and services in the water sector is certainly a part of a nation's development strategy, thus understanding the institutional drivers and barriers to forging synergistic relations is key. One model that could assist in understanding the distinct roles of government and other actors involved in various forms of partnerships that promote sustainable development, is the public entrepreneurship network put forth by Susskind *et al.*, (2004). This model offers an innovative way to examine and learn from partnerships; the model identifies five facilitative roles that have to be played for development to flourish. These roles range from the "pioneer who recognizes opportunity, seizes initiative, and catalyzes action" to the "stewards…who focus attention on the common good…and facilitate the coalescence of democratic community around programs of action" (Susskind *et al.*, p.5).[25] Public entrepreneurship networks emphasize the multiple roles that contribute to the success of a venture, and functionally define each role.

While Jordan's experience with partnerships in the water sector demonstrates the willingness of the state to collaborate with local communities (i.e., farmers in the case studies presented) or the private sector, this study assesses the extent to which these non-state actors are able to challenge or maneuver around the government's "monopoly on the orchestration of governance" (Rogers and Hall, 2003, p.10), and how and why this is.

2.2.3 Water governance

In a similar vein to the notion reflected in the state-society synergy discourse that public and private interests can be better balanced through an array of collaborative efforts, water governance also invokes the idea of drawing on a range of actors to negotiate sustainable solutions to a myriad of water management problems, and then mobilize them for action. Perhaps the earliest call for more effective water governance came during the International Conference on Water and Environment, held in Dublin in 1992 under the umbrella of the United

[25] The other roles include the following: encouraging public venture capitalists who embrace risk and package financial, social, and human capital to meet project needs; developing superintendents who create an environment conducive to innovation by fostering relationships that are sustained through informal and formal networks; and identifying mediators who build consensus on goals and solve problems and conflicts that could disrupt the development of initiatives (Susskind *et al.*, 2004).

Nation's World Meteorological Organization. This Conference resulted in the issuance of the Dublin Statement. *Inter alia,* the Statement urged the global community to: recognize fresh water as a finite and vital resource; encourage participatory approaches; and account for water as an economic good as a tool to achieve equitable and efficient use (GDRC, 1992). Since then, a host of other global calls for improved water governance have emerged, and despite some progress, effective water governance remains a critical goal according to the community of practitioners, researchers, and government bodies that prioritize sustainable water management as one of their important policy instruments. Susskind and Ashcraft (in press 2009) also make a valuable contribution to the discourse on water governance through their study of how to move away from traditional hard bargaining in water negotiations, and move toward a consensus building approach, which seeks "unanimity but settle[s] for overwhelming agreement, as long as every effort has been made to meet the interests of those who express concerns about a nearly final agreement" (Susskind and Ashcraft, in press 2009).

The 2006 United Nations World Water Development Report points out that the Middle East and North Africa region, in particular, is facing a "double challenge" of water shortages and governance challenges, and Jordan is not an exception (UNESCO, 2006). The four partnerships in my study are all examples of water governance, and my research aims to unravel whether, and why, partnerships in Jordan's water sector "work", and the reasons behind this.

As I discussed in Chapter 1, it is the institutional arrangements - namely the formal and informal rules spelled out in contracts, policies, legal requirements, and information sharing between groups and individuals - that constitute the factors that I believe account for different levels of effectiveness in water partnerships. I have selected the institutional arrangement as my explanatory variable because there is a growing belief in academic circles that these arrangements strongly influence the quality of governance, and in particular water governance (Sohail and Cavill, 2001a and 2001b; Sohail *et al.*, 2005; Surjadi, 2003; Davis *et al.*, 2001; UNESCO, 2006; Moench *et al.*, 2003; World Bank, 2003a and 2007; Rogers, 2006; Elhance, 2000; Spiller and Savedoff, 1999).

Sohail *et al.*, 2001 undertook a comprehensive study on water services in three urban projects in South Asia (i.e., Pakistan, India, and Sri Lanka), where national governments partnered with either municipalities or specific local communities. Their study underscores the importance of joint decision-making and planning, information sharing, and contracts. They argue that the benefits of water services can only be realized after projects have been handed over to communities. In turn, handing urban water projects to communities can only happen if the necessary measures are taken to develop effective operations (i.e., the day-to-day running and handling of infrastructure) and maintenance (i.e., activities required to sustain existing assets in a serviceable condition). Effective operations and maintenance are constrained at the municipal level as a result of the lack of training and understanding of operations and maintenance by municipal workers and the government's priorities directed to construction rather than operations and maintenance, for example. Operations and maintenance are constrained at the community level because of the lack of community involvement in project design and the inadequate understanding of the importance associated with operations and maintenance by the community. The tools that were used to encourage greater participation in operations and maintenance included for example Community Action Planning in Sri Lanka. In this case, guidelines and procedures were developed for communities on a range of topics so as to assist them in the planning process for matters ranging from identifying priorities to monitoring and evaluation, all so that the community could develop and maintain household and lane level infrastructure at their own expense. Also, in the Indian city of Cuttack, the Cuttack Municipal Corporation received training to improve their management and monitoring skills and to enhance their knowledge of operations and maintenance of water infrastructure. They also improved their skills in community partnering and community contracting. The Memoranda of Understanding that were signed between the Cuttack Municipal Corporation and the Community Management Groups bolstered the delineation of roles and responsibilities.

"Freedom of information" regarding baseline data and analysis about the water sector and various social factors involved, are seen as critical to sound decision-making (Moench *et al.*, 2003). Further, there are suggestions that policies and governance structures related to the water sector should be crafted in such a way as to respond effectively to unforeseen events, or indeed crises in the sector, and that contingencies should always be considered carefully (UNESCO, 2006; Moench *et al.*, 2003). The United Nations World Water Development Report notes:

> More attention needs to be given to resilient institutions and approaches that can govern or guide the complex, often surprise laden, process of water governance central to long-term management at a regional, basin, aquifer or even local level. This suggests that specific solutions – the ideal solution – may be less relevant and emphasizes the importance of enabling processes and frameworks that can be applied to resolve certain issues in situations of economic or other constraints and in contexts of change, that is, 'second or third best' solutions. (UNESCO, 2006, p.83)

Spiller and Savedoff (1999) discuss the importance of credibility and regulatory frameworks in the context of partnerships in the water sector. Although their discussion focuses on examples in Latin America, their points are equally valid to many developing countries, including Jordan. Spiller and Savedoff (1999) explain that regulations in the water sector must be sufficiently rigid to provide investors and managers with the certainty they need for profitability. At the same time, governments need to have enough flexibility built-in to adapt to changing conditions (e.g., advanced technology can bring about cost-savings and the public interest demands that these savings should be shared with consumers). More specifically, a credible regulatory framework should spell out policies for price setting, conflict resolution (arbitration or judicial), consumer rights, quality standards, and investment. If a credible regulatory framework is not in place a number of undesirable consequences risk ensuing: (i) if the government does not explicitly commit to not expropriating investments then the private sector will usually not take the risk of investing in the first place; (ii) operators may decide to keep maintenance expenditures to a minimum which can be detrimental to water quality and water losses; and (iii) operators may earn high up-front economic rents through high prices, thereby allowing companies to minimize exposure to risk, but this is often politically unpopular. In Argentina, for example, the government increased the prices for water services in Greater Buenos Aires at close to costs. Spiller and Savedoff (1999) also explain that effective regulatory frameworks are just as relevant to water utilities that are in government hands. The main difference is that private operators will respond to regulatory frameworks and incentive structures in a way that maximizes their return and minimizes their risk. Whereas, public operators, because they do not directly gain from asset ownership, will tend to disperse rents through excessive employment and other inefficient resource utilization, thereby creating ways to regain those rents privately. Also, government opportunism typically means setting prices so low that the operator is not even able to finance its business expansion. Politicians may tout social consciousness but in reality, low prices imply that the public operator will depend on the government for expansion and investment (e.g., in Peru the average return on equity of the water operators is 0%). The result is that these factors make it difficult for governments to build a credible regulatory framework.

The authors suggest a few ways to avoid these pitfalls. Countries should establish water enterprises that are financially and managerially autonomous. Also, the water industry should be fragmented. For example, the national water enterprises can be divided up into several smaller independent firms, with each being responsible for providing water services in given areas in order to create a sense of competition. Regulatory frameworks should be crafted in such a way that procedures for determining prices really limit government influence. Lastly, it is suggested that water utilities privatize in such a way that the country's citizens can buy shares in the company, thereby increasing domestic participation in ownership of assets.

Again, there is a substantial body of literature that discusses how and why institutional factors can influence the effectiveness of partnerships in the water sector. However, I think the gap in the literature concerns comprehensive studies of institutional arrangements i.e., studies that look at several institutional factors simultaneously, and then try to unravel just how and why these factors had a significant impact on the partnership. That is the goal of my inquiry.

2.3 Jordan's efforts in promoting partnerships in the water sector

In Chapter 1 section 1.1.1, I outlined the path towards partnerships in Jordan's water sector. I suggested that looking back, it appears that there have been three waves in the country's efforts to decentralize water provision. First, there were efforts to decentralize the governmental system. These were followed by centralization. And now there is decentralization linked to PPPs. In this section, I review this third (and current) phase of decentralization and discuss the key milestones over the past 10 to 15 years that have shaped Jordan's approach to PPPs in the water sector. The emphasis has been overwhelmingly on municipal water (i.e., urban water partnerships), but there have also been steps that set the stage for partnerships that influence irrigation water (i.e., rural water partnerships). These are discussed at the end of this section. I also make reference to the initiatives described here in the context of the four case studies in Chapters 3 and 4.

Since 1995, the World Bank has been encouraging Jordanian privatization of many state-owned enterprises mainly in the infrastructure sectors (e.g., transport, electricity, telecommunications, and water) (World Bank, 2001). In this latter World Bank report, it describes their program in Jordan as "one of, if not the most, successful programs in the Middle East region" because it had achieved various goals[26] in many sectors. This included the Greater Amman management contract for water and wastewater services. Even though the World Bank deemed its efforts in Jordan a "success", such success with any PPP is rarely clear-cut and outcomes are usually mixed. The Bank pointed to the effectiveness of the Executive Privatization Commission which is a government body entrusted with implementing the country's privatization program in accordance with *Privatization Law No.25* (2000). They saw this as a key factor in Jordan's success across all sectors because the Executive Privatization Commission was able to provide the required technical resources and support to the process, as well as influence top decision-makers.

The earliest national policy paper that set the stage for Jordan to consider PPPs was their "Water Strategy and Policies", as adopted by the Council of Ministers in 1997. In addition to outlining the country's overall national water strategy, this document comprises four thematic policy statements: Groundwater Management Policy; Water Utility Policy; Irrigation Water Policy; and Wastewater Management Policy (MWI, 1998). The Water Utility Policy is the most relevant to PPPs. It consists of a section on PSP which calls for expanding the role of the private sector in

[26] The achievements included the following: (i) 33% sale of Jordanian Cement Factories; (ii) granting of four bus concessions in the Greater Amman area; (iii) grating of a concession for the Ma'an Spa; and (iv) a 49% sale of the Jordan Telecommunications Corporation (World Bank, 2001).

water management through contracts, concessions, and build-operate-transfer/build-operate-own arrangements for example (for both municipal water and irrigated agriculture). This policy reflects the government's pledge to consider involving the private sector in water management "the government intends, through private sector participation, to transfer infrastructure and services from the public to the private sector, in order to improve performance and ensure delivery of services to the population" (MWI, 1998, p.39). Between the late 1990s and 2008, numerous PPPs dealing with drinking water and/or wastewater services have been undertaken, with some still in the planning phase (as of late 2008). These include the following (in chronological order):

The *Greater Amman water supply and wastewater service management contract* and the *NGWA and Managing Consultant contract* are both explored in detail in Chapter 3 and subsequently analyzed in Chapter 4.

Governorate of Madaba micro-PSP project. The micro-PSP concept was fist developed by a German consultancy in Jordan (Dorsch Consult) in 2004 and refers to the outsourcing of selected business activities (e.g., meter reading, billing and revenue collection, customer surveys) in order to support commercialization and efficiency of water service delivery. The operative premise is to contract out a specific business activity to a local company in an effort to speed up the implementation and improvements of that activity. A micro-PSP is not seen as an alternative approach to traditional PSP projects but rather as a complementary and preparatory stage for all kinds of PSP in operation and management of water and wastewater systems in Jordan (Interview 16; OMS, 2003b). In the Governorate of Madaba, the micro-PSP contract (initiated in 2006 and set to conclude in 2009) involves outsourcing customer support related to water and wastewater services because Madaba's WAJ-owned water utility (i.e., the Madaba Water

Authority) has a history of very high administrative losses (e.g., as a result of incorrect billings, loss of customers because of incorrect application/registration processes, undistributed bills because of there is no information/data base systems, and high levels of unaccounted-for -water in the 45-60% range) (Zureikat, 2008). The Madaba micro-PSP contract was awarded to Engicon, a local engineering company. Engicon reports that performance over the 2006-2008[27] period has been positive: net billed water has increased 75% in the first year of operation; net collections increased from almost US$1.3 million in 2005 to close to US$2.7 million in 2007; and NRW has dropped from 45% to 34% (Zureikat, 2008).[28]

Aqaba Water Company (AWC). Water and wastewater service in Aqaba is provided by this limited liability company created in 2004. Although WAJ is formally responsible for water and wastewater services, the system's operation was legally transferred to AWC in mid-2004. AWC is 85 % owned by WAJ and 15% by the Aqaba Special Economic and Zoning Authority (ASEZA) (Segura, 2006a). The AWC operates according to a Business Plan, and because it is a private sector enterprise, its staffing system is more responsive, flexible and adaptable than its governmental equivalent. It is also not constrained by government procurement and civil service regulations. One clear governance advantage that AWC has enjoyed (e.g., when compared to LEMA in Amman) is that the AWC Board of Directors meets monthly and agree to work from an agenda prepared by the General Manager. As a result, the General Manager can raise priority issues and solicit feedback and guidance in order to make decisions in a far timelier manner (Segura, 2006a).

[27] Data as of September 2008.

[28] There are a few issues that will likely influence the ultimate success of the Madaba micro-PSP contract such as, the lack of emphasis on capacity building, specifically, training local staff in modern customer service management (Interview 82). The management expertise comes from external project management staff who will leave at the end of the contract, which means the Madaba Water Authority, may need to consider creating an incentive system to award staff a bonus when recruited from outside the authority (Zureikat, 2008).

Miyahuna Water Company for the Governorate of Amman. Miyahuna means "Our Water" in Arabic. Like the AWC, Miyahuna is a limited liability company, even though it is owned 100% by WAJ. It was created upon conclusion of the Amman management contract (January 2007), and is operated as a financially viable, self-sustaining entity, and managed under modern commercial principles and private sector practices (Segura, 2006b). As Darmame and Potter (2008) explain, in January 2007 when Miyahuna was created, the water and wastewater services in Greater Amman were "effectively 'deprivatized' and placed in the hand of a local company, which is owned by the Water Authority of Jordan, although its remit has remained avowedly commercial" (p.1). Miyahuna shares many of the same advantages enjoyed by AWC, and it is also keen to engage in outsourcing (i.e., micro-PSP) certain customer service and information technology activities for example, as a way to reduce costs (Miyahuna, 2007).

As-Samra Wastewater Treatment Plant. This new treatment plant (i.e., it replaced the original As-Samra facility) treats wastewater from Zarqa and Amman. It started operation in August 2008. This US$170 million facility will treat approximately 267,000 m^3 of wastewater serving 2.3 million residents in both the Governorates of Amman and Zarqa (Hazaimeh, 2008a). The new plant will be operated and maintained according to a 25-year build-operate-transfer agreement (i.e., a type of PPP). At the conclusion of the agreement, it will be transferred to the Government of Jordan. USAID funded almost half the plant's costs, with the balance coming from the Jordanian government, Samra Plant Consortium, and a bank consortium (USAID, 2007b).

Disi Water Conveyance Project. GAMA, a multinational Turkish holding company won a bid to implement the US$1 billion Disi water conveyance project. Construction began in September 2008. This project will be implemented through a 25 year build-operate-transfer agreement

(Namrouqa, 2008a). The project envisions pumping an additional 100 MCM annually from the Disi aquifer, which is a non-renewable, fossil (ancient) groundwater reservoir situated over 300 km south of Amman. The water will be extracted from 55 wells and piped to Amman. This supply of water is projected to last for about 100 years (Namrouqa, 2008a).

Red Sea-Dead Sea Water Conveyance. In May 2005 Jordan, Israel and the Palestinian Authority announced their agreement to study the feasibility of transferring water from the Red Sea to the Dead Sea in response to the steadily declining level of the Dead Sea (World Bank, 2008). The project will entail constructing a 200 km canal (along the border with Israel) from Aqaba on the Red Sea to the Dead Sea and could also involve the construction of a hydroelectric power generation project and a desalination plant (Ghazal, 2008). An economic feasibility study and environmental assessment of the US$2 to 4 billion conveyance project started in April 2008. A French and British company won the tender for the feasibility study and assessment (Ghazal, 2008). When (and if) this conveyance project is launched it will most likely be implemented by a PPP of some description, given the enormous financial and technical requirements.

Red Sea desalination plant. Jordan's first seawater desalination plant on Aqaba's southern coast is planned to start operation by 2010. It will desalinate water from the Red Sea (Namrouqa, 2008b). The feasibility study is supposed to be completed by April 2010 and is expected to be followed by an agreement to operate the desalination plant on a build-operate-transfer contract is to be finalized. The plant should start supplying Aqaba by the second half of 2010.

The points made previously that related to the AWC and the Miyahuna Water Company warrant further elaboration, given that creating water companies appears to be the trajectory the Jordanian government has chosen in managing its water sector. The "2002-2010 Water Action

Plan" prepared by the MWI detailed Jordan's long term strategic goals for both municipal and agricultural water sectors. Moreover, it was the first document that called for WAJ to "allow for the establishment of the public owned companies run on a commercial basis" (MWI, 2002a, p.2). A more important policy turning point arose in 2003 when the MWI endorsed the policy notion of water sector "corporatization", as explained in the Ministry's report entitled "The Concept of Commercial Companies in the Water Sector" (MWI, 2003). This report noted that "the MWI has embarked on a strategy of corporatisation and increased private sector participation. An interim step in this regard – and part of the overall strategy – is the definite intention of the MWI to establish water companies, initially in Amman and Aqaba, but eventually in the whole of Jordan" (MWI, 2003, p.4). To date, it is not only Amman and Aqaba that have public water companies but eventually the water and wastewater services in the Northern Governorates (i.e., one of the urban partnerships in my study) will be run by a public company, as I will elaborate in Chapter 3. The involvement of commercial companies in the water sector is underpinned by two pieces of legislation. First, the amended *WAJ Law No.18*, Article 28 (1988) states that "[t]he Council of Ministers, upon the recommendation of the Minister, may assign any of the Authority's duties or projects or the execution of any stage or part thereof to any other body from the public or private sector, or to a public shareholders company, or to a limited-liability company owned totally by the Authority or in which the Authority contributed to the capital" (p.25). Second, Jordan's *Companies Law No.22* (1997) does not restrict the establishment of government-owned corporations (Stone and Webster, 2004).

As I mentioned at the beginning of this section, there have also been steps taken by the Jordanian government that have set the stage for partnerships that influence irrigation water (i.e., rural water partnerships). Chapters 4 and 5 of this study examine two such partnerships in detail.

There is one law and one policy that sowed the seeds for the kind of rural water partnerships (i.e., water user cooperatives) that we are seeing today in Jordan. I previously mentioned Jordan's Water Strategy and Policies, which was prepared and approved by the Council of Ministers in 1997 (MWI, 1998). One of its pillars is an Irrigation Water Policy, within which is a clause that calls for increasing farmers' participation in irrigation management and an eventual transfer of more responsibility from the JVA to the cooperatives. This is in fact the backbone of the water user cooperatives project, "[g]overnment shall gradually phase-out of the business of irrigation water distribution, as is feasible, as soon as possible. … Pilot irrigation areas shall be designated to test the workability of participatory irrigation management, where farmers will assume the responsibility of water delivery to their farms. When found successful, participatory irrigation management will be extended to the Jordan Valley irrigation systems" (MWI, 1998, p.73). The amended *JVA Law No.30* (2001) opened the way for private sector participation (nota: a private operator includes farmers) in JVA water resource management activities. This supports the water user cooperatives' rationale of helping to bring about more efficient water distribution, as well as the cooperatives' ultimate goal, which is to assimilate certain responsibilities from the JVA in the near future (this started in 2008 as I explain further in Chapter 4). The pertinent reference in the *JVA Law* (2001) is Article 3: "[t]he Authority may by a decision of the Cabinet of Ministers upon recommendation from the (JVA) Board, entrust any of the projects it has implemented or implementing or is managing, to any entity from the private sector whether by leasing, management or operation, in accordance with the effective laws and regulations" (JVA, 2001, p.4).

The two chapters that follow present my findings from the two urban case studies of partnerships in Jordan's water sector (the Greater Amman water supply and wastewater services management contract, and the NGWA Managing Consultant contract), and the two rural case studies (the water user cooperatives in the Jordan Valley, and the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa).

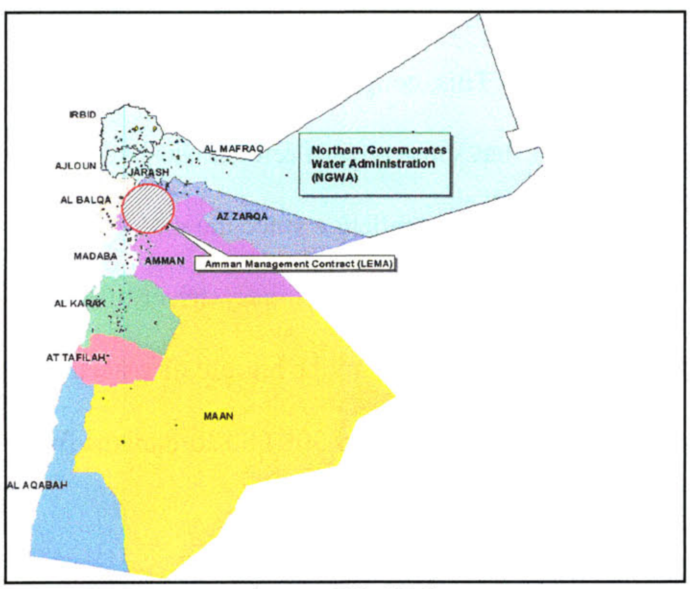
CHAPTER 3: Urban case studies of partnering for improved water and wastewater services

3.1 Overview

The Greater Amman water supply and wastewater services management contract and the NGWA Managing Consultant contract are examples of the earliest efforts to involve the private sector in the water and wastewater management in Jordan. This Chapter explains: (i) how these partnerships arose; (ii) their effectiveness (using the performance measures listed in Table 2); and (iii) factors that might have influenced their effectiveness and the most unanticipated findings in each case. The evidence I have compiled involves a mix of annual reports, reviews written by external auditors and interviews I conducted with the senior decision-makers involved.

The map of Jordan provided in Figure 2, outlines the geographic area covered by the Amman management contract, as well as that of the Managing Consultant contract in the northern governorates.

Figure 2 - Location of the two urban case studies



Source: EC, 2006.

3.2 Greater Amman water supply and wastewater services management contract

3.2.1 Context of launching the management contract

The initial reaction from my interview respondents, when asked about the capital city's management contract awarded to the LEMA consortium, was that questioning 12 different respondents would yield an equal number of differing perspectives. This alludes to the controversy that surrounded LEMA from day-one that left a mix of impressions among those involved in the management, as well as the users of Jordan's water sector.

First, it is important to define what a management contract covers. As explained in Chapter 2, there is a spectrum of PPP models and the management contract is the simplest of these in terms of assuming responsibility and risk for the private firm involved. Operational decisions are shifted, and payment is often tied to the performance of the private operator. Moreover, ownership of all assets, as well as responsibility for capital investment (e.g., machinery, buildings, and pipelines) and commercial risk, remain squarely in the hands of the public sector (Davis, 2005). Amman, the city of seven hills[29] has experienced dramatic population growth. The capital had a population of 60 000 in 1948, and grew to 1.6 million in 1999 when the management contract was awarded. This, coupled with a deteriorating water system, sent clear signals to most in the water sector that some type of reform was badly needed. Amman's population growth has been a continuous challenge since the mid-1900s. Successive migrations to Jordan and Amman in particular, have been the primary driver of this growth. The largest influxes of migrants coincided with turbulence in the region: displaced Palestinians as a result of Israeli occupation in 1948 and 1967; the return of 300 000 Jordanians from Kuwait during the

[29] In 1987, the City of Amman merged with smaller neighboring towns and villages to form the Municipality of Greater Amman.

Gulf War in 1990; and the near-half a million Iraqis as a result of the Iraq invasion in 2003, have all combined to push population numbers to 2.1 million (Abu-Shams and Rabadi, 2003a). By 2007, the population of Amman reached 2.22 million (DOS, 2007). A recurrent observation of interviewees is that the government struggled to keep apace with the need to extend water and wastewater networks. However, as a result of inadequate planning and/or financial resources the expansion of the network was largely haphazard and not based on sound engineering principles. Over the past hundred years, Amman essentially evolved from a small agricultural village with its population concentrated around natural springs to an ever-growing and dynamic city.

Amman's deteriorating water system, and in turn the way this reflected the inability of the public sector to deliver adequate water and wastewater services to customers, were probably the chief reasons that the idea of introducing PSP to improve Amman's water and wastewater services was seriously considered by the government. Services were in a state of disarray. The Greater Amman service area,[30] as delineated in the management contract, covers an area of about 530 km^2 including 19 hills, and is the country's largest domestic water market accounting for nearly 45% of total drinking water consumption in Jordan (World Bank, in press 2008). Prior to granting the management contract to LEMA in April 1999, water and wastewater services in Amman were managed entirely by the government. This function was specifically the responsibility of the Amman Water Sewerage Authority established in 1973, later renamed the Amman Governorate Water Authority (AGWA). Table 7 was adapted from LEMA data and it contrasts the baseline situation (i.e., the condition of water and wastewater services before the 1999 management contract), with the situation in 2006 upon conclusion of the contract.

[30] The management contract covered the Governorate of Amman governorate, and also included parts of the Governorates of Karak and Balqa.

Table 7 - Indicators of water and wastewater services' performance in the Greater Amman service area

Water and wastewater services	Beginning of 1999	End of 2006
Average distributed water (liter/capita/day)	67	81
Number of subscribers	265,000	416,000
Number of invoiced subscriptions	82% of subscribers	98% of subscribers
Number of illegal connections discovered annually	2300	9000
Revenue (million US$)	27.3	58.8
Collection (million US$)	23.3	57
Operational loss or profit (million US$)	Losses of 3.8	Profit 16.5
Water distributed (MCM)	91.2	11.7
Average water distribution (hours/week)	24	72 (winter months) and 46 (summer months)
Average cost per m^3 (US$)	0.45	0.40
Number of employees	1614	1260

Adapted from Lema, 2006b.

Discussion with high-level officials from both LEMA and WAJ revealed the main dysfunctional elements of Amman's water and wastewater system that existed when LEMA assumed the Amman management contract in 1999. LEMA's Operations Co-Director explained that thousands of kilometers of pipes had been laid using galvanized iron, which easily corrodes. To complicate matters further, Amman's water supply uses a rotational rationing program[31] so that water is not continuously flowing through the pipes and thereby resulting in perpetual wet and dry conditions which further accelerate corrosion. Ultimately these pipes leak water, and this happens at two meter intervals in some areas. Another issue was the actual development of the water distribution network. The rapid and mostly unplanned expansion of Amman resulted in WAJ, under their obligation to provide water and wastewater services for any new home or building, using ill-suited expansion mains that were generally undersized. The water pressure in some places reached 30 bar (a "bar" is a unit of pressure) whereas these pipes were designed to support a maximum of 12 bar (Interview 2). Another related problem was that previously

[31] The term 'rationing' describes water services that are not continuous over a week due to water shortages. Water service is restricted to a certain number of hours per week for each customer. In Amman, customers receive water on average twice weekly.

Amman's bulk supply of water was not separated from the distribution of water which essentially meant that the entire supply to the network was pumped through [the entire network]. This further exacerbated water loss. A separate system should have been built to collect the treated bulk water and distribute it to the specific recipient area.[32] The founder of WAJ's PMU echoed these concerns:

> The technical systems were there, but they were rotten. They were horrible … this was ruined over time, based on the permanent requests or pressure … There were influx from Gulf Wars, from other wars, and these were always in the hundreds thousands of people. So, there were immediate demands there which have had to be satisfied with a little money … it was very run down. (Interview 7)

The system for dealing with billing, documentation and complaints prior to LEMA was antiquated as well. Both the Co-Director of Water Production and Quality and the Head of the Customer Call Center at LEMA explained this to me. Customer complaints were documented by hand only, when they were submitted by telephone. There was no organized database and no monitoring system which dealt with following up on these complaints. Usually, the very limited number of seven customer service phone lines was constantly busy (Interviews 4; 69). The Director of Capital Investment in WAJ explained that there were also inefficiencies between units within WAJ. For example, the Operation and Maintenance Department and the Project Management Department were supposed to coordinate their work plans. However, countless times an employee in the Operation and Maintenance Department would find a contractor under the Projects Management Department replacing the exact same pipe as a result of a complete lack of communication between the two (Interview 9). Another major inefficiency, as described by an international water consultant for WAJ, was the absence of an independent accounting system for AGWA (or for any of the other utilities in the other governorates for that matter). It

[32] Bulk supply has now been separated from water distribution as a result of the Capital Investment Program in Amman.

was therefore unclear as to how revenues and expenses were tallied, thereby minimizing financial transparency (Interview 11).

Prior to the management contract, AGWA had no monitoring of the implementation of the rationing program in Amman, resulting in no assessment of whether water was reaching customers on the days and for the number of hours intended. This was a key responsibility of the operations department and it was going unchecked, as explained by the Jordanian Co-Director of Operations at LEMA (Interview 33).

There are a number of studies that assess the problems that faced the Amman municipal water and wastewater network in the late 1990s and they all buttress the points mentioned by the respondents above. AGWA was beleaguered by a fairly common set of problems that face other public water utilities in developing countries. Studies by Abu-Shams and Rabadi (2003a) and Decker (2006) describe three major concerns. One problem was the infrastructure of the network was in poor condition. This was a result of many factors including: a failure to replace damaged and worn-out pipes; the diameters of the pipelines being too small and hydraulically insufficient; rusty pipes as the product of a failure to meet specifications on casings, and linings; and the lack of pressure distribution zones to ensure the supply of water at adequate pressure. Another issue was the NRW, which was at 54% of total water pushed through the delivery system in 1999. This means that 54% of the metered volume of water was not producing revenue. This was mainly a result of: (i) old or damaged parts throughout the network; (ii) using direct pumping into the network instead of by gravity which subjects the network to excessive pressure and causes more damage and leaking; and (iii) the lack of specialized leak detection teams that would regularly survey the network. There was also inadequate monitoring and network planning. This was because of the absence of an organization-wide set of approved engineering rules and standards which extended from network design to selection of construction materials. Additionally, the absence of comprehensive and consistent documentation of data on flow quantities, pressure, condition of pipes, and details on consumers' behavior patterns and needs also played a negative role (Decker, 2006).

Other problems with the management of water and wastewater services in Amman when under AGWA's full control prior to the management contract included the following issues: (i) the government put most of its efforts into increasing the supply of Jordan's water resources rather than matching these initiatives with aggressive water-demand management, which is a cornerstone to water conservation; (ii) AGWA faced recurring technical problems related to pressure and water rationing, resulting in greater water loss, and interrupted service; (iii) there was insufficient and ineffective staff in AGWA, particularly in the domain of water meter reading and bill collection; and (iv) AGWA was plagued with a high level of delinquent or overdue accounts receivable,[33] and relatively high operational costs that were barely covered by total revenue (Darmame, 2006).

Another set of important pre-LEMA reports on Amman's water and wastewater network were produced by Germany's international development arm, GTZ. GTZ have worked in Jordan on water matters since the 1970s, including the one initiative that has focused on gathering baseline data on the water sector in the country know as the Operation Management Support Project. Since 1994, this project has played a vital role in analyzing the water sector in Jordan and producing baseline data to inform the kind of restructuring that the government envisioned. It supports both technical and institutional improvements in the water sector (Interview 79). GTZ's Operation Management Support Project remains highly regarded in Jordan. In this regard, it is

[33] Money owed by individuals to an entity in exchange for goods or services.

worth noting that in one of their 1995 reports on Amman's water supply and distribution it stated that "[t]he water supply of Greater Amman is in a state of emergency" and that "WAJ is not in a position to ensure a permanent, sufficient water supply for the population of Greater Amman, [WAJ] faces a severe financial problem with ever increasing costs of operation" (OMS, 1995, p.5).

While the poor status of water and wastewater services in Amman were reason enough to contemplate some kind of reform for the municipalities water sector, there were two additional driving forces behind the Jordanian government's decision to opt for a management contract for Amman's water and wastewater services. First, the key role played by the World Bank in essentially halting all lending to Jordan's water sector in 1995. This was primarily because in the Bank's opinion, the pace of public sector reform and the inclusion of PSP were too slow in taking hold (World Bank, in press 2008). Two years later, the 1997 World Bank Water Sector Review on Jordan was completed, and it was this report that saw the idea of a management contract being officially proposed: "[t]he financial feasibility of the sector and the security of further supply is being undermined by the inefficiencies of service delivery which exceed 50 percent … Water losses are much too high and reducing much too slowly. A more radical approach is needed. A private sector management contract is therefore recommended for the management of water and wastewater services in the Greater Amman area" (World Bank, 1997, p.20). This was arguably in-line with "Jordan's Water Strategy and Policies" published earlier in 1998 (MWI, 1998) which stated that "[t]he role of private sector shall be expanded. Management contracts, concessions and other forms of private sector participation in water utilities shall be considered and adopted as appropriate" (p.5). Further, both the World Bank and the MWI also seemed to agree on the level of PSP. The 1997 World Bank report deemed privatization of the Jordanian water sector "not an appropriate step because of the monopoly inherent in water and wastewater services and because the regulatory regime in Jordan is inadequate to effectively control an essential service under monopoly private sector ownership" (p.20). Privatization refers to a concession, where assets are retained in public hands, but capital investment and commercial risk are taken on by the private entity. And according to respondents from both WAJ and a number of international water consultants interviewed in Jordan, the government in the late 1990s was only willing to consider beginning with a management contract. As explained previously, this is a "lighter" form of PSP (Davis, 2005; Interviews 11; 71; 77; 87).

The second driver behind the management contract (again, apart from the existing status of poor water and wastewater services in Amman that I described earlier), was the 1998 water quality crisis in Amman. It was the most significant water quality incident that Jordanians have experienced to date (2009). This crisis remains a controversial topic in Jordan and it was difficult for me to obtain information about it. Thus, the following account has been pieced together from reports and interviews. In July 1998, residents of Amman's west region complained that their water was discolored and odorous (Melkawi and Shiyyab, 1999). This water is pumped from the Zai water treatment plant (i.e., constructed between 1982 and 1985 and at the time was the only treatment plant in the country) into the Dabouq reservoir, before entering the distribution system and providing homes in Amman with drinking water. In response to the residents' complaints about the water quality, the MWI and WAJ (which manages Zai) halted the distribution of water to all residents. The Ministry of Health urged all residents to boil their water as a precaution. Both international and local groups that investigated the incident pointed to the growing algae as the source of foul taste and smell of the water. They also identified the inability of the operators at the Zai water treatment plant to run the plant at full capacity (which was required because of the very high summer temperatures and rise in demand for water), and their inexperience in implanting an increased dose of powdered active carbon, which is the main chemical needed to control taste and odor problems in water (Melkawi and Shiyyab, 1999). The primary water quality issue was in fact the presence of nematodes (algae encourages nematode infestations) most likely from the Yarmouk River. The Yarmouk River feeds the King Abduallah Canal, which in turn supplies water to Zai. The infestations may also originate from the silt deposits in the King Abdullah Canal. Water from wells, streams, dams, and indeed anywhere water has been in contact with soil and not sterilized can contain nematodes. In this case, these specific nematodes carry a pathogenic bacteria. They are immune to chlorine disinfection and present a health hazard (WHO, 2008). Another response to the crisis was that water from the poorer areas of east Amman was partly diverted to west Amman. This caused serious problems for poorer communities in east Amman who could not always afford to buy water on the private market, which had jumped to US$11.30/$m^3$. Some inhabitants died and many others were hospitalized (Van Aken *et al.*, 2007).

About 10 days following the start of the water quality scare, both the MWI and MOH declared that the water from the Dabouq reservoir was fit to drink and the Zai water treatment plant resumed operations. One consequence of Zai was the dismissal of the Minister of Water and Irrigation. A number of my interview respondents, including a WAJ senior official and the Technical Services Director of LEMA, believed that this incident pushed the new government towards the management contract in an effort to bring about a major change in water operations (Interviews 1;71). I spoke to the Minister of Water and Irrigation of the day regarding the water quality crisis in 1998, who explained that supporters of the management contract were happy to see him go because as he had serious reservations about the process of awarding the management contract. Although, the Minister was a proponent of the notion of the management contract, he was not supportive of the way the management contract was being issued (Interview 108). The Minister described how much effort he put into preparing the tender documents and selecting the pre-qualified bidders, but also how he began doubting the transparency of the process when only two bids were submitted. The Minister therefore suggested an alternative that would still award a management contract, but this would not be to any water company that claimed that terms of the management contract were tailor-made for them (the French water corporation Suez Lyonnaise des Eaux had apparently made this claim). To the Minister's surprise, the World Bank did not mind a two-bid process and even the officials in the government were pressing for the award to go to Suez. As a result, the Minister's resistance to the lack of transparency in the bidding process was seen as an obstacle to establishing a management contract in Amman, and the incident at Zai provided the opportunity to force him to step aside (Interview 108).

A foreign legal and accounting consultant prepared the management contract documents in 1997. The government decided that only joint ventures between an international water company and a local company would be considered. In the end, 26 consortia purchased tender documents. Ten were pre-qualified and invited to respond to the request for proposals. Ultimately, only two consortia submitted proposals, both included French water companies as the international partner.[34] After the tendering committee evaluated the technical and financial proposals, LEMA was selected in April 1999 (Abu-Shams and Rabadi, 2003b).

[34] The Minister of Water and Irrigation at the time had met with all the potential bidders and had heard that Suez Lyonnaise des Eaux was advising the other ten pre-qualified bidders not to waste their time in submitting bids, because the contract was to be awarded to Suez Lyonnaise des Eaux. The Minister believes that this inappropriate comment discouraged other bidders, and in the end left only two companies bidding (Interview 108, 2008).

3.2.2 Evaluating the effectiveness of the partnership

As outlined in Chapter 1 (Table 2) there are four broad measures that I identified to assess the effectiveness of my case studies, namely (i) water quality; (ii) sustainability of supply; (iii) affordability and financial arrangement; and (iv) efficiency of the service. Voluminous of data exists on the Greater Amman water supply and wastewater services management contract. This is most likely due to the fact that the stipulations of this contract demanded regular and comprehensive monitoring and evaluation by both the operator and external auditors since its inception in 1999.

(i) Water quality

In terms of assessing how LEMA faired in terms of the quality of the water being delivered to its customers, the most substantial information was gleaned from evaluation reports and interviews. The interviewees included, but were not limited to, LEMA's Co-Director of Water Quality, the Co-Director of Operations, a senior engineer at the Zai water treatment plant (which as explained above is the main pumping station supplying water to Amman since 1985), and various technical staff in LEMA.

In terms of water quality, LEMA's objectives over the course of the management contract included the following:

- to develop a water quality monitoring program;
- to discontinue the use of any source that does not meet the required standards;
- to notify the PMU of any failure to fulfill raw water quality standards; and
- to treat water to comply with Jordanian drinking water standard 286/2001.

Table 8 lists key data on water quality compiled by LEMA's Water Production and Quality Directorate between 2000 and 2006 (i.e., spanning the duration of the contract). This data relates mainly to the effluent from the Zai water treatment plant which is the most significant source of water to Amman.[35] Most importantly, Table 8 shows that nearly all effluent samples complied with the standards for chemical, bacteriological and algae and nematode tests (i.e., the compliance rates range from 96.7% to 100%). One of the most substantial improvements in water quality testing happened after the 1998 Zai crisis, namely the testing for nematodes and algae. As noted above, it was a nematode and algae infestation that caused the public health scare in July 1998. The Jordanian Royal Scientific Society recommended that these two micro-organisms be tested regularly after 1998[36] (Interview58).

[35] It is estimated that 70% of water supplied to Amman is from external sources (i.e., located outside of the Governorate of Amman) and that of this 70%, approximately 55% comes from the Zai water treatment plants. Water is pumped from the King Abdullah Canal in Deir Allah (in the Jordan Valley) to Zai station, then on to Dabouq reservoir and finally to the network in Amman.

[36] A senior water quality engineer at the Zai Treatment Plant explained to me that ferric chloride is being used to treat nematodes and chloride dioxide can deal with both algae and nematodes. Testing for heavy metals also started but crypto is still not tested (Cryptosporidium is a parasite found in water that is contaminated with sewage and animal wastes) (Interview 58, 2007).

Table 8 - Key water quality data compiled by LEMA

	2000	2001	2002	2003	2004	2005	2006
% compliance of water samples from effluent*	100%; 99.9%; 98.9%	100%; 99.9%; 100%	97.3%; 99.9%; 99.9%	96.7%; 99.3%; 99.2%	99.6%; 99.7%; 99.8%	99.6%; 99.9%; 99.8%	99.5%; 100%; 100%
Number of tested samples	79,492	66,633	84,350	92,003	95,802	96,568	94,584
Complaints	--	--	--	270**	299**	208**	338** –
Miscellaneous	Ferric chloride was added to treatment processes because of increasing turbidity of raw water	--	One breakdown*** case in Russifa water treatment plant	No breakdown cases reported in all LEMA water treatment plants	No breakdown cases reported in all LEMA water treatment plants	No breakdown cases reported in all LEMA water treatment plants	Zai's water quality lab is first to receive ISO 17025 accreditation in Jordan

Source: LEMA/Zai 2000-2006.

* The first value refers to chemical samples; the second value refers to bacteriological samples; and the third value refers to algae and nematodes.

** Most complaints related to site contamination and about 12 were a result of wastewater leakage. Solved on time and samples post-incident were accepted by WAJ, Ministry of Health, LEMA.

*** Breakdown is defined as any failure that reduces water production by more than 25% and for more than 30 minutes.

The current senior water quality engineer at Zai, who was employed prior to the management contract being issued, explained that a major change to water quality management at the plant occurred as a result of the management contract. In 1999, Zai became a unit under LEMA's control. This meant that its responsibilities extended beyond treating its effluent (i.e., previously the plant's sole task), to now include the water in Amman's distribution network operated by LEMA. This also meant an additional 80 wells to be tested at Zai's laboratories. LEMA was also placed in charge of Zai's maintenance and most importantly the monitoring function which as of 2007 has been carried out more rigorously (e.g., samples area taken from all points along the Yarmouk River which supplies 40% of Zai's raw water), as opposed to the few random samples which was the previous practice. The extensive data collected are now stored in a database, which has replaced the simple spreadsheets used prior to 1999 (Interview 58; LEMA/Zai, 2007). The senior water quality engineer I spoke with, as well as the Co-Director for Water Production and Quality at LEMA, believe that it is the LEMA -provided training in the use of better technology for water quality monitoring that has allowed Zai to receive the internationally recognized ISO/IEC[37] (ISO/IEC 17025:2005) standard for their laboratory in 2005.

LEMA's customers' feedback rated water quality in Amman as only average or slightly above average during the period of the management contract. A survey conducted by the Customer Services directorate at LEMA revealed that customer satisfaction with quality ranged from a 5 to 7 score on a scale of 1 to 10 (i.e., where 10 is "totally satisfied" and 1 is "totally dissatisfied"). The two elements of water quality which received the lowest scores were color and hardness (LEMA, 2006c). The complaints about color, as the Head of the Complaints Centre in LEMA,

[37] ISO/IEC stands for the International Organization for Standardization/International Electrotechnical Commission.

explained were most likely as a result of the rationing of water. When a water network is subject to rationing, the pipes are not always flowing with water. As a result, dry sediments in the pipelines tend to accumulate and discolor customers' tap-water once the flow would again resume. The water-color would clear again after running the tap for a few seconds. Nevertheless, people would incorrectly associate discoloration with the health and safety aspects of the water's quality. The discoloration is in fact a benign side effect of water rationing (Interview 68).

The most significant public health issue related to water quality is linked not to drinking water but to the wastewater which LEMA also manages (Interviews 21; 40). LEMA's Wastewater Services Director explained that there were at least three major problems with wastewater services and water quality in Amman. One problem was that most large wastewater pipes in Amman have been laid into *wadis* (dried riverbeds). Many of these *wadis* have been backfilled, by using up to five to ten meters of sand or gravel, by the Greater Amman Municipality in order to build new roads. Consequently, many manholes ended up being buried in the process. When a blockage occurs in one of these pipes,[38] wastewater overflows from the pipe and into the *wadi* and flows to the Ras el Ain spring, one of the lowest points in Amman where groundwater is stored and used for drinking water. Customers' drinking water was never affected because the spring's sources are carefully monitored and drawing water would be stopped for at least a week, for recovery purposes in the event of a problem occurring. The external Technical Audit Reports for LEMA support this statement. Blockages can take anywhere from several hours to several days to fix and to access these pipes very deep sewer lines (15 meters on average) need to be built.

[38] Sewers block mostly because a missing manhole results in large solids accumulating in the pipes.

Also, the construction of large buildings in Amman often means building belowground level floors in order to house as many people as possible in one building. During excavation, sewers are very often damaged and collapse as a result (nota: sewer pipes in Amman are fairly weak because they are mostly over 40 years old). Wastewater is then diverted for up to a week. Further, there are currently no regulations about connecting these large buildings to the sewerage system. In addition, the sewer pipes in Amman are undersized with a diameter of just 200mm. They are designed to carry wastewater only; however, many residents illegally connect their stormwater collection tanks on their roofs to the wastewater network. This is an enormous problem because it can lead to the flooding of the wastewater systems which would present a public health hazard. Residents illegally connect their stormwater connections to the wastewater network because they do not want to incur the trouble of draining their tanks during periods of heavy rainfall.[39] To help address this problem, there was a performance target in the contract related to the disconnection of existing stormwater connections to the sewerage system. The target was to disconnect 10,000 houses by the fourth year of the contract. At the end of the fourth contract year, the external Technical Audit Report stated that only 3720 disconnections had been made (out of 27,195 visits to detect illegal connections) over the period of the contract (ABT, 2004). The report attributed this low number to a lack of cooperation from customers during detection visits, and the fact that many illegal connections of the stormwater tank to the wastewater network are hidden. This issue of illegal stormwater connections garnered a fair amount of coverage in the media during the first couple of years of the contract. Articles in the *Jordan Times* cautioned about flooding sewerage systems as a result of these illegal stormwater

[39] This last point was arguably the biggest problem in the area of wastewater services. Reducing the volume of stormwater entering the network by disconnecting existing stormwater connections was a contractual target (i.e., disconnect 4000 houses by the end of the contract), and this remained the only wastewater-related target that LEMA was not able to attain (WAJ, 1999a; Interview 40).

connections, and advised of penalties for illegal connections of a minimum of six months in jail or a fine of US$1400-7000 (Charkasi, 2000a and 2000b; Al Farawati, 2002).

When I asked the Director of Wastewater Services in LEMA whether these problems had been alleviated since LEMA started, his answer was inconclusive. He advised that "there were more problems because we [LEMA] are taking more precaution and more close control of the sources and there is more follow-up and being more careful" (Interview 40).[40] However, actually solving these problems requires a redesign and rebuilding of the sewer lines, a job that would cost up to 19 million US$26.8 million, something that was not in the scope of the management contract.[41] But, the Director explained that thanks to LEMA the urgency of the wastewater problems has been highlighted and brought to WAJ's attention, and that letters were written to the Prime Minister, "LEMA's letters were more strong than AGWA's[42] because of the contract and our obligations ... AGWA did not contact the Prime Minister, AGWA only had contact with WAJ" (Interview 40, 2007). The reality, it seems, is that a management contract with an international water corporation was needed to get the attention of the highest level of government. A public water utility like AGWA still managing water and wastewater services would probably see its concerns ignored or dismissed, largely because of its circuitous access to the most senior political officials.

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[40] A survey of wastewater complaints between 2000 and 2006 shows a steady increase in the number of complaints about wastewater services (Battah, 2006).

[41] Although an overhaul of wastewater infrastructure is not within the scope of the management contract (capital investment will be discussed later in this Chapter), LEMA did make smaller but significant improvements e.g., the sewer network length increased by 25% between 2002 and 2006; the number of wastewater connections in the service area increased by over 20%; and the total volume of wastewater pumped through the system since 2000 increased by 25% (Battah, 2006).

[42] AGWA was the public utility that managed Amman's water and wastewater services prior to LEMA.

(ii) Sustainability of the water supply

This section presents data on the various sources of water for the Governorate of Amman. The Governorate relies on water from sources both within and external to its borders as Table 9[43] illustrates, there are a number of significant trends emerging:

- The annual total volume of water from sources external to the Governorate-proper is approximately double the amount that originates internally (i.e., external sources comprise on average 65% of Amman's water). This means that any operator of Amman's water services will need to carefully manage the mix of numerous sources that Amman relies on.
- The total annual production of water has steadily increased from 96 MCM in 2000 to 128. 1 MCM in 2006. This is a reflection of the increase in demand as a result of Amman's rapidly growing population described earlier.
- The total annual amount of water supplied to consumers in Amman is less than the total production volume because some of the water produced is exported to other governorates. However, total supply has continued to rise since 2000 reaching 119.6 MCM which is a little over 93% of total production in the Kingdom.

[43] This table does not present any data on the volume of water consumed by residential or commercial customers in the Amman service area that was purchased from private tankers. Most tankers draw their intake from a well on Amman's Airport Road (i.e., a WAJ-owned well). Others draw from their private wells. A small number would siphon their loads illegally from by connecting to LEMA's physical distribution network. A part of the market was people buying water after they had been cut off for non-payment or for illegal use. They do this in the belief that they would be below LEMA's "radar" and would be able to avoid sewerage charges. Some were successful others were billed (Interview 104).

Table 9 - Water sources for the Greater Amman service area

Water sources (MCM)	2000	2001	2002	2003	2004	2005	2006
External sources:							
Zai water treatment plant*	38.5	38.4	36.4	39.2	54.8	60.3	59
Fuheis/Balqa to Dabouq reservoir	0.4	0.4	0.3	0.2	0	0	0
Khaw pumping station to Ein Ghazal	17.1	19.5	17.7	18	15.4	13.5	12.4
Zarqa distribution	0.04	0.05	0.02	0.05	0.02	0	0
Khaw pumping station to Marka Housing	0.7	0.4	0.3	0.3	0	0	0
Wala-Hidan to Muntazah	5.1	3.9	3.9	5.8	5.6	5.5	5.9
Lajoon	0	0.4	3.4	5.4	10.9	8.5	7.7
Zara Maeen**	0	0	0	0	0	0	5.5
Total external sources	62	63	62	68.9	86.7	87.8	90.6
Internal sources:							
Muhajereen well	2	2.3	2.9	2.8	1.3	1.8	2.7
Ras el Ain spring	1.6	1.7	1.7	1.8	3.4	5.6	4.9
Taj wells	9.3	9.3	9.8	9.6	8.5	8.9	9
Russeifa wells	4.9	4.3	3.6	2.9	2.9	1.8	1.7
Rusaif outlet	0	0	1.7	2.7	2.5	2.6	2.2
Yajouz wells	0.6	0.6	0.6	0.5	0.2	0.05	0.4
Qastal wells	2	1.8	1.4	1.4	1.3	1.5	1.4
Suwaqa east wells	4.3	5.9	4.8	5.4	5.1	4.6	4.1
Suwaqa west wells	1.9	1.6	1.6	2.2	2	1.8	1.8
Qatraneh wells	3	3.8	3.8	3.4	2.8	3.3	3.5
Wadi Qattar well	0.4	0.4	0.5	0.4	0.4	0.4	0.4
Wadi Saqra well	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Muwaqqar well	1	1.3	1.6	1.3	1.3	1.4	1.3
Musaitbeh	1.4	0.8	0.8	0.7	0.5	0.2	0.2
Wadi Sir spring	0.9	1.4	2.1	2.4	2.8	2.9	3
Abdoun well	0.2	0.3	0.3	0.3	0.3	0.2	0.3
Yadudeh well	0.2	0.5	0.4	0.4	0.3	0.5	0.4
Irainbeh well	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Total internal sources	**34**	**36.5**	**38**	**38.6**	**35.7**	**37.9**	**37.6**
Total production* **	**96**	**100**	**100**	**108**	**122**	**125.7**	**128.1**
Total output+	**5.5**	**5.1**	**5.1**	**5.2**	**7.4**	**8.8**	**8.5**
Total supply++	**90.5**	**94.5**	**94.9**	**102.4**	**115**	**116.9**	**119.6**

Source: Adapted from LEMA OPS (2007).

* This is Amman's main source of surface water. The Yarmouk River and water collected from 10 other sources located in the northern part of the Jordan Valley, feed the King Abdullah Canal which supplies the Zai water treatment plant.

** The Zara Maeen Water Treatment and Conveyance Project started operating in August 2006, and at full capacity it will provide Amman with 45 m^3 of water per year. It treats saline water collected from three nearby *wadis*. It is considered one of Jordan's water "mega-projects" intended to address the country's water deficit (Namrouqa, 2007).

*** Production is the sum of external and internal sources.

+ Output is the volume of water that Amman exports to other governorates.

++ Supply is production net of output (i.e., the volume left for the Governorate of Amman).

The Wells and Pumping Stations Manager at LEMA shed light on how water resource use is monitored (Interview 72). The Manager explained that WAJ has always had a "maximum allowable production" limit (m^3/hour) on the internal wells in the Governorate of Amman. These maximum allowable production limits were also applied to AGWA (i.e., the public entity that was in charge of water and wastewater services in Amman prior to the management contract). However, the Manager who worked for AGWA before LEMA explained that AGWA did not keep any records of the volume of water it drew from each internal well. By contrast, LEMA since the beginning of its management contract put in place a database that tabulates the average well yield, the amount of water drawn from each well, and the updated maximum production for each well. The Manager believes having data that can be shared, analyzed, and updated is the single biggest contribution that LEMA made to his Division. According to the Manager and a series of graphs that compared the allowable production from each well to the amount drawn from each well, LEMA did not exceed the maximum allowable production limit from its internal wells (nota: penalties would have been applied for exceeding these limits, however there were no production limits or penalties applied to the external well sources) (Interview 72).

To further investigate the account of the Manager of Wells and Pumping Stations at LEMA, I spoke to WAJ's Director of the Groundwater Basins Directorate. The Director stated that although LEMA had indeed remained within the allowable limits of production from its internal wells, there was still significant drawdown[44] as measured via the levels in its wells. For example, I was shown data from the monitoring wells at Suwaqa wells (which are the second largest internal well fields that supply Amman). The average drawdown was 10 meters and the

[44] The drawdown is the difference in water surface elevation observed over time via the wells drawing on a given aquifer.

Director thought that drawdown in this well field, and most likely others, will continue to increase (Interview 81). Thus, although the actual supply of water to the Governorate of Amman has increased during LEMA's management contract (see last row in Table 9), clearly suggests that supply, and the level of production, are not sustainable in the long run. This does not bode well for Amman's future water supply, and the government will need to rely on some of the "mega-projects" to meet Amman's growing need for water such as the Disi Water Conveyance Project (discussed in Chapter 2) and the Zara Maeen Water Treatment and Conveyance Project.

(iii) Affordability and financial arrangements

This section will examine the comprehensive financial framework involved. This will include the role of capital investment in the contract, the funding scheme, and revenue and its collection.

In terms of affordability, it is important to consider the Jordanian water tariff in some detail. Formal tariffs charged consumers by WAJ are not regulated, but rather are modified by a Council of Ministers whenever the Council deems it necessary. Water is heavily subsidized in Jordan; for example, the tariff covers approximately 40% of the full financial cost of the water supply in Amman (EC, 2006). The design of the tariff is such that WAJ is able to recoup its direct operating expenses.[45] Customers are divided into household and commercial units, and there are drinking and a wastewater tariffs applied, with both pricing structures varying across the country (i.e., tariffs are geographically and end-use differentiated)[46] (Stone and Webster, 2004). There is a separate drinking water tariff for the Governorate of Amman which is, in turn, lower lower for the rest of the country. Recurrent water charges (i.e., quarterly meter

[45] In Amman's case, the tariff structure and the pricing cover operating costs. But by no means do tariff revenues cover the needed capital investment costs which are generally funded by donors or development banks (Interview 39).

[46] Those service areas with a greater percent of commercial customers in the areas user-base apply a much higher tariff. This results in more revenue being generated from their customer base e.g., in the Governorate of Aqaba the average tariff is more than double that of any other governorate (Stone and Webster, 2004).

maintenance fees and volumetric charges) are 50% higher in Amman. The wastewater tariff structure is grouped and the applied fees are differentiated geographically: the first area is specific to Amman; a second centers on the Governorate of Zarqa,[47] and then one for the balance of the governorates. Residential customers receive a cubic meter charge based on water used, in addition to a quarterly fixed charge. The variable charge is structured as an increasing block tariff with four consumption blocks. By comparison, commercial customers are charged a linear tariff with limited fixed charges (Stone and Webster, 2004). The tariffs were initially set in 1997, followed by three subsequent increases in the scheduled rates (EC, 2006). The first was in 2001 when the Governorates of Zarqa and Amman took on a 12% increase in wastewater charges in order to contribute towards payments for wastewater treatment at As-Samra. This is a new build-operate-transfer wastewater treatment plant that rehabilitates wastewater from Zarqa and Amman. It officially started operating in August 2008 (Hazaimeh, 2008a). The second and third were increases in fixed charges in 2002 and 2005. In 2002, the rationale was to cover the costs of electricity in treating water, and the 2005 bump was to assist in further cost recovery, according to the MWI's 2002-2010 Action Plan (MWI, 2002a). Table 10 lists the charges for drinking water and wastewater in Amman since 1997 (EC, 2006).

[47] Until 2001, Zarqa faced the same charge as the other governorates outside Amman, but a 12% increase was applied in 2001 in order to contribute towards payments for wastewater treatment at As-Samra. The latter is a new build-operate-transfer wastewater treatment plant that reforms wastewater from Zarqa and Amman. It came into operation in August 2008.

Table 10 - Charges for drinking water and wastewater in Amman since 1997

Charges for drinking water:

Consumer category	Min. charge US$/quarter	From 1997 Quarterly volumetric charge in US$		Changes from Oct.2002	Changes from Oct.2005
Residential	US$2.80	≤20 m^3/qtr 21-40 m^3/qtr 41-130 m^3/qtr >130 m^3/qtr	min. charge $0.196Q^* - 1.12$ $0.0092Q^2 - 0.17Q$ $1.19Q$	$0.70 added to all bills ≤20m^3 $1.40 added to all bills >20m^3	Additional fixed charges were imposed as follows: $2.31 added to all bills ≤20 m^3 $3.71 added to all bills 21-40 m^3 $5.11 added to all bills >40 m^3
Commercial	US$1.40	1.40Q		As for households	$5.11 added to all bills
Tanker sales	0	0.532Q		No change	No change

Charges for wastewater:

Consumer category	Min. charge, US$/quarter	From October1997 Quarterly volumetric charge in US$		Changes from January 2001 (amounted to a 12% increase)
Residential	US$0.84	≤20 m^3/qtr 21-40 m^3/qtr 41-130 m^3/qtr >130 m^3/qtr	min charge $0.056Q - 0.28$ $0.004Q^2 - 0.106Q$ $0.49Q$	Min. charge = $0.94 $0.0672Q - 0.336$ $0.0045Q^2 - 0.118Q$ $0.5488Q$
Commercial	US$0.84	1.00Q		$5.11 added to all bills

Source: EC, 2006.

* Q = quarterly billed water volume.

There are a few important points about the water tariff that are not immediately apparent from Table 10, as follows:

- WAJ's volumetric tariffs are unusual in that for quarterly billed water volume (Q) above 41 m^3 per quarter, charges per m^3 are a function of Q^2, while the charge between 21 to40 m^3 is a function of Q, and below 20 m^3 there is a fixed fee. The marginal price departs sharply from the average unit price once consumption exceeds 41 m^3. Above 41 m^3, the tariff changes from a linear trend (i.e., up to 40 m^3) to a quadratic equation such that if you double your consumption your bill will not double, it will actually increase six-fold (Interview 19). The increasing block tariff structure provides some protection for low income households. However, this is usually offset because poorer households are generally larger in size (Stone and Webster, 2004).
- The fixed charges explained above, that were imposed in 2003 and 2005, has meant that the biggest jump in cost was incurred by those using the least amount of water. Those in Amman buying 20 m^3 have seen prices rise 2.4 times, those buying 40 m^3 by 40%, while those buying 100 m^3 have seen a 9% reduction in prices. This implies that the changes in the water tariff have been regressive (Interviews 19; 99).
- The average residential quarterly consumption in Amman is 40 m^3 and a quarterly billing at this rate of consumption amounts to US$15.30, or US$5.00 per month (i.e., includes both drinking water plus sewerage service). Given that the average income for a poor household in Jordan is US$282.50 per month, the water bill amounts to a relatively small fraction of this amount. However, it is critical to note that it is mostly the poor who are forced to buy water from private tankers to top-up their piped supply, since these poor

residents have less on-site water storage[48] associated with their smaller dwellings. Moreover, market prices for water from private tankers ranged from US$2.80 to 4.90/m^3, which is well over the US$0.38/m^3 a household is paying LEMA for 40 m^3 of water per quarter.[49] The Jordan Human Development Report underscored this issue as a major problem for poor households (UNDP, 2004).

- According to government officials, low-income households are supported by the tariff structure, which includes a "lifeline" block of 20 m^3 per quarter at a fixed price of US$4.90/m^3. The problem is that low-income households tend to be larger, and in some cases multiple households are connected to the same water meter,[50] which places them at risk of falling into higher consumption categories, resulting in a yet bigger financial burden on these same users (Gerlach, in press 2009; Darmame, 2006).

All of this suggests that the water tariff may be affordable, but it is not necessarily equitable. Small users experienced the biggest hike in water charges and are still dependent on expensive private tanker water. It is important to understand the extent to which LEMA could actually affect the affordability of water. A key point that nearly all respondents mentioned when discussing the water tariff in Jordan, is that neither LEMA, nor any other entity for that matter, has any formal voice over the water tariff rate.[51] It is solely in the hands of the Council of Ministers. The LEMA officials, who were most knowledgeable about the affordability of these

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[48] As a result of water rationing, customers need to install household storage facilities. These are usually rooftop storage tanks along with ground-level storage. Larger buildings have underground reservoirs. Minimum storage requirements have been included in the revised 2003 Building Code (Gerlach, in press 2009).

[49] Private water tank suppliers usually ignore government price regulations of US$2.80/m^3 in summer and US$2.50/m^3 in winter (Gerlach, in press 2009).

[50] In the poorer areas of Amman, multiple households illegally connect to the same water meter because some families live under informal housing arrangements, and are not eligible to apply for a water connection (Darmame, 2006).

[51] LEMA did make an effort to inform WAJ (who in turn could communicate with the Council of Ministers) of potential problems with the tariff such as its regressive nature (see second bullet above). Also the revenue accrued by LEMA from water bills was deemed public money: LEMA collected money and then transferred it directly to WAJ (Interview 21).

services, were their two Co-Directors of Customer Services. When I inquired as to their views on providing water and wastewater services to the poor, one Director stated that they [the poor] could use tankers if needed, and the other noted that "we have a big problem of non-payment from the rich areas of Amman as well. Nobody is not paying because he or she is not able to. If you are a poor person, still 40 m^3 is not excellent, but you can manage on 40 m^3 in three months. So you get about 500 liters a day. And 500 liters a day, you can live with this and pay a little less than US$5.70 a month. So even the poorest person can afford this" (Interview 22). In my view, there remain problems related to equity as I explained above; however, it is unclear how any kind of PPP in the water sector could have any influence on the water tariff given that water tariff decisions remain firmly in the hands of the Council of Ministers.

The comprehensiveness and effectiveness of the financial arrangement of the management contract was largely linked to the freedom LEMA had to use funds out of the US$55 million management contract on capital investments (i.e., vehicles, equipment, pipes, in fact anything with a useful life of more than one year). Essentially, the management contract was comprised of a US$8.8 million fixed fee[52] as compensation for the operator's services. Most of this went to pay the expatriate staff and the remaining US$47 million went into an Operating Investment Fund.[53] The latter was the pool of money that LEMA could use for capital investment, and the establishment of this fund was in fact one of LEMA's targets in the contract. The Operating Investment Fund was described by the interviewee as completely insufficient to undertake the major work needed to improve the network. In addition, any spending from the Operating

[52] The fixed fee for the first four years of the management contract was US$8.8 million, which was followed by an additional US$6.2 million covered the fixed fee for the 41 month extension of the contract.
[53] Ultimately, the Operating Investment Fund was only US$32 million because another US$15 million was taken from the Operating Investment Fund to pay the management fee for the extension of the contract between 2002 and 2006.

Investment Fund had to adhere to strict World Bank procurement guidelines that made the process more protracted (Interview 39). The Operating Investment Fund was usually referred to as the "small" fund for investment in the Amman network, compared to the "big" fund (i.e., the Capital Investment Program), which LEMA had virtually no control over. The main objective of the Capital Investment Program (which started in 1999) was to construct the backbone for the water system in the Greater Amman service area, which involved restructuring, expansion and rehabilitation.[54] As the Director of Finance at LEMA explained:

> The small fund [the Operating Investment Fund] was supposed to augment the big fund [Capital Investment Program]. The Operating Investment Fund was capital investment for quick jobs ... that really needed some investment. It was like a quick fix. ... Both funds big and small were insufficient. To really make the water system better we needed another $300 million. What we had was not even enough to bring it [Greater Amman's infrastructure and water management system] to international standards. ...And we are not even talking about wastewater which really needed expansion and improvement and probably would have cost $600 to $700 million. (Interview 39)

This implies that WAJ wanted to be in full control of any major capital investment projects for Amman's water network, which in fact it was thanks its full ownership of the Capital Investment Program. LEMA's contractual role with respect to the Capital Investment Program was to "co-operate with WAJ in implementation" of the program (WAJ, 1999a). This in effect meant that when WAJ's contractors for the Capital Investment Program finish a segment of work on the water network, LEMA was then obligated to take it on board and operate it. But LEMA had no control over the timing. Various informants (directors at LEMA and senior water consultants to WAJ) saw the constraints on LEMA's ability to direct capital investment in Amman's network as one of the most serious flaws of the management contract (Interviews 3; 8; 15; 39).

[54] The entire Capital Investment Program was divided into 15 contracts, and each was financed by a donor. The donors included the German development bank (Kreditanstalt fur Wiederaufbau, KfW), the Government of Italy, the World Bank/International Bank for Reconstruction and Development, USAID, and the European Investment Bank. The Capital Investment Program amounted to approximately US$200 million (PMU, 2005).

There are a few other key indicators that help explain LEMA's financial health over the course of the management contract (1999-2006). One element is its success at improving the accounts receivable (i.e., reducing the accounting liability accrued by non-payment of bills). The contract stated that the accounts receivable to revenue ratio should decrease to 20% by the end of the contract (i.e., debt should be reduced). Data from the Customer Services Division in LEMA showed that the initial level of debt, as inherited from WAJ, was approximately US$18.2 million, with annual turnover of about US$29.4 million. At the end of the contract in December 2006, the debt was around US$24.5 million against annual billing revenue of around US$49.4 million. This is considered good performance in reducing the debt ratio (ratio of debt to billing revenue) from around 0.65 to 0.5, with an increase in billing of 66%.[55]

In addition, the data on billing (amount subscribers owe LEMA), collection (actual payment from subscribers), and number of subscribers is telling (see Table 11). Billing had steadily increased each year, which means that LEMA had a more effective billing system than that which existed under AGWA prior to 1999. LEMA collected almost 97% of what it billed in 2006. This could be linked to the following improvements introduced by LEMA: (i) replacement of more than 200,000 meters since the beginning of the contract; (ii) visual estimations of meter reading has been replaced by hand-held computer devices that issue bills on-the-spot; (iii) automation of the billing system[56]; and (iv) door-step billing in certain areas (Interview 19). Collection has steadily improved as well, but has mostly not kept apace with billing. The number of subscribers has also continued to rise, reaching over the 443,000 level by

[55] If the debt ratio is 0.5, this translates into bills taking 6 months to be paid on average, which is considered good performance. Customer service studies showed that about 55% of bills are collected in the same three month period as billing, rising to about 85% being collected within 6 months (Interview 51, 2007).

[56] In 2003, a new customer relationship management system was introduced. The X7, an Oracle based system, replaced WAJ's dated COBOSS system. It provided much better management and control of the billing process, hence the improvement in the billing function's success (Interview 20).

the end of the contract (see Table 11). Overall, LEMA improved cash flow from a negative to a positive (as shown in Table 7), with its operational profit at over US$16.2 million by the end of 2006. A related point is staff productivity. It improved from 5.6 to 3.4 staff per thousand water connections by 2006 (i.e., the contractual target was to improve staff productivity to four staff per thousand connections) (World Bank, 2007c).

LEMA also drastically improved its overall customer service. There are now two new modern customer call centers (I had occasion to visit both), with one dedicated to operational complaints (e.g., leakages, water quality), and the other focused on administrative complaints (i.e., mostly billing-related issues). Both are equipped with computerized databases that replaced hand-written notation and hard-copy filing of complaints, and a Geographic Information System (GIS) to track exact locations of customers. Additionally, the actual bills are far-easier to read now given that they consist of a detailed breakdown of charges (Interviews 25; 68). LEMA also set up three repair and maintenance shops in East, West, and South Amman, which provided 24-hour service with a crew ready to go out to any reported location (IC, 2007).

Table 11 - Data on billing, collection, and number of subscribers under the Amman management contract period

Year	Billing (million US$)	Collection (million US$)	Billing collection ratio (%)	Subscribers
1999	31.2	25.7	82.4	265,000
2000	31.2	30	95.0	--
2001	32.5	30.9	95.2	--
2002	35	28.3	80.3	--
2003	42.5	40.3	94.7	360,697
2004	47	46.3	98.5	388,230
2005	50	51.4	100	416,897
2006	59	56.9	96.9	443,043

Source: LEMA CS, 2007.

One of LEMA's greatest successes was the vast improvement it made to customer services and, in turn, the gains it realized in productivity and efficiency as outlined above. As I discuss in section 3.2.3 below, these improvements were a result of the training and technological improvements that LEMA's expatriate staff provided.

(iv) Efficiency of service

This section covers how efficiently LEMA provided drinking water and wastewater services to its customers. There are two chief indicators to examine: the change in NRW, and the reliability of the service. Before looking at these two issues more closely, it is useful to get an idea of the scope of LEMA's drinking water and wastewater services. In 2006, almost 99% of Amman's service area received access to drinking water, yet only 80% of customers receive wastewater services. The latter primarily occurs in South Amman, home to most of Amman's poor[57] (Interview 22). As for water meter readings: almost 98% of all connections were read in 2006 compared to 75-80% in 2000. LEMA's Co-Customer Services Director explained that the low percentage in 2000 was because, prior to the management contract, there was no system in place to assess the performance of the actual meter readers (i.e., whether each meter reader was reading every meter assigned to him/her). The Co-Director implemented a new system to regularly assess the performance of meter readers and he attributes the improvement in meter readings to this step (Interview 20).

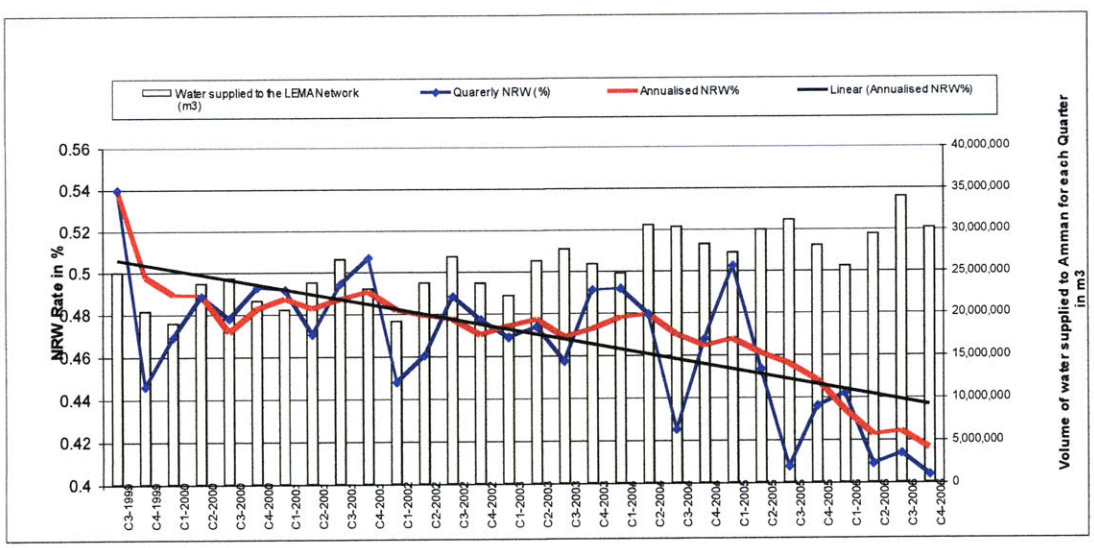
NRW was clearly a major goal of the management contract, with almost 1/3 of the targets being related to the reduction of NRW (i.e., it stood at 54% which means that 54% of the metered volume of water was not producing revenue as mentioned previously). The NRW-related targets included the following broad activities: reviewing illegal use of water; replacing old or broken meters; producing a NRW Action Plan; and improvements to general network maintenance and

[57] The Co-Customer Services Director of LEMA explained that the wastewater network has not been extended to South Amman because most of its population has only recently moved there and extending the wastewater network would require enormous capital investment funds that LEMA did not have. However, because of the growing population in South, WAJ is currently constructing the needed wastewater network (Interview 22).

leak detection. A review of the external Technical Audit Reports show that LEMA was able to comply with these targets, except for one (IC, 2000-2007). The exception was the specific target for the percentage reduction in NRW. The initial target for the first four years of the contract was a 25% reduction (from the original 54%), and this was later revised to getting NRW at "35% or better" for the last two years of the contract, meaning a 19% reduction or better) (WAJ, 1999a).

Ultimately, LEMA was able to reduce NRW from 54% in 1999 to 41.6% in 2006, which represents a reduction of less than 13% (Bobillier, 2007) as illustrated in Figure 3 (the red line is the "annualized NRW %"). As explained earlier, NRW comprises both "real" (e.g., leakages, storage tank overflows) and "apparent" (e.g., illegal water use, water meter inaccuracies, data handling errors) losses. Almost half of NRW in Amman is a result of these "real" losses (i.e., leaks, overflow at storage tanks). This means that about 6.5% of the water was actually "saved" or conserved, while the 7% balance was not really a water saving as such, but is rather more of a financial loss that has been recouped (Interview 21).

Figure 3 - Trend in NRW over the course of the Amman management contract



Source: LEMA OPS, 2007.

This is in fact a substantial success for LEMA given the state of the Amman network. Respondents from both WAJ and LEMA believe that the NRW targets were set unrealistically high. As the Co-Director of Operations at LEMA told me "the government made LEMA sign on to a number of targets and some of these targets were not unrealistic. ... One of the targets is for water revenue to reach international levels, this is unrealistic and this was not achieved" (Interview 3). In my view, it is interesting to consider a few of the factors that both helped and hindered LEMA's work on NRW (see Table 12). LEMA's main contribution to reducing NRW was its work on replacing old water meters, decommissioning and replacing old pipes, and setting up a division whose staff was tasked with locating illegal users. The major obstacle in LEMA's path to improving NRW was that Amman's water network was (and still is) undergoing an overhaul to switch from rationing to continuous supply (i.e., supplying water to customers 24 hours a day). This is being undertaken on a district-by-district basis. By 2007, only 12% of Amman was under continuous supply in 2007. Moreover, this kind of switch means a risk of increasing physical losses (i.e., leaks) as pipelines are being cut, moved, and reconnected in the process (Interviews 2; 18; World Bank, in press 2008).

Table 12 - The factors that helped and hindered LEMA's work on NRW

What helped LEMA reduce NRW	What hindered LEMA in reducing NRW
• The Capital Investment Program for Amman's water network replaced old or deteriorated galvanized iron pipes.. Since pressure in the network is directly proportional to physical losses, which is a big contributor to NRW, these important reductions in leakage allowed for marked improvements in water pressure. • LEMA's measures to reduce commercial losses saw replacement of more than 60% of old water meters that under-registered water volume. LEMA also set up an illegal water use division of about 50 employees who located on average 800 illegal users/month. • LEMA's work on reducing physical losses through the decommissioning of old pipes, and replacing deteriorated galvanized iron pipes. Some 600 km of pipes (10% of total) were replaced. • Worked with Capital Investment Program contractors to establish 60 out of 313 districts in Amman under a continuous supply of water. This helped find non-visible leaks which in turn reduced NRW in these districts to below 35%, whereas the average NRW for Amman was almost 42%.	• Water meters in a water rationing system deteriorate and are prone to inaccurate readings more quickly than those in a continuous system. This is because: (a) water is distributed once or twice a week under the rationing system, but at a much higher velocity which, in turn, erodes the meter device more quickly; and (b) galvanized iron pipes corrode more quickly when continuously moving from wet-to-dry conditions. • Public's acceptance of water theft (a joint survey by the MWI and LEMA showed that the majority of people deemed water theft as acceptable behavior). • Leaks were not repaired before switching from rationing to continuous supply for the 60 districts in Amman, which meant that more water was lost because water (and in turn leaks) was running for longer periods of time. • The districts under continuous supply require water that flows at a lower velocity than under rationing. The type of meters in Amman start measuring water at 30 meters/hour. The initial flow under continuous supply is under this rate resulting in water is not being metered (studies estimate that 20% of the flow is not read under continuous supply). • About 88% of Amman is still under the water rationing system and this makes it very difficult to find leaks because the water is not always flowing through the system. In addition, Capital Investment Program contractors did not always coordinate their rehabilitation work on the network with LEMA. Pipelines were therefore being cut and other pipelines reconnected with LEMA having no control, and NRW worsened as a result.

Sources: Interviews 2; 18; World Bank, in press 2008.

Another aspect of the efficiency of water and wastewater services is the reliability of the service. LEMA's compliance to the rationing plan is the key indicator in this regard. Compliance with the rationing plan refers to how well LEMA was able to supply drinking water to its customers (hours per week) in light of the number of hours agreed to with WAJ. This was in fact one of the contractual targets for the last three years of the contract. The Technical Audit Reports state that in 2003/2004 the average number of hours that water was supplied to customers per week was 41, and the compliance with the agreed rationing was 118% of the targeted level for that year (ranged from 95 % to 167%); in 2004/2005 it was 63 hours per week and a compliance of almost

107% (ranged from 74.2% to 139%); and in 2005/2006 it was 53.7 hours per week with a compliance of again almost 107% (ranged from 95.7% to 126.3%) (IC, 2000-2007; LEMA OPS, 2007).

The compliance values greater than 100% in all three years signify that LEMA was able to exceed the "agreed to"[58] total number of hours of water supplied to customers.[59] Even when the compliance rate dropped noticeably (e.g., in 2004/2005 it dropped to 74.2% for a few days), this was due to technical problems beyond LEMA's control, such as water production coming to a halt in a few of the major plants because of heavy rains which deteriorated the raw water quality beyond the acceptable standard (Bankworld, 2006). These values tell us that drinking water services were on the whole very reliable and LEMA's surveys show that customers value reliability very highly because it allows them to structure their time around the availability of water (LEMA, 2006c). The major contractual target for the reliability of wastewater services (since the first year of the contract) was that LEMA had to reduce the response time to wastewater complaints to six hours. LEMA always met this performance indicator by exhibiting an on average response time over the seven-year contract of under 2.2 hours (IC, 2000-2007).

In sum, as mentioned in Chapter 2, management contracts usually last between one to five years. They should be short and focused and can "also serve as a transitional arrangement, during which the government can prepare for a deeper form of private participation" (World Bank, 2006c, p.7), or another model that does not involve the private sector such as a creating a public water company. A senior USAID official from the Jordan office informed that in 2005 the MWI knowing the management contract could not be extended indeterminately, wanted to explore all

[58] These values are agreed to based on discussions between WAJ and LEMA.
[59] Prior to the management contract AGWA supplied on average 24 hours of water per week to each customer, and this figure more than doubled by the end of LEMA's contract (Interview 33).

options for the management of the Amman water supply and wastewater services. The MWI approached USAID for assistance on how to carry out an assessment because the Ministry was already thinking about developing a public water company to take over water services in Amman. At the time, USAID was providing assistance to the AWC as it moved towards corporatization (Interview 115). In March 2005, an agreement was reached between the MWI and USAID on the structure of the assessment of LEMA, and the future Amman water utility. There would be two phases and USAID agreed it would commit to funding these phases. In December 2005, USAID assured the Minister that the studies would be done in sufficient time for his Ministry to make a decision by January 1, 2007 (i.e., the process for Amman was the same as that used for Aqaba, which had been found acceptable for all parties) (Interview 115).

The consultants that authored these studies concluded that neither a revised contract with LEMA nor a full re-bid for a new management contract, or any organizational model that involves private investors such as leases or concessions, would be advisable at the time (Segura, 2006a). They gave three reasons: (i) high risk associated with the lack of an explicit tariff policy in addition to the uncertainty of water availability to Amman over the long-term; (ii) international operators/investors seemed to be withdrawing from international investment commitments; and (iii) the absence of a more suitable organization (i.e., one that is more self-sufficient, efficient, and free from government limitations) that has been operating for some time in order to limit the risks to a private operator and add more value to WAJ. The details of how Miyahuna is structured and what it means for water and wastewater services in Amman are discussed in Chapters 2 and 6.

Based on my assessment above of water quality, sustainability of supply, affordability and financial arrangements, and efficiency of service, I found that LEMA attained almost all of its contractual targets and, improved overall water and wastewater services in Amman. In my view, the management contract accomplished everything that it could be expected to accomplish given the constraints it faced - both technical in terms of the actual water network and institutional as I describe in the following section (3.2.3). The management contract was terminated on December 31, 2006. It morphed into another form of public-private partnership, namely a government-owned water company called Miyahuna. The following are a range of views from my respondents about the effectiveness of the Amman management contract. The local LEMA Co-Director of Operations claimed that:

> The management contract was not a partnership; we were not partners with the government. We were not an independent body to make independent decisions. ... LEMA had to follow laws and regulations of government, so government practice has been applied to LEMA. It would be more of a partnership if we had more independence. I have to say that this independence has to be regulated and audited.[60] (Interview 3)

The expatriate LEMA Finance Director explained that:

> LEMA was like a servant. It's like a maid in your home, you tell a maid what to do ... and then after each month you give her a fixed fee. This was LEMA. The house remains yours; you're the owner of the house. If the maid had to buy groceries it was out of your money, but she would do the cooking. Had the maid employed a gardener, it would be at your cost. So everything during the management contract was really being paid out of WAJ money. The salaries of all the employees were paid by WAJ. All the expenses and all the costs were paid by WAJ. By the same token all the collections for the water bills that we issued went back to WAJ; it had nothing to do with LEMA. (Interview 39)

And the expatriate Co-Director of Operations described LEMA's final years as follows:

> At the end, in the last two years, we [LEMA] were the ones pushing [WAJ] to another solution, saying we can't extend this contract forever because we have, you know, achieved what the management contract can achieve. And now we are

[60] This respondent went on to say that despite this, LEMA still managed to greatly improve water services "during the period where AGWA had the total power over water management (before the management contract in 1999), many water meters were not working, and volumes of water consumption were recorded only by estimation. But now under LEMA things are different. We have revenue water, we have the billing system, we use a Geographic Information System , and we monitor our operations" (Interview 3).

> – it's flat. We cannot achieve much more with the tools that you are giving us. And now if you want to change performance more you have to change the type of contract. You have to give more freedom to the operator. (Interview 2)

3.2.3 Explaining the outcomes: What influenced the effectiveness of the partnership?

In Chapter 1, I hypothesized that the institutional arrangement is the main factor that influences the effectiveness of partnerships in the water sector. I also proposed that there are likely intervening variables that also affect the success of such partnerships. The following section discusses what my dataset revealed about the five facets of an institutional arrangement that I believe to be of primary importance. These facets comprise the contract, the legal setting, the governance structure, policies, and information channels. I also discuss the role of shifting to a more commercially-oriented approach and knowledge transfer, both as intervening variables.[61]

(i) The contract

The management contract is a voluminous and extremely detailed document, drafted mainly by legal specialists on behalf of the World Bank, with input from WAJ. It is signed by three parties which were the Water Authority of Jordan, Suez Lyonnaise des Eaux (the international partner in the consortium), and Montgomery Watson Arabtech Jardaneh (the local partner in the consortium). LEMA was the consortium's agreed acronym. LEMA was essentially tasked with operating, managing, and maintaining the water and wastewater services for Amman. In return, it earned a management fee of US$8.8 million over the four years of the initial contract, plus US$6.2 million for the subsequently granted 41 month extension. The contract included over 60 performance standards, or "targets" as they are commonly known, to fulfill. The original Amman water supply and wastewater services management contract was a four year contract

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[61] For both this section on "explaining the outcomes", and the equivalent section for the rural case studies presented in Chapter 4, I based my analysis on the factors that emerged most frequently. These were determined by my coding of interviewees using my chosen qualitative analysis software (i.e., Atlas Ti 5.0). Appendix C includes a chart of the most salient factors that influenced the effectiveness of the four partnerships in this Study.

(1999-2003). It was extended once in 2002 for 17 months and then again for 24 months in 2004, thereby pushing the actual end-date to December 31, 2006.[62]

A few respondents had reservations about the type of contract itself. Some thought that a longer-term contract, such as a lease or concession arrangements, would have had certain benefits over a management contract. The rationale behind preferring a concession for Amman was two-fold. First, under a concession LEMA would have had full control over recruitment and procurement[63] (Interviews 39; 94). Respondents from most of the directors at LEMA[64] agreed that procurement was a particularly frustrating issue for them given the need to adhere to both the World Bank's, as well as WAJ's procurement guidelines. The latter encouraged the awarding of projects to the lowest complying bidder. This often meant poor quality work and the resulting need to constantly switch contractors. LEMA therefore had little chance to build much needed capacity in human capital within a constant group of contractors (Interviews 1; 2; 3; 39). As LEMA's Finance Director explained "we had to deal with a lot of suppliers or contractors who offered poor quality and ultimately it cost us more … in a concession, I could have procured that item today and this item working for me tomorrow. Here I am stuck in a zillion bureaucratic procedures so that I could be able to procure something six months down the road. Imagine the loss of opportunities" (Interview 39). The second reason that a concession would have been preferable according to some respondents is that LEMA would have had responsibility for capital investment in Amman's water network, and as the Co-Director of Customer Services put

[62] The initial management contract was planned for four years only (1999-2003) because the Capital Investment Program was supposed to be completed by 2002, thereby overlapping with the management contract. But in 2007, the Capital Investment Program was still not completed because it had experienced major construction delays (Interview 18; 39)

[63] Procurement is the acquisition of goods or services. This could include pipelines, vehicles, contractors, and the like.

[64] Specifically, the co-directors of three divisions: operations, finance, and technical services.

it, LEMA could then have made "considered decisions" about how and when to improve the network (Interview 20).

There are at least five main aspects of the Greater Amman management contract that warrant explanation. The actual objectives are, by definition, central to the contract. These are outlined in the contract's Service Appendix (WAJ, 1999b), and the key objectives include the following:

- operate the collection of raw water from source, the pumping and transportation of raw water to the water treatment plants, the treatment of water and the distribution and supply of drinking water to the customers;
- operate the collection of wastewater, the pumping and transportation of wastewater to the wastewater treatment facilities;
- maintain the facilities to an improved standard and develop a comprehensive maintenance management program;
- complete the repair and rehabilitation of the facilities;
- carry out and improve the billings, collection and customer service functions related to the subscribers;
- cooperate in WAJ's implementation of the Capital Investment Program; and
- improve the operations, maintenance, rehabilitation and repair of the facilities.

The contract was a *performance-based* undertaking. Its Performance Standards Appendix lists over 60 specific activities that the operator must attain.[65] One senior WAJ official interpreted the onerous number of performance standards as a sign of the government's inexperience in contract negotiating (Interview 91). And many respondents from both LEMA and WAJ referred to how unrealistic the actual targets were (e.g., slashing NRW by 25% and doubling the duration of water supply to customer); WAJ's "wishful thinking" one respondent commented (Interviews 7; 15; 33).

There is also the issue of compensation to the operator. The key consideration in determining LEMA's compensation is that "the operator was to receive a fixed fee to cover his services, and a variable fee contingent on the successful performance of the utility", as stated in the Contract for Consulting Services Report prepared by the multinational accountancy and audit firm Arthur Andersen (Andersen, 1997). LEMA therefore received a fixed fee of US$15 million over the entire contract, for managing the enterprise. It also received an additional variable fee according to the "performance incentive compensation." The performance incentive compensation was derived from the comparison between the performance of providing water and wastewater services to the service area when under WAJ's sole ambit, and the actual performance of

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[65] Many of the performance standards have been referred to in the previous section of this Chapter (section 3.2.2) (WAJ, 1999a). More examples of the performance standards included the following:
• integrate a GIS-based information system for the primary and secondary networks, as well as for tertiary and service connections and a repair database;
• develop a program for the identification and conversion of illegal water connections;
• monitor water quality and discontinue use of any source that does not meet required standards;
• carry out all chemical, physical and biological processes to achieve the effluent standards;
• various repair and rehabilitation targets such as increase accounted-for-water to 25% by the fourth year of the contract; improve constancy of supply of water to subscribers during peak and non-peak seasons; replace non-functioning water meters within 30 days and replace meters (200,000 by the end of the contract's fourth year) that have been in service for more than five years; and develop and implement a leak detection and repair program;
• reduce response times for repairs to water leaks and wastewater complaints to six hours, by fourth year of the contract, for both;
• develop a monitoring program to ensure greater accuracy and to reduce unaccounted for water; and
• improve accounts receivable for the service area by 20% by the fourth year of the contract.

providing these same services by the contracted operator. The performance incentive compensation formula was designed to compare the financial performance of the water and wastewater systems in the previous year only, and therefore ideally, the operator would have improved his performance from the previous year. The percent of improvements in financial performance that was paid to LEMA by WAJ ended up being 5%.[66] What appeared problematic to me was having the incentive based on incremental improvements. These might have a tendency to become smaller as the operator's effectiveness each year improves, and the annual incentive level of 5% becomes successively less significant. Both were considered too small to promote any behavioral changes in LEMA (Interview 14; Segura, 2006a). Notably, there was no link between performance incentive compensation and the financial bonus awarded to the staff. Such a link could have far better coupled staff motivation with the contract goals (World Bank, in press 2008).

Another important aspect of the management contract were the penalties involved. Penalties are referred to as either "withhold" or "liquidated damages" and these are applied in the event that the operator is unable to meet the performance standards mentioned above. The issue was the relatively high number of possible penalties listed in the Withholding and Liquated Damages Appendix (WAJ, 1999c). There were almost 30 activities (i.e., half the total) that had penalties attached to them, and as one seasoned international water consultant who worked extensively in

[66] The actual Performance Incentive Compensation formula is the following:
$(X)\% \times \{[(R^{(n)} - R^{(n-1)}] - [E^{(n)} - E^{(n-1)}]\}$
X% = Percent of improvements in financial performance that will be paid to operator by WAJ as set out in the contract. It was set to be 5%.
$R^{(n)}$ = Eligible cash receipts from operating revenues in contract year (n).
$R^{(n-1)}$ = Eligible cash receipts from operating revenues in contract year (n-1).
$E^{(n)}$ = Eligible operating expenses in contract year (n).
$E^{(n-1)}$ = Eligible operating expenses in contract year (n-1).
Year (n) = Current year of operations under the contract and Year (n-1) = The base year, the immediate previous year (Arthur Andersen, 1997).

Jordan commented “the LEMA management contract had a very high number of penalties. It had incentives and penalties, but more penalties than in any other contract that I have ever seen” (Interview 94). The penalties had three classifications according to the Withholding and Liquidated Damages Appendix:

- “withhold” which refers to the amount that WAJ could hold back from the management fixed fee or the PIC in any given month;
- “liquidated damages” which WAJ could retain from the management fixed fee in any given month; and
- “liquidated damages” from the annual performance incentive compensation, setting out the percentage that WAJ may withhold for any contract year.

Lastly, one of the most problematic elements of the contract was the staffing policy. As stated in the Staffing Policy Appendix, LEMA was obliged to take on almost all of WAJ’s employees that previously worked in AGWA (i.e., 1600 employees), and LEMA had to retain at least 50% of this pool of seconded staff. The seconded employees were to return to WAJ once the contract terminated (WAJ, 1999d). These employees were subject to the same employment terms (i.e., salaries and benefits) that they had as WAJ employees. By contrast, newly recruited LEMA employees were hired from the market, and their conditions varied to those of the seconded employees. In 2006, LEMA had 1250 employees, 750 were from the original pool of WAJ’s seconded staff. This meant 850 were sent back to the Authority) and 500 were new recruits from the market. This situation posed a few major problems to LEMA’s performance. The seconded staff was still paid by WAJ and LEMA was not allowed to increase their salaries, enforce disciplinary action, etc. The new recruits were also paid from WAJ funds. LEMA found it virtually impossible to further motivate performing staff because the consortium could not offer incentives or bonuses.[67] This minimized their ability to build loyalty, along with instilling any sense of corporate culture. The only action LEMA could take against poor performers was to send them back to WAJ, and this was often met with considerable resistance because understandably, WAJ had little interest in re-absorbing "rejected staff." Also, recruiting new staff was a struggle. The recruitment process was very bureaucratic and involved preparing considerable justification and documentation for WAJ's consideration. As well, retaining the new recruits proved difficult because they were paid below market rates (but slightly higher than government rates). Finally, there was the dual human resource pay scale: seconded staff were given better salaries and incentives than current staff and this caused a lot of resentment from seconded staff and weakened their commitment to LEMA (Interviews 3; 11; 19; 39).

(ii) Other important institutional factors: legal setting, governance structure, information channels

The next three prevalent factors that help explain LEMA's performance are the specific legal context that framed its activities and initiatives (i.e., statutory and regulatory) the governance structure, and the manner in which information was communicated.

There were six statutes that respondents mentioned when asked how the legal setting affected LEMA's ability to provide effective services. Four of those laws were viewed as constraints, while two were seen as supportive of LEMA's aims. According to the international consultants who worked for LEMA, as well as LEMA's directors (Interviews 15;16;20; 22;39; 40), the constraining laws and legal requirements included the following: (i) the overly bureaucratic government procurement regime arising from two regulations (i.e., the *Government By-Work*

[67] At the beginning of the contract, LEMA was able to add 10%, and then later another 15%, to the salaries of the seconded staff. However, this was still considered a minor raise compared to expectations (Interview 39).

Regulation No.71 (1986), and the *Supplies Regulation No.32* [1993][68]) which emphasized securing the lowest cost for supplies, thereby significantly compromising the quality of the same supplies; (ii) the three auditing bodies (i.e., LEMA was audited by Technical Auditors comprised of U.S.-based consultants funded by USAID,[69], the Jordanian Audit Bureau, and the auditing arm of WAJ) were overly redundant and time consuming exercises, and resulted in sets of inconsistent assessments; (iii) the *Civil Service Law* (2002[70]) which was seen as very rigid and limiting because it did not allow LEMA to operate on a commercial basis (see Table 13); and (iv) the *Water and Sewerage Authority Law* (1973) which does not include any penalty for illegal stormwater connections to the network, making it very difficult for LEMA to oblige customers to disconnect (discussed in 3.2.2 above). More generally, the dispute resolution system in Jordan for dealing with illegal acts related to water (e.g., dumping polluted water into a manhole, tampering with water meters) was dysfunctional. The Co-Customer Services Director explained that for years, he fought to establish a special court for water issues the way the Municipality of Amman has a special court, or income tax related cases have a special court. Water issues had always been dealt with by the general court and resolution of cases could take up to five years. In LEMA's case, witnesses of illegal water usage were oftentimes LEMA employees, who leave the company before the case actually reaches the trial stage. Creation of a special court for water-related challenges would require approval from the Council of Ministers, and senior governmental officials were always against this approach for a number of varying reasons (Interview 22).

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[68] The implementing agencies are the Government Tenders Directorate of the Ministry of Public Works and Housing and the General Supplies Department of the Ministry of Finance.
[69] This audit service was funded by USAID as one of its many water-related projects in Jordan.
[70] This law was originally enacted in 1963.

Table 13 - Clauses of the Civil Service Law (2002) relevant to LEMA's activities

• Article 72: Lengthy employee reviews, that can involve the relevant Minister (and a small committee of senior Ministry officials), if the person being reviewed has a grievance related to an assessment that deems him/her mediocre (or worse!). Reviews can result in either a demotion or loss of employment. The committee decides on whether the initial review was fair. The implication for LEMA was that time and effort are lost in an immensely bureaucratic process.
• Article 60 and 61: Recruiting a specialist to work on a project involves reviews from various senior levels, up to the relevant minister and the Prime Minister. The successful candidate can only be hired for that particular project with no room for any contract time-extension or scope-widening.
• Article 142: If an employee is under-performing or not complying with certain rules or procedures, then the employer can impose a number of disciplinary actions. However, as the severity of each action increases, so does the approval process to allow for these same disciplinary actions e.g., to increase the disciplinary action from a warning to a salary decrease, the employer would need the approval of the Prime Minister. And if there is any contention on the course of action, then the case will be referred to a disciplinary council made up of the Deputy Prime Minister, the Head of the Civil Service Council, and the Deputy Minister of Justice, with a majority vote required to proceed with the action.

Source: *CSL* (2002), as summarized and translated from Arabic to English.

There were two laws that worked in LEMA's favor. One was the amended *WAJ Law No.18* (1988) Article 28, which underpins any PSP activity in Jordan's water sector. It essentially permitted WAJ to engage in PSPs by assigning any part of its "duties, projects, or the execution of any stage" related to water and wastewater services to another entity in the public or private sector.[71] The other statute was Jordan's *Emiri Law*. It states that all government billing (e.g., water bills) must be paid even if the customer has accrued debt. Delinquents face consequences such as confiscation of land, or publication of defaulters' names, thereby making it very difficult to renew a drivers' license for example. LEMA made use of this law in its arsenal of tools aimed at lowering its account receivables debt arising from non-payments, which as mentioned earlier stood at US$18.4 million at the start of their contract (Interviews 16; 22).

Another critical aspect to the legal setting was the regulatory framework for water and wastewater services. There is no consensus within Jordan as to which entity should assume the

[71] WAJ's website describes Article 28 of *WAJ Law No.18* (1988) as "...a breakthrough that made possible the incorporation of the commercialization principle into Jordan's water sector. It can be said that all major initiatives that took place recently, such as As-Samra build-operate-transfer, Amman Management Contract, Amman and Aqaba Water Companies, and the managing consultant contract in the Northern Governorates, were possible only because of the amendment of *WAJ Law* by introducing the said Article" (WAJ, 2008).

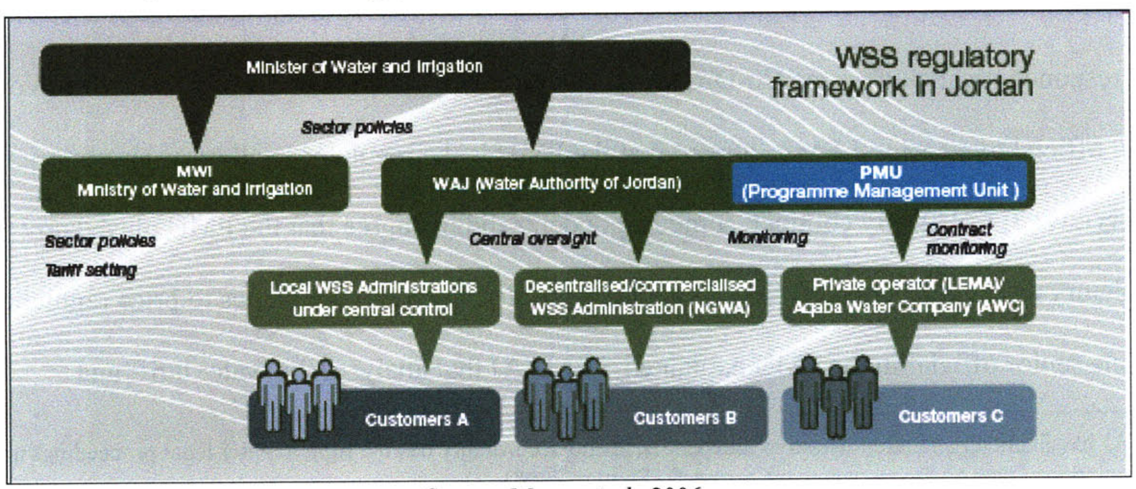
role of regulator in the water sector. A closer look at the organizational setting explains why this is the case. As mentioned in Chapter 1, the MWI was established in 1992 to enhance coordination in the Kingdom's water sector, and to this end it amalgamated WAJ and the JVA. Subsequently in 1997, a new body was created within the semi-autonomous WAJ.[72] This was the previously cited PMU, whose mission is to promote PSPs in the water sector and monitor projects that "transform the current structure of the water and wastewater services in the Kingdom into a service industry that provides these vital services in a cost-efficient yet socially responsive manner"[73] (PMU, 2007). As Figure 4 illustrates, there is no clear division of the roles of these three bodies (i.e., the MWI, WAJ, and the PMU). The role of regulator in Jordan's water sector is ambiguous. Legally, it seems that WAJ has most regulatory functions because according to Article 6 in *WAJ Law No.18*, this Authority is the only entity that can: (i) "[d]irect and regulate the construction of public and private wells"; (ii) "[r]egulate the uses of water, prevent its waste, and conserve its consumption"; and (iii) and be responsible for "preparation of approved water quality standards for different uses" (WAJ, 1998, p.6 and 7). However, respondents differed in their opinions as to who actually acts as regulator in the water sector. A few respondents, including the Co-Director of Operations at LEMA, as well as the senior World Bank official overseeing LEMA, agreed that the PMU is the regulator in all areas except pricing (Interviews 3; 6; 15). By contract, some respondents did not agree that the PMU played any regulatory role and contended that WAJ is the regulator, even when it comes to price regulation. As one senior official in the PMU explained, it is WAJ that analyzes the water tariff and

[72] WAJ has financial and administrative independence and accordingly has the right to enter legal proceedings and sing contracts (such as the management contract) (Steiner, 2008).
[73] As mentioned in section 3.2.2 of this Chapter, the MWI encouraged the creation of a PMU. The PMU's original objective was to coordinate and monitor the Greater Amman water supply and wastewater service management contract, as well as oversee the Capital Investment Program in Amman. The PMU is sponsored by the European Commission, KfW and the Japanese International Cooperation Agency. The Chief Technical Advisor to the PMU (for 11 years, 1997-2008) was a German consultant who was funded by the German development bank, KfW (Interview 7).

proposes tariff modifications to the Council of Ministers if need be (Interviews 7; 9; 39). The implication of all this for LEMA, as concluded by a a study on the institutional framework and the effect on LEMA, was that not only was the regulatory framework nebulous, but the lines of responsibility between key organizations was also unclear. This could lead to confusion about LEMA's discretionary power in its daily operation and maintenance activities, as well as confusion as to whom it was really accountable (Steiner, 2008).

Another regulatory gap is the operation of private water tanker-trucks. While water quality of private tanker-supplied water is rigidly regulated by the Ministry of Health, the regulation of price is not enforced by the MWI or WAJ. The allowed pricing of tanker water is at "whatever the market can bear" (Interview 104). The law on tanker water prices was not enforced, and most drivers and customers were unaware that a law on private water tanker prices existed. Thus many poor households were disadvantaged as a result. The purchase of private tanker water obviously meant a loss of revenue for LEMA (Interviews 20; 39).

Figure 4 - The water supply and wastewater services regulatory framework in Jordan



Source: Meuss *et al.*, 2006.

The last two institutional factors that affected the performance of the partnership were the governance structure and information channels. The prevailing governance issue among respondents was LEMA's inadequate decision-making power in coordinating the Capital Investment Program, which as mentioned earlier, was a target in the management contract. The crux of the problem was that LEMA inherited all the restructuring and rehabilitation work that the Capital Investment Program contractors did on the Amman network. However, LEMA had no contractual relationship with these contractors meaning that LEMA could not direct and review the contractor's work, as they saw fit (Interview 7). Senior officials in both LEMA and WAJ admitted that significant problems ensued. The problem mentioned most often was that part of the Capital Investment Program contractors' job was to decommission old pipes, but many times this was not done properly,[74] resulting in serious problems in terms of continuous leaking or supplying water to illegal connections (Interviews 2; 3; 7; 9). The Director of Capital Investment at WAJ recalled how diligently LEMA verified all of the work the Capital Investment Program contractors. LEMA would closely compare finished items to the design documents and specifications because ultimately it would be handed over to them to operate (Interview 9). The actual governance issue was that three years into the contract, WAJ and the PMU finally realized that it was in their best interest to get LEMA more involved with the Capital Investment Program contractors. To this end, LEMA's Technical Services Director was assigned lead responsibility for the Capital Investment Program and his title became Capital Investment Program Director in 2002. This involved having weekly meetings with the PMU and the Capital Investment Program contractors. Decisions were made in a more timely fashion, with all three parties around the table. Most importantly, LEMA's Capital Investment Program Director was finally granted more decision-making power relevant to the sequence of work or the division of labor (Interviews 2; 9). There was one other governance flaw that both a senior

[74] The Co-Director of Operations at LEMA explained that decommissioning old pipes is not necessarily expensive, but is very time consuming because each and every segment of the network must be examined and it can be a tedious albeit important job (Interview 2).

official in WAJ and an international water consultant both mentioned. This was the absence of any kind of business plan. The contract did not require LEMA to produce a business plan of any sort. A five-year business plan for example was seen as an important component of corporate governance: it charts a vision for the company that includes all employees, it also becomes the one unifying document read by all staff, and it can also articulate incentives for employees which is motivating (Interviews 91; 105). Such business plans exist for Miyahuna, the AWC,[75] and NGWA (the three other major initiatives to "corporatize" the water sector).

In terms of information channels, this institutional aspect refers to how well information is communicated within LEMA, and between LEMA and its customers. The one dimension of communication that improved greatly as a result of LEMA's efforts was the company's interactions with customers in response to complaints as discussed earlier. Such improvements were largely thanks to the modern technology, training of customer service staff, and around-the-clock service of both customer call centers (one center deals with administrative complaints and the other operational complaints) at the LEMA headquarters[76] (Interview 68). Further, LEMA's customers are also being consulted via annual surveys and polls at customer service centers, more than they ever had been previously (Interview 115). However, the actual sharing of information and responsiveness to feedback were LEMA's weaknesses, as both WAJ officials and water consultants that worked with LEMA admitted (Interviews 8; 9; 15). For example, the

[75] As I explained in Chapter 2, water and wastewater service in Aqaba is provided by a limited liability company named the Aqaba Water Company (AWC), which was formed in March 2004. Although WAJ is formally responsible for water and wastewater service, the system's operation was legally transferred to AWC in June of 2004. AWC is 85 % owned by WAJ and 15% by the Aqaba Special Economic and Zoning Authority (ASEZA) (Segura, 2006a).

[76] A good indication of improved customer service was the response to customer leakage complaints. Data from the Operations Call Center shows that complaints and repairs steadily declined between 2001 and 2006: over a six-month period the number of received complaints for leakage was 44,008 in 2001 and actual repairs were at 31,606 so 72% of leakage complaints were actually repaired. Whereas in 2006 complaints over the same period reached 30,689 and actual repairs were at 29,046, which means over 95% of leaks were dealt with (LEMA CS, 2007).

annual reports prepared by the external Technical Auditors were not for public consumption. As the Technical Auditor of the contract for the last two years to whom I spoke pointed out, the results probably should have been posted on a website accessible to anyone as this is common practice in most countries. Even soliciting feedback within the company was ineffectual. An "ideas box" that was set up for any employee to submit written feedback to the directors in LEMA was hardly used, and the evaluation conducted at the end of the contract revealed that this was because employees did not trust their views would be duly considered. They also resented that there was no conduit for actually speaking to the top executives in the company. Another feature of information channels that I thought could have also had a direct positive effect on LEMA's performance (particularly with respect to NRW caused by commercial losses such as theft of water in various forms) is public education campaigns on why LEMA was present, and how the public could play a big role in helping curb NRW to their own benefit, for example. None of the respondents mentioned any education or awareness campaigns launched by LEMA, and the website had very minimal information, which was little more than a few cartoons about water efficiency an illegal water use (LEMA, 2006c).[77]

The most surprising finding in this case study is that there was virtually no mention (i.e., either by respondents or in the documentation I analyzed) of the positive or negative influence of policies on the effectives of this partnership. Despite the respondents not being particularly vocal about the influence of national public policies on the Amman management contract, I am aware of several major policies that the government has drafted over the past 10 years to guide decisions and activities in Jordan's water sector. The most substantial policy is "Jordan's Water

[77] Although the management contract has concluded , the LEMA website which remained accessible at time of writing or publication included a section titled "Education" can be found at this link http://www.lema.com.jo/index.php?ID=61

Strategy and Policies", as adopted by the Council of Ministers in 1997. In addition to outlining the country's overall national water strategy, this document comprises four individual policies: Groundwater Management Policy, Water Utility Policy, Irrigation Water Policy, Wastewater Management Policy (MWI, 1998). The Water Utility Policy is the most pertinent to PPPs because it consists of a section on PSP which calls for expanding the role of the private sector in the water sector through management contracts, concessions, and build-operate-transfer/build-operate-own arrangements for example (i.e., for both municipal water and irrigated agriculture). This policy reflects the government's pledge to consider involving the private sector in the water sector in that "the government intends, through private sector participation, to transfer infrastructure and services from the public to the private sector, in order to improve performance and ensure delivery of services to the population" (MWI, 1998, p.39). The water utility also includes sections on human resources, public awareness, water resource management, and the like. However, I think the reason why the Water Utility Policy is not viewed by respondents as critical in shaping the Amman management contract is because it is rather vague, general, and moreover it was adopted in 1997. Since then, the PPP landscape in Jordan has evolved (i.e., the Amman management contract, the NGWA Managing Consultant contract, and the creation of public water companies (in Aqaba and Amman). As a result, water utilities have been essentially transformed. I think the policy's future evolution will have to account for these learning experiences, and chart an improved and more detailed a path forward for water utilities and private sector participation specifically.

There are also several other plans dealing with Jordan's water sector that the government has put forth over the years. However, these have all been more forward-looking and do not focus on policy prescriptions or analysis that can actually be applied by a private sector entity in a partnership in the water sector. These include primarily: (i) the "MWI Action Plan 2002-2010", which calls for allowing the establishment of public-owned water companies run on a commercial basis and investments in the rehabilitation of the water system for example (MWI, 2002a); (ii) Jordan's "Water Sector Planning and Associated Investment Program 2002-2011", which is a 400-plus page analysis detailing existing and projected water sector investment projects such as dam construction, desalination, rehabilitation of irrigation canals, wastewater projects, etc. (MWI, 2002b); (iv) the "National Water Master Plan", which was compiled in 2007 and is in fact a digital master plan that presents scenarios of water demands by various sectors (MWI, 2007); and (v) Jordan's "National Agenda 2006-2015", which is a comprehensive visioning effort across all sectors in the country (e.g., justice and legislation, financial services and fiscal reform, education, etc.), but it includes only a brief "water" section coupled with few concrete targets that the public or a private operator might hold the government accountable to. It identifies five priority areas: exploring new sources of water; curbing NRW from both physical and commercial losses; addressing disproportionately high subsidies for irrigation water; improving wastewater treatment plants and increasing wastewater reuse; and encouraging more private sector participation (GoJ, 2006). Finally, on May 13, 2009 the Royal Water Committee tasked by His Majesty King Abdullah with drafting a new US$8.3 billion water strategy presented its final report to the King. The report is titled "Water for Life: Jordan's Water Strategy 2008-2022" and it provides a vision for Jordan's water sector which takes stock of Jordan's water resources and challenges and charts a series of goals to attain regarding water demand and supply, institutional reform, irrigation water, wastewater and alternative water resources (e.g., treated wastewater).

There was no water conservation policy that LEMA was contractually required to follow or establish (I suggest that water conservation is an element of an effective partnership Section 3.2.2 above). Both the Co-Directors of Operations and Customer Services revealed that their efforts to put in place a water conservation policy received lukewarm reaction from both the MWI and their customer base. They thought the root cause was cultural, in that asking people to maintain their home water network (e.g., meter, roof storage, interfixings on toilets) was not perceived as a priority (Interviews 21; 22).

(iii) Intervening factors

As mentioned in Chapter 1, there are certain intervening factors (i.e., in addition to the five facets of institutional arrangements listed in Table 3) that appear to play a significant role in influencing the effectiveness of partnerships in the water sector. In this case study, two such factors were identified as the company-wide shift to a more commercially-oriented approach, and the knowledge transfer that occurred between LEMA expatriate staff and local staff.

When I asked respondents what they thought most influenced LEMA's ability to effectively provide services, the resounding reply that was additional to the institutional factors cited above, was the way in which LEMA injected better commercial practices and encouraged a corporate mindset among staff. This view was shared among WAJ officials, LEMA staff, and international consultants who worked for both (Interviews 3; 7; 9; 16; 20; 67; 77). As a long-time international consultant for Jordan's water sector (since 1996) stated:

> One of the most important factors in LEMA's success was the commercial organization of their business processes, business affairs - that was definitely a big, big advantage. And to break this rigidity in the way business is done. They tried to be more transparent when it comes to customer management. They started a good investment program, a small internal one. A really good thing is that they

> created a business spirit; it was pushing government influence back a bit, trying to be a bit more autonomous. (Interview 16)

The Chief Technical Advisor to the PMU commented that "the management contract was effective because it changed operational habits of the biggest water supply utility in Jordan. It [LEMA which became a government-owned water company called Miyahuna after the end of the management contract in 2006] is much more structured and much more quality driven. And these are things which do not directly translate into monetary benefits, but the work now is conducted in a manner more consistent with the practices of a "modern utility." It's a *significant* change" (Interview 7).

An equally substantial number of respondents believed that knowledge transfer from LEMA to other staff, and to WAJ itself, was a crucial factor in providing effective water and wastewater services (Interviews 3; 9; 19; 39; 40; 77). By knowledge transfer, I mean the capability and commitment of the partner with the more expertise to train, advise, and build the capacity of the other partner. This resulted mainly because: it brought about huge technological improvement in the customer call centers; training of staff by directors at LEMA; and formalized ways to offer technical and policy advice to WAJ.

3.3 The NGWA Managing Consultant contract

This case study, like the Greater Amman management contract case, is also centered on an urban partnership in the water sector. The key difference in this second case is that its origins, performance measures and outcomes are documented at a substantially reduced level. Unlike the Amman management contract case study, this is largely attributable to the fact that the partnership is currently ongoing (at the time of writing) and as a result both the private sector and government parties remained reluctant to share data. There have not been any relevant studies published by academics or consultants. Even though it was more challenging to pin down what happened in the NGWA case, this is a first in this respect, and it hopefully provides a meaningful baseline contribution to the further understanding partnerships in the water sector in Jordan. A more detailed comparison between the two urban cases follows in Chapter 5.

3.3.1 The context of launching the NGWA Managing Consultant contract

The PSP arrangement in the four northern governorates of Jordan (i.e., Ajloun, Irbid, Jerash, and Mafraq) involves a group of consultants, called the Managing Consultant, who support and advise the public water utility. Created in 1999, NGWA is responsible for delivering water and wastewater services in all four northern governorates. The Managing Consultant that was selected is the joint venture between British water operator Severn Trent Water International and Consulting Engineering Center, a local firm. The Managing Consultant contract was signed in 2005 by WAJ and the contract officially took effect in May 2006. The events leading up to the Managing Consultant contract help to explain the kind of situation the Managing Consultant team were faced with from the outset.

NGWA is charged with providing services for a population a little over 1.6 million and expected to grow to over 2 million by 2020 (NGWA, 2007a). Joining the four northern water utilities into one administrative unit was part of WAJ's effort to streamline its management role. Its service area covers over 5000 km^2 and its water network is approximately 6180 km long (i.e., transmission and distribution water mains).[78] The geography of the area is varied: part is in the northern Jordan Valley is at 300m below sea level while other sections are at 1100 m above sea

[78] This total is likely to be understated based on observations during the proactive leakage detection work introduced in February 2007 which has indicated an accuracy level of approximately 55%. A major data cleansing exercise started in 2008 (Interview 109).

level in the Governorates of Ajloun and Jerash. There is also flat desert in the Governorate of Mafraq in the east of the service area (NGWA, 2007a). See map provided in Figure 2.

NGWA's head office is in Irbid, the largest of the four governorates. While WAJ delegated its management role to NGWA, the Authority still owns the assets and water resources, and is responsible for the staff. NGWA is effectively in charge of daily operations (Interview 71). The Assistant Secretary General of NGWA is the designated head (Managing Director) of NGWA. The real shift in the management of NGWA happened in 2001 as a result of two governmental decisions. The Minister of Water and Irrigation called for the creation of "an independent autonomous entity 'NGWA[79]' that would operate on commercial basis and separate all financial, administrative and technical affairs from WAJ headquarters" (OMS, 2001a). At the same time, the Prime Minister approved the bidding of a management contract for NGWA (OMS, 2001a). It was the Germans who played a principal role in providing both the technical (through the Operations Management Support project) and financial (through KfW[80]) support for both endeavors (Interviews 79; 94; 95).

What prompted WAJ to consider a management contract for NGWA in 2001? According to the German officials working in Jordan at the time, WAJ was keen to improve the poor performance of the water utilities in the northern governorates. They approached the German team whom they had been working closely with since 1994 and asked for their assistance. Officials at both the GTZ Operation Management Support project and KfW recount that KfW was only willing to consider an option that involved cost recovery. As the Program Manager in KfW explains:

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[79] The main organizational change saw NGWA's central functions located in the Irbid office and the service area would be split into ten Regional Operating Units, with an office in each to carry out day-to-day operations. Powers transferred to NGWA included the following: financial responsibilities; a separate budget; personnel management to the maximum extent possible, while still observing the rules and regulations of the *Civil Service Law* (OMS, 2001a).

[80] KfW's financial role will be discussed in more detail in section 3.3.2 below.

> The management contract for the north was under discussion in the late nineties. It was the one solution for raising the efficiency of the water sector which was acceptable at the time to the Jordanian government. They had some experience with LEMA and the management contract and the government started thinking let's do this for the north as well. Commercialization in the water sector was the issue for the future ... [Kfw]'s main objective in the water sector in Jordan is that we had a lot of money to put into investments in the north (rehabilitation of water supply and wastewater, construction of new pipes, new treatment plants[81]), our objective is an economic one. We want our investment to be sustainable and they should be maintained with revenue gains from tariffs and from operations. WAJ was not able to guarantee the long-term sustainability of the system. So we also had to think about a solution to manage everything, and the management contract was the best solution in terms of what was acceptable to the Jordanian government. (Interview 100)

The reality was that the management contract was not merely a proposal from KfW to WAJ, but in fact it was an ultimatum. The management contract was actually a pre-condition for continued KfW investment in Jordan's water sector in the northern governorates (Interviews 71; 79). The tendering process for the contract happened in 2004, but was cancelled because only one company submitted a bid (Severn Trent Water International), and the law required that there be at least three bidders (Interview 56). Several respondents from WAJ, KfW, and consultancies engaged with the process at the time admitted that the real reasons (based on discussions with potential bidders) for the failure of the management contract were more profound (Interviews 56; 71; 94; 98; 100). For one thing, the risk to the private operator was too high because payment was tied to meeting performance indicators that were deemed by most experts to be unrealistic. In addition, the Minister of Water and Irrigation's commitment to the management contract waned because LEMA's results in Amman did not meet expectations. The Amman management contract was Jordan's first experience with a PPP in the water sector and that experience influenced the Minister's view as to what kind of PPP needed to be implemented for NGWA. The management contract also included excessive restrictions on recruitment, capital investment

[81] Since KfW has invested over US$280 million in the water sector in the northern governorates (Interview 71).

decisions,[82] and other business-operational areas. Rising tensions in the region, particularly the war in neighboring Iraq, also dissuaded many bidders from participating. KfW suspended its aid and reiterated that an alternative management option would need to be in place for funding to continue (Interview 71). In July 2004, at a workshop for German and Jordanian government officials facilitated by an external expert, a new management orientation was selected, namely the concept of a Managing Consultant. The Managing Consultant would assume line functions within NGWA and its chief responsibility would be to provide advisory services to improve the efficiency of NGWA. There were two main targets set. NGWA would have to reach an operating ratio (or operating cost recovery as it is usually referred to and as I will refer to from here on) of 105%. As defined in Chapter 1, an operating ratio of 105% means operating revenue exceeds operating costs by 5% and a balanced cash flow is sustained through the contract period. By the end of the contract, a commercially operating public company for the northern governorates would need to be established (Frank, 2004).

The water sector in the northern governorates was in dire need of reform. As in the Governorate of Amman, the government was very aware of the problems but documentation detailing the specific needs and priorities was non-existent. The Operation Management Support project prepared much of the baseline data in the North. The majority of these reports dealt with the most serious problem, that being the poor financial health of NGWA since 1999. I examined these "profit-and-loss" statements and culled data from 1999 up until 2005 (i.e., just before the start of the Managing Consultant contract). Table 14 indicates that NGWA incurred annual losses from its inception, although the amounts steadily decreased over time. The cost recovery

[82] An official from KfW explained that the original language in the management contract was actually not that restrictive. However, WAJ became nervous about the openness of staff and budget policy and as a result, they ended up modifying the clauses to make them more restrictive, and grant WAJ more leeway in decision-making (Interview 100).

aspect, despite increasing annual revenues, was still far from the 105% target. The two most pressing problems for the northern governorates remained ever-increasing debt (i.e., overdue accounts receivable needing to be written-off the asset side of their balance sheet), and high NRW rates (43.7% in 2005). The latter in Irbid, the most populated of the four governorates, ranged from 49-66% during the 1990s. This can probably be attributed to defective meters caused by both illegal tampering and high operating water pressures (OMS, 1999).

Table 14 - Data on NGWA's performance in the years preceding the NGWA Managing Consultant contract

Year	Net profit (+) or loss (-)* in million US$	% of losses due to drinking water operations	Cost recovery (operating costs divided by operating revenues)	Accounts receivable in million US$(Net billed – Net collected)	% NRW
1999	-7.54	84	67	--	54
2000	-7.49	84	64	5.57	52
2001	-6.21	91	69	5.62	52
2002	-6.50	88	71	6.32	53
2003	-6.18	86	73	7.98	49
2004	-5.62	83	76	8.94	46.5
2005	-5.63	82	78	9.61	43.7

Source: OMS, 2000-2006.

* Across most years, the Governorate of Irbid contributed to about 50% of total losses, and it is home to 65% of the total population of the four northern governorates.

Several other GTZ Operation Management Support reports point to other problems faced by NGWA prior to 2006. Mismanagement of sewerage connections resulting in low connection ratios, outstanding connection fees, and illegal connections are illustrative (OMS, 2001b). In addition, NGWA has suffered from insufficiently reliable data on water production, .through poor well identification, broken meters, faulty survey sampling and data collection methods, and inefficient manual data processing (OMS, 2002). Overstaffing has been another serious problem. The average number of staff per 1000 connections across the 10 Regional Operating Units in NGWA was 12. By comparison, the number in Amman was four. Reducing staff by 54% was the recommendation made to NGWA by GTZ in 2003 (OMS, 2003a).

In sum, the Managing Consultant contract was donor-driven. The MWI was increasingly reluctant to go along with any kind of reform that threatened to loosen their grip on decision-making in NGWA. The Managing Consultant contract was a "happy medium", as a compromise that pleased both KfW and WAJ. The next two sections examine how effective the partnership has been and what accounts for this level of effectiveness.

3.3.2 Evaluating the effectiveness of the partnership

I have used four indicators to assess the effectives of the consulting contract: (i) water quality; (ii) sustainability of supply; (iii) affordability and adequacy of financial arrangements; and (iv) efficiency of service. Unlike the Amman management contract, there are no annual evaluations of NGWA's operations. Furthermore, WAJ and the Managing Consultant team (i.e., UK-based Severn Trent Water International, and Jordan-based Consulting Engineering Center) as parties to the contract, were limited in the information they could provide because of contractual limitations. What was available were the business plans and reports that the Managing Consultant team drafted, as well as evaluations that KfW conducted on its own.[83] At the time of writing, most of this information covers the 2007 calendar year and there is partial data for 2008.

(i) Water quality

According to NGWA's 2007-2011 Five Year Business Plan, water quality was characterized as "generally good", although there were high levels of sulphur present in some of the underground sources. This is controlled by blending those sources with other sources or by using simple aeration to remove the sulphur. Water quality has improved in areas where new treatment plants are operating (i.e., use of reverse osmosis to treat the high levels of salinity). Other advanced treatments including ultraviolet and microfiltration were also being introduced. These are used

[83] Although KfW is not a signatory on the managing consultant contract, it is the co-financier. KfW is financing 50% of the fees and WAJ the other 50% (Interview 98).

to remove various bacteria, coliform, sulphur, iron, and manganese (NGWA, 2007b). In terms of the results of chemical and biological water tests , the data for 2007 show that the 98.7% of the samples (based on 1,533 samples) complied with stipulated chemical threshold values, and 98.4% of the samples (based on 5,255 samples) complied with biological threshold values. Also, 95% of the samples complied with wastewater standards in 2007 (MaCo, 2007). The sampling points include a mixture of mainly house connections, wells, reservoirs, and springs. Total suspended solids are an important criterion because drinking water can harbor bacteria. The Managing Consultants decided to use a polyelectrolyte flocculent aid to remove particles and solids in order to reduce total suspended solids (NGWA, 2007b). Trace metals and industrial discharges have never really been an issue for NGWA because there is little industry in the service area. The one industrial town in the Governorate of Mafraq has its own treatment facility (Interview 54).

According to the Co-Director of Operations at NGWA (i.e., one of the Managing Consultant staff), the biggest water quality related problem with the potential to cause a public health hazard was the existence of cesspools[84] adjacent to drinking water pipes in semi-rural areas. If these tanks leaked, and the drinking water pipe is depressurized,[85] the force of the pressure difference can cause the contaminated pool of water to be sucked into the drinking water pipe (Interview 55). An example of such a situation caused a serious health crisis in July 2007, and is reconstructed here based on my interviews with respondents, and articles published in the *The Jordan Times* during the summer of 2007. A copy of the classified official government-commissioned investigation (prepared by the Royal Scientific Society, the Jordan University of

[84] A cesspool or cesspit is a tank or cistern that is used to collect sewage.
[85] Water pipes are depressurized because of the water rationing system which means pipes only have pressurized water flowing in them on certain days according to the rationing schedule.

Sciences and Technology, and Jordan's chapter of the World Health Organization's Centre for Environment Health Activities) was not made available to me. In early July 2007, about 130 residents in Mansheyet Bani Hassan, a town in the northern Governorate of Mafraq, were hospitalized for diarrhea and fever. The Minister of Health confirmed that this was a result of a faulty water pipe. It had leaked and formed a pool of water that was eventually contaminated by animal dung. As the water pipe depressurized, it sucked the contaminated water into the network thereby polluting the village's drinking water (Hazaimeh, 2007a). The investigation revealed a non-fatal parasite called Cryptosporidium as the cause of the outbreak. By the end of July 2007, 1100 cases of diarrhea and high fever were treated at hospitals (Neimat, 2007). Cryptosporidium is a waterborne pathogen, resistant to chlorine disinfection, and is known to cause major outbreaks of gastrointestinal disease (Blair, 1995). The primary source of Cryptosporidium is drinking water infected by animal feces or human wastewater (Blair, 1995). Residents were instructed not to use tap water and to empty their storage tanks, while government water tankers provided drinking water free of charge over a three week period following the incident (Hazaimeh, 2007b). Understandably, the event also caused political upheaval. Eight senior health and water officials were held accountable and referred to a disciplinary council, including the head of NGWA. Two Cabinet members (i.e., the Health and Water and Irrigation Ministers) also resigned (Neimat, 2007). By the end of July, NGWA were able to resume pumping from the wells in the area (Hazimeh, 2007c).[86]

When I asked senior staff from both the Managing Consultant team and KfW about whether the partnership between the Managing Consultant and NGWA played any part in the Mafraq water

[86] Following the incident, source audit procedures have been developed and the audit of all water sources has started and is to be completed in 2008. A prioritized source improvement program will be developed form the audits (NGWA, 2008d).

quality incident, they answered that the problems had little to do with the new management arrangement (Interviews 38; 98). They pointed instead to operational problems (e.g., the water rationing system) and to flaws in national water governance. As the Co-Managing Director of NGWA advised "within the overlapping responsibilities, which are a problem, the central lab in Amman is responsible for quality control in Mafraq, not NGWA. The incident reflected nothing about the new NGWA structure. The incident itself in many ways highlighted many problem areas in the decision-making process more nationally" (Interview 38). Although it seems that the incident reflects what was primarily a technical problem (i.e., related to some of the challenges of operating a water rationing system), my understanding of the contract is that one of the Managing Consultant's responsibilities is to better coordinate operations with the ten Regional Operating Units charged with managing the NGWA service area. Perhaps, more timely advice from the Managing Consultant to the Regional Operating Unit in Mafraq might have led to a quicker response once the incident occurred. The topic of governance will be discussed further in section 3.3.3 below.

(ii) Sustainability of supply

The water system in the northern governorates includes 200 wells that produce around 70 MCM annually. NGWA is obliged to supply 11.7 MCM per year to Amman (primarily by exporting water from the Aqeb-Zatary wells). This transfer will phase out once the Zara Maeen water treatment plant starts operating at full capacity, as it was operating at only 25% of full capacity in 2007 (NGWA, 2007b). When this happens, NGWA should have an extra 11.7 MCM per year to supply to its service area. This depends, though, on building additional transmission pipelines from the Aqeb-Zatary wells to the Governorates of Jerash and Ajloun , which will be financed by USAID (Interview 91). The other major water project that will help NGWA meet its growing demand for water is the construction of the Wehdeh Dam on the Yarmouk River. This should supply NGWA with 30 MCM of water per year, and is due to come on line in 2012 (NGWA, 2007a).

NGWA is faced with a severe water shortage. Drinking water supplies are tied to a rotational rationing program. A majority of customers receive a ration of water only once per week (NGWA, 2007b). The Operations Co-Director at NGWA explained that in preparation for the summer 2008 dry season, 12 new wells started operating which were expected to provide approximately 22,000 m^3 per day in total. Customers will continue to complain though, of not receiving their allotted share of water (Interview 109). Equally concerning is that the benefits of new well-resources are being offset by the failure rate of existing wells. In 2007 the Managing Consultant team started a major investigation into the reasons for this. Preliminary results show that a number of key considerations have all contributed to over-pumping. These include: poor procurement specifications for well pumps; faulty installation practices by WAJ Central Workshop; removal of dipping tubes during pump replacement, thereby making it impossible to accurately measure the standing and pumping levels and difficult to figure out which wells have water and which do not); and insufficient ground water management planning (Interview 109).

The Managing Consultant's most significant contribution to conserving water resources is the NRW Reduction Plan prepared in January 2007. NGWA's 2006 Business Plan stated that reducing NRW is a key objective and called to reduce NRW to 36% of total water production by 2010. NRW is a serious problem in the NGWA service area for a number of reasons. First, the operating water-pressures in the distribution network are excessive, with pressures over 30 bar in some parts. This is a result of nearly half the water mains being undersized, the impact of daily water scheduling (rationing) in high flows and pressures, no pressure reducing valves in operation, and large differences in elevation among other factors (NGWA, 2007a). Second, with respect to the undersized water mains, nearly half of these have diameters that are too small. Eighty percent of the pipeline (i.e., which is 70% of NGWA's asset value) has a diameter of 50 mm (i.e., less than two inches), and is composed of aging galvanized iron pipes which must be repaired on a daily basis. These smaller pipes are ill-suited to the excessive pressure on the water flowing through them. This leads to more leakage. The main problem is "the legacy of underinvestment in the system" (Interview 38). Third, in many places the pipe-distribution system is laid on or near the ground. This means that the majority of the iron connections are on the surface, which exposes them to damage and illegal connections (NGWA, 2007c).

The NRW Reduction Plan focuses on lowering physical losses by 2% per year between 2007 and 2010, as well as reducing losses in the transmission and distribution networks (NGWA, 2007b). The crux of the Plan is to implement "a pro-active strategic approach to water loss detection and repair activities" so as to replace NGWA's purely reactive modus operandi to leak detection (NGWA, 2007c). The main features of the Plan include:

- appointment of leakage detection staff, and their training in the operation of leakage detection equipment;
- preparation of a leakage pilot study (which took place in early 2007) within the Irbid distribution network (NGWA, 2007d);
- requiring the submission of monthly water production data from all four governorates so that the leakage detection teams can evaluate the current situation and place a priority on high water loss areas;
- establishing a work plan to minimize leak run times (i.e., the time between locating network defects and repairing those same defects);

- structuring the network into water supply zones, starting in 2008 in order to monitor flows, network operating pressure, water quality, etc.; and
- identifying opportunities for pressure reduction in the network to reduce leaks by reducing leakage flow rates and the frequency of bursts.

NRW has to focus on both physical and commercial losses. NGWA's water balance shows that physical losses remained at just under 30% in 2007 (nota: they were at 30% and 31% in 2006 and 2005 respectively). Although this improvement in physical losses seems minimal, the Managing Consultant team informed me that physical losses at 30% compares as "good-or-better" than for most of Jordan (Interviews 38; 54). As for commercial losses, this figure stayed the same at 11% in 2006 and 2007, but decreased to 8% as of September 2008. Thus, in total NRW in 2006 and 2007 remained steady at 43.6% and 43.4% respectively (it was 43.7% in 2005), but dipped to 39.1% in 2007[87] (NGWA, 2008a).

Discussions with senior Managing Consultant and KfW staff underscored the reasons why NRW is still higher than the 36% NRW target (Interviews 54; 55; 98). These reasons reflect the variety of challenges facing the Managing Consultant team and NGWA as a whole. A chief issue is that the leak detection work by NGWA (led by the Managing Consultant team) had only started in early 2007 and less than 10% of the NGWA service area had leak detection measures in place. Also, the co-ordination between the Operations Department (i.e., the entity in charge of the leak detection teams) and the 10 Regional Operating Units throughout the four governorates (i.e., in charge of day-to-day management and operations) was described as weak and ineffective. Another challenge was that customers who connect illegally to the network is still rampant in the

[87] This total for NRW is more than the sum of physical and commercial losses because the total also includes unbilled authorized consumption. This is water used by the utility for operational purposes e.g., of water for firefighting, animal feeding, or water provided for free to certain customer groups.

Governorate of Mafraq and the North Badia region. Finally, the goals of the NRW Reduction Plan are being supported by a few very large capital investment schemes, as discussed in detail in the next section. These goals deal with rehabilitation of water mains and restructuring of the water distribution network and results will not be apparent until at least 2010. And, the leak detection teams and the repair teams are in different units and under different supervision. The repair teams are managed by the Regional Operating Units and their priority is to get water to customers versus engaging in pro-active leakage detection. In my view, most of these issues related to NRW are complex and cannot be solved in the short term. Some issues are social, others are logistical and the fact that they have been identified is a first, important step in attempting movement toward their resolution.

There are three other points to mention regarding the Managing Consultant and NGWA's efforts to promote sustainable management of their scarce water resources. A big problem for NGWA is that most of the well-drilling for NGWA is done by WAJ. However, WAJ does not appear to have any groundwater management plan for the northern governorates that any of my interlocutors were aware of. What exacerbates this problem is that many of the 220 wells that supply NGWA with water do not have dipping tubes (i.e., tubes in a well that measure the standing water-level). They were likely taken out by WAJ staff when a well pump was replaced and just left on the side of the well, rather than being returned into the well. This means regular monitoring of well-levels was not happening. The Operations Co-Director, as a member of the Managing Consultant team, found this very disconcerting and instructed his unit (in April 2008) to place dipping tubes in wells when pumps are removed for repairs. This mandatory requirement was aimed at building a database on water levels to be used for an eventual groundwater management plan (Interview 101). Another initiative that the Managing Consultant have started working on is a new plan that will introduce needed water resource management measures (i.e., because of limited supply and adverse impacts on water resources such as climate change). One measure they are looking at is reducing pumping hours during winter time by supplying water once, as opposed to twice a week. Maintaining an equitable distribution across the four governorates will also be a complementary prerequisite of the plan (Interview 54). These are steps in the right direction to correct and improve various aspects of NGWA's operations.

(iii) Affordability and financial arrangement

Much of the discussion on drinking water and sewerage tariffs in the Governorate of Amman (section 3.2.2) pertains to the situation in the northern governorates. Drinking water charges are considerably lower in the northern governorates than they are in other governorates. For a given level of consumption, water charges outside of Amman are 33% lower than in Amman (EC, 2006). Like LEMA, NGWA has no real influence over how or when water tariffs are set. Discussion with senior Managing Consultant team members did reveal a few points regarding the affordability of water and wastewater services in the NGWA service area. One international measure of affordability is the ratio of the water bill to a household's income. This percentage should be between 4 to6% to be considered as "affordable." For NGWA's customers, water bills are between 2 to3% of household income. The Managing Consultant directors believe there is room to double bills and maintain the level of affordability, but this is outside of the Managing Consultant's remit (Interviews 54; 99). In NGWA's case, the tariff structure and pricing do not cover either capital or operating costs. In fact, each time NGWA makes a household water-connection, they lose US$35.30 because tariffs are nowhere near cost recovery levels (Interview 54). In terms of wastewater services, the issue is non-payment. Even if the sewerage system is extended as is happening in central Irbid. NGWA surveys have shown that customers who could afford to connect usually choose not to connect because of the added expense of a sewage charge (Interview 54).

There are a few other indicators that can be used to assess NGWA's financial health such as billing efficiency, collection rates and the levels of maturing accounts receivable held (i.e., bad debt). Table 15 shows these totals for 2006, 2007, and 2008 across the NGWA service area. The billing for water and wastewater has steadily increased from US$17.21 in 2006 to $19.82 in 2008. However, the Managing Consultant staff did find the decline in billing collection rate (between 2006 at 91%, and 2007 at 84%), and the increase in bad debt (i.e., account receivables losing their asset values and proving uncollectable) concerning,[88] but the decline in collection was not for lack of effort (Interview 106). NGWA's Director of Commercial Services and Finance (a member of the Managing Consultant team) explained some of the major improvements in collection that the Managing Consultant introduced. One was a standardized billing system using special software (COBOSS2+); another was continuous billing (i.e., automated billing) and the purchase of Class C meters that are much more accurate than the existing installed meters. In addition, a business case[89] was prepared in 2008 for the procurement of hand-held computerized meter readers to get around the pitfall of customers bribing local meter readers to record false readings (e.g., these devices will contain the history of water use so incorrect entries will become apparent) (Interview 99). However, the billing collection rate in 2008 improved to 96%. The Managing Consultant staff argues that this

[88] These values worsened in 2007 primarily because of two factors. First was the withdrawal of a centrally controlled WAJ incentive scheme paid to staff involved in the debt collection process. They were paid on the basis of cash collected against bills issued within a billing period, and measured as a percent. Second is the reluctance to impose the *Emiri Law*, which requires the collection of debt from customers (Interview 106).
[89] The Managing Consultant introduced the concept of having NGWA staff prepare business cases to support proposals for procurement.

improvement relates directly to NGWA acquiring additional vehicles for collectors, coupled with a determined effort to impose disconnection from the service for late payers (Interview 99). In short, they focused their efforts on the existence of a culture of "unwillingness", rather than an "inability" to pay. The billing collection rate is obviously a significant component of NGWA's revenue and affects their operating cost recovery. The 2006 cost recovery was 83%, then in 2007 the target cost recovery was 89.9% when NGWA managed to achieve a ratio of 85.4% (NGWA, 2007f). In 2008, the cost recovery increased to 86%. The numbers of staff-to-water and wastewater connections ratios have improved since the beginning of the contract. There was 8.4 and 8.5 staff to 1000 water connections in 2006 and 2007 respectively. These reached 7.8 by 2008, which was a sizable improvement from 2005 when it was 8.7. For wastewater, the ratio reached 22.9 staff to 1000 wastewater connections in 2008 again an improvement from 2005 when it was 27 (NGWA, 2008a).

Table 15 - Data on billing, collection rate and accounts receivable since the start of the NGWA Managing Consultant contract

Year	Billing for water and wastewater (million US$)	Billing collection rate (%)	Cost recovery (%)	Accounts receivable (million US$)
2006	17.21	91	83	10.06
2007	18.49	84	85	13.04
2008*	19.82	96	86	--

Source: NGWA, 2008a; 2008b.
* Data compiled in September 2008 and projected to December 31, 2008.

The effectiveness and comprehensive nature of the financial arrangement of the Managing Consultant contract is largely linked to the latitude the Managing Consultant has in directing the use of capital investment funds. As stated in the General Conditions of the contract, the Managing Consultant cannot rely on any of WAJ's capital investment programs except for the Rehabilitation and Repair Fund and the Water Loss Reduction Programme (WAJ, 2006a). These are two major investment projects co-funded by KfW and WAJ which amount to over US$90 million, with KfW's share of the funding is approximately 66% for both (NGWA, 2006a).[90] The chief objective of the Water Loss Reduction Programme is to replace leakage in water mains, restructure water distribution networks, and reduce operating water-pressure, all of which should reduce NRW (NGWA, 2006b). The programme actually started before the Managing Consultant contract, but the Managing Consultant team is responsible for project management and delivery. The Water Loss Reduction Programme comprises five contracts. Three are ongoing involving pipeline replacements. The fourth contract was tendered in April 2008 (Interview 101).

For the Repair and Rehabilitation Fund, on the other hand, the Managing Consultant plays a much more substantial role. This fund started in January 2007 and it is the first major capital investment program for which NGWA and the Managing Consultant team have held partial management and financial control (NGWA, 2007e). The Fund's targets include the following: reducing operating costs and improving NGWA's income through reducing energy consumption (NGWA's single highest expense); curbing NRW; improving the operational and administrative structure; and improving cost recovery ratios (NGWA, 2006a). Much of the activity to date has been focused on developing governance procedures for capital expenditures. To this end, NGWA's Executive Management Board[91] authorized the formation of a Capital Expenditure Committee. It comprises eight members including the Managing Director, the Managing Consultant and NGWA directors. This Committee approves capital expenditures according to a Project Appraisal Manual. The Manual requires that the submission of capital expenditure

[90] Note that these two investment projects are co-financed by KfW and the Government of Jordan. The loan is between these two parties only. However, the execution of these two investment projects requires the involvement of the Managing Consultant (Interview 98). Some respondents noted that KfW attached a condition to the capital investment in the northern governorates; that an international partner is present to oversee the funding and ensure it is spent effectively (Interviews 101; 102).

[91] NGWA's Executive Management Board of which the Managing Consultant is an integral member manages NGWA staff operates the water and wastewater facilities, implements the Repair and Rehabilitation Fund and WLRP, carries out billing among other short- and long-term management activities (WAJ, 2006c). Discussed further in section 3.3.3.

proposals from Regional Operating Units in NGWA be substantiated through business case studies. The Committee also decides whether it needs a further feasibility study, or whether the initiative can go directly to the procurement stage. It also reports monthly to the Executive Management Board in order to seek final approvals and provide updates on the progress of previous activities (NGWA, 2007e). As the Co-Director of Operations explained, "it is a control mechanism to make sure the funds are used in the most effective manner. ... in NGWA there is a knee-jerk reaction to things, and staff do not worry about how they will fund or manage big capital programs ... so it's important to prioritize these schemes and see what benefit is going to come out of them" (Interview 101). Better management of capital investment is clearly advantageous to provided better water and wastewater services. However, several respondents from the Managing Consultant team, WAJ, and KfW were unanimous in pointing to the single biggest obstacle to actually spending the funds and implementing projects, namely a protracted procurement process (Interviews 38; 91; 98; 99; 101). By the end of 2007, just a tiny fraction of the funds available had been spent. Procurement had to follow WAJ's regulations which meant long delays and oftentimes the delivery of low quality goods. For example, it took over 12 months to get equipment for leakages and an energy saving device, both of which supported major objectives of NGWA's Annual Business Plan. This was a very long time considering the Managing Consultant has a three-year contract (Interview 101). A breakthrough happened in December 2007 when the Cabinet approved a series of decisions that the Managing Consultant/NGWA had proposed, one of which was a new procurement policy (Interview 91). This decision on procurement (the Cabinet decision is discussed in more detail in the next section) meant that, in theory, NGWA and the Managing Consultant team have the authority to manage the entire procurement process independent of WAJ. The new Procurement Manual drafted by the Managing Consultant was approved by KfW and the PMU in April 2008, and procurement has switched into high gear since then (Interviews 91; 98; 99; 101). My impression is that the Managing Consultant was very skilled at producing the groundwork - plans and reports - to bring about improvements and reform in NGWA's management and operation, but there were many roadblocks (as discussed above and later in this Chapter) to actual implementation. As a senior Managing Consultant team member put it:

> Because of delays in procurement and other things we have not been able to realize changes or spend as much money as we wanted to. So the improvements that are predicted in the business plan based on the capital investment program have not been realized yet. So we are pushing against a closed door at the moment. The PMU realizes the problems we have, KfW realizes them, hence the last management steering committee found [the Management Consulting team] trying to empower the Managing Consultant to have much more of a say in the decisions or actually make the decision. (Interview 38)

(iv) Efficiency of service

At 95%, the connection rate for drinking water is high in the northern governorates. The rate for sewerage connections is markedly lower at 65%, although the average sewerage connection rate for the country is only 50% (NGWA, 2007b; Ghazal, 2008). The actual percentage rates of both water and wastewater connections have risen steadily since the start of the contract. In 2005, the year before the start of the contract, the numbers of connections were 194,737 for water, and 64,158 for wastewater (NGWA, 2008a). Since the contract took effect, the water and wastewater connections reached 217,297 and 74,127 in 2008 respectively (NGWA, 2008a), which suggests access to water services is steadily improving. The reliability of service delivery is important. Data on water scheduling and complaints is largely fragmented, and the following account is based on my examination of what data are available.[92] Unlike LEMA, NGWA has yet to

[92] I was informed by the Managing Consultant staff that data for 2006 is not accurate. For example, no water complaints were even recorded prior to 2007 (Interview 110). This is most likely because the Managing Consultant contract only started in May 2006 and improvements to data collection started in 2007 (Interview 109).

produce water schedules in a format that would allow accurate monitoring of performance. The basic serviced areas are identified, but operating-valve locations and their opening and closing times remain unavailable (Interview 109). The prevalent customer complaints in 2007 and 2008 from most to least were no water, leakages, and water supply blockages (Table 16) (NGWA, 2008c).

Table 16 - Data on customer complaints in the NGWA service area since the start of the NGWA Managing Consultant contract

Year	Total "No water" (%)	Total "Leaks" (%)	Total "Blockages" (%)	Total "Valve replacement" (%)	Total complaints (%)
2007	18,549 (50)	12,464 (34)	3,143 (8)	2,923 (8)	37,079 (100)
2008*	19,024 (47)	12,168 (31)	6,391 (16)	2,275 (6)	39,858 (100)

Source: NGWA, 2008c.
* From January to July 2008.

The largest proportion of complaints relate specifically to 'no water'. These refer to customers reporting that they are not receiving *any* water. This reached 50% in 2007, and 47% in 2008. Based on customer complaints and operational observations, it has become clear to NGWA that many of the proposed schedules were not being implemented by the Regional Operating Units. On average customers in the NGWA service area can expect 12-24 hours once a week, although 24 hours is rarely achieved. NGWA and the Managing Consultants are expected to begin a hydraulic analysis of the major parts of the distribution network, particularly in Irbid City, to identify changes to the existing schedules based on collected system performance data (Interviews 101; 109). Some 31% of complaints in 2008 (over 34% in 2007) related to leakages. The majority of maintenance activity is devoted to the repairing of reported or detected leakages. Within the NGWA network, about 80% of this maintenance and repair is on water mains and service lines that are smaller than 50mm in diameter and this is considered to be very high[93] (Interviews 109). Another frequent complaint centered on water supply blockages at 16% in 2008 (up from 8% in 2007). NGWA's Operations Co-Director explained that the complaints about blockages were unexpectedly high and flagged a concern. As a result,the Managing Consultant team decided to investigate further by launching a study during the summer of 2007 on pipeline and meter blockages (Interview 55; NGWA, 2007g). The study revealed that various operational practices contribute to the lodging of debris into the distribution mains[94] and a number of low cost solutions were recommended. For example, making sure that the inflow of water into the distribution network, for an area that is scheduled to receive water, is at low flow. Also, hydrants should be opened to remove air and debris and flushing pipes prior to refitting new or repaired water meters at homes (NGWA, 2007g).

As for how quickly complaints are resolved, data showed that the average response time was six to seven days in 2007, which is above average for Jordan. This will most likely improve thanks to the introduction of the Distribution Computerized Maintenance Management System which records all incidents of reported blockages or leaks, and should shorten the reaction time (Interview 103). Another notable improvement involves the establishment of the Customer Call Centre at NGWA's Irbid Headquarters. I visited the newly created Customer Call Centre which boasts continuous 24-hour service and is supported by a GIS system to track the exact location of

[93] The Managing Consultant team predicts that some of the leak-related problems will be resolved by the ongoing water mains rehabilitation contracts, but many small diameter pipelines in poor condition will remain (i.e., the exact length will be unknown until the hydraulic data cleansing is completed). These small-diameter pipelines will require further upgrade-funding (Interview 109).

[94] The key operational practices that cause water supply blockages are the following: (i) when the weekly schedules are operated, the water flows at high velocities and removes encrusted deposits in the mains, much of it building up in the pipes, valves and domestic meters; (ii) the distribution network lacks the necessary number of washouts, air release valves, and hydrants resulting in the flushing of pipes and transport of debris into service connections and domestic water meters; (iii) the use of wooden plugs to repair leakages on galvanized pipes is a major consideration ; and (iv) when undertaking repair work outside the schedule period (i.e., pipes are empty of water) particles can be sucked back into the pipes because of the pressure difference. A number of low cost solutions were proposed in the study as well (NGWA, 2007g).

each problem. Once the location is pinpointed, a service action-ticket is produced which goes straight to the Regional Operating Unit closest to the location. The Centre fields a full range of complaints, from billing issues to water operation, and everything in between.

In sum, the partnership between the Managing Consultant team and the local NGWA staff (as well as with central WAJ) has fared well based on the four performance measures I have now reviewed (i.e., water quality, sustainability of supply, affordability and financial arrangement, and efficiency of service). The partnership at the time of writing is on-going (i.e., it terminates April 2009), and therefore I am not able to evaluate the ultimate impact of the partnership on these measures. However, it is clear that major steps have been taken to identify and improve on the host of aspects that affect the provision of better drinking water and wastewater services to the residents of the northern governorates. The following section discusses the factors that have helped and hindered the effectiveness of this partnership.

3.3.3 Explaining the outcomes: What influenced the effectiveness of the partnership?

As in the previous case study on the Amman management contract, this section will examine my hypotheses about the importance of five features of an institutional arrangement (i.e., terms of the contract, governance structure, legal setting, information channels, and policies). I will discuss the extent to which these features determined the effectiveness of the partnership between NGWA and the Managing Consultant. Further, I discuss my proposition that there are intervening factors that are not a function of the institutional arrangement, which also affected the partnership. As in the LEMA case, these include the shift to more of a commercially-oriented approach and knowledge transfer, and an additional factor-grouping that I term "innovative organizational arrangements." Although I offer some comparisons with the Amman management case, I have dedicated Chapter 5 to a more in-depth comparison of all case studies considered.

(i) The contract

The Managing Consultant contract signed between WAJ and the Managing Consultant team (i.e., UK-based Severn Trent Water International and a Jordanian firm called Consulting Engineering Center) had by far the strongest influence on the effectiveness of this partnership. The role of the Managing Consultant team was somewhat ambiguous. According to the contract, the Managing Consultant's primary role was to manage the functions of the seven professional line-reporting positions[95] it was allocated, and manage the required improvements to service delivery and operating cost recovery. This was to be achieved through the preparation and implementation of the NGWA Business Plan, and its associated sub-plans. The Managing Consultant staff also share responsibility with NGWA staff in providing water and wastewater services, planning and monitoring service improvements, and proposing performance standards for monitoring progress (WAJ, 2006a).

The idea was for the Managing Consultant to act on behalf of NGWA, and to take on co-director roles (with local NGWA directors) of the main units in the utility (Interview 100). The critical point as both the Managing Consultant and WAJ staff reminded me is that although the Managing Consultant team has line responsibilities, they do not have authority to actually manage NGWA. They must also work alongside Jordanian staff and build the latter's capacities, although there is no clear split between the responsibilities of the Managing Consultant and local NGWA staff (Interviews 38; 71; 91). A senior Managing Consultant staff member complained

[95] These seven Managing Consultant positions include the following: Co-Managing Director, Co-Operations Director, Director of Finance and Commercial Services, Director of Technical Services, Director of Human Resources, Co-Director of Information Technology Services, and Manager of GIS (WAJ, 2006d).

that NGWA senior staff are adding to the ambiguity of this set-up by citing the following as an example: "Letters have still not been sent to senior functional managers stating that the Managing Consultant members are their bosses and they are to take instructions only from us. These letters would go to Directors in the Regional Operating Units (in the NGWA service area). And this is the Managing Director of NGWA realizing that this will affect his power base and he only knows how to micromanage" (Interview 99). Another consequence of the unclear delineation of responsibilities is that a power struggle developed between the Managing Director of NGWA (a Jordanian) and the Managing Consultant member who is acting as Co-Managing Director. This exacerbated the Managing Consultant's ability to fulfill its management functions (Interviews 98; 99).[96]

Unlike the LEMA management contract, the Managing Consultant contract is not performance-based. This means there are no obligatory targets, except for the operating cost-recovery level that the Managing Consultant was required to achieve. The contract stipulated that the Managing Consultant would receive a fixed fee for their services over the three-year contract (US$10.1 million co-financed by KfW and WAJ), with no additional incentives to improve performance (i.e., LEMA had an additional incentive through the performance incentive compensation as explained in section 3.2.3 above) (Interview 95;NGWA, 2008a). Having said this, there is a performance standards appendix to the contract, but as one senior Managing Consultant member explained, it is "more qualitative than quantitative" (Interview 38). Indeed, the performance standards appendix refers mainly to preparing plans (e.g., for rehabilitation of the network, human resource management, NRW reduction, commercial management),

[96] It has not helped that in the first 1.5 years of the contract there had been three different NGWA Managing Directors (NGWA, 2008d).

designing a new billing system, and establishing a customer call center (WAJ, 2006b).[97] The Managing Consultant is obliged to meet these performance standards, but again this is not tied to any financial incentives or penalties. A few respondents remarked that the Managing Consultant's real incentive is not really financial, but rather that of preserving its reputation as an internationally recognized water operator (Interview 94; 95;100). So, why did this contract not include performance-based incentives to help ensure NGWA's progress? A senior KfW official explained that a performance-based contract (such as LEMA's management contract) requires that the international operator have the freedom and authority to make decisions and manage all aspects of water and wastewater services. But in this case, the Government of Jordan was unwilling to grant the requisite degree of freedom and decision-making power. As a result, performance-based incentives were not included (Interview 100).[98]

The sole contractual target with a financial incentive is for the Managing Consultant to achieve "an operating ratio of 105% and a balanced cash-flow, and achieve all of the criteria necessary for WAJ to assign responsibility for the management of water and wastewater services to an Operating Company" by the end of the contract in April 2009 (NGWA, 2006b, p.4). In the event that the Managing Consultant meets this goal, it will receive a "success fee" which would amount to a modest US$70,620 for each NGWA as a whole and the Managing Consultants as a whole (WAJ, 2006e). As one Managing Consultant staff member commented: "The small bonus reflects the probability of attaining this target" (Interview 102). As for transforming NGWA into

[97] What actually guided NGWA's performance were NGWA's business plans that the Managing Consultant had prepared. These included the measures in the performance standard appendix in addition to a sub-set of key performance indicators. The latter is a shorter, more quantitative list of measures to assess NGWA's performance (e.g., operating ratio, collection as percent of billing, accounts receivable, staff per 1000 connections, etc.).

[98] Following a review of the contract by KfW in February 2008, it was decided that the Managing Consultant would be evaluated at the end of 2008 on a set of five key indicators: accelerated delivery of WLRP and Repair and Rehabilitation Fund; staff reduction; energy consumption; billing and debt collection from customers; and NRW. However, these "big five" are again not contractual targets (Interview 102; NGWA, 2008d).

an operating (or public) company, much like Miyahuna in Amman, such companies are created according to Jordan's *Companies Law No.22* (1997) and must operate on a commercial basis. Hence, the contractual target of attaining a 105% operating cost recovery for NGWA. Unless NGWA becomes a commercially viable entity at the end of the contract (April 2009), it will not have met the legal prerequisite to become a public company (Interviews 100; 91).[99] The chief problem according to all interested parties (i.e., WAJ, the Managing Consultant, and KfW), is the realization that the operating cost recovery target is simply unrealistic and unattainable by April 2009 (Interviews 38; 91; 99; 100). This is attributed to at least two reasons, as the Director of Commercial Services and Finances for NGWA explained (Interview 99). The contractual requirements are "mutually exclusive" (Interview 99). The Managing Consultant is to improve water and wastewater services, while NGWA's network as well as its internal structure (i.e., billing system, complaints center etc.) are in dire need of improvements which cost a substantial amount. At the same time the Managing Consultant is instructed to carefully manage costs in order to ensure an ambitious cost recovery (105% operating cost recovery). Also, the current water tariff structure is heavily biased toward subsidizing the domestic user, which in the northern governorates makes up 95% of NGWA's customer base. The average tariff is US$0.50/m^3 whereas it is double that level in the rest of Jordan. There are barely any commercial customers who would be paying the higher commercial tariff. The Managing Consultant sees the tariff as being too low and really limiting NGWA's revenue and ability to cover costs. Another senior Managing Consultant member pointed out that achieving the 105% cost recovery target is in fact contradictory to the goal of becoming an efficient utility and proving good customer service:

[99] NGWA's revised Five Year Business Plan (2008-2012) notes that although achieving an operation ratio of 105% is a commercial parameter for covering operational costs "there is no law or regulation in force that would require an operational threshold of that kind as a precursor for corporatization" (NGWA, 2008d p.34).

> We can achieve 105% operating ratio next week, even with the current tariff structure. We just stop all maintenance, we stop pumping, have no expenses, and we collect money, so we end up with a 105%. But it would be totally irresponsible. When you are providing water one day in seven, it is a difficult job. We are in a vicious circle: we cannot improve service because there isn't enough water, there is not enough water so we have to schedule the water, because we are scheduling the water we are ruining[100] the water distribution system, because we are ruining the distribution system we increase the amount of leakage. It is a basket-case (Interview 38).

The over-arching impediment to achieving the operating cost recovery of 105%, or improvements in NGWA more generally, are the host of constraints and interference from WAJ (Interviews 54; 55; 99). These constraints run the gamut from recruitment, to budgeting, to procurement. One example is in NGWA's financial accounting system, which is run by WAJ headquarters in Amman and is a cash-based system. Whereas, the Managing Consultant would much prefer to install the international standard accounting system, which is based on accruals and is vastly more efficient.[101] As a senior Managing Consultant member stated "there are all sorts of things that need to be sorted out at a very high level in WAJ. So we want the independence to implement systems specific to our needs, not the one size fits all which is what WAJ tends to do" (Interview 38). Another example is the recruitment component of staffing policy. The Managing Consultant has been quite vocal about the restrictive recruitment practices where it has taken them more than nine months to recruit new employees and they are still not able to fully implement the incentive scheme that they put forth in April 2007 (Interview 38).

The final point is not really an element of the contract *per se*; rather it refers to the degree of flexibility in the contract. The sequence of events was explained by senior WAJ officials and the Managing Consultant staff (Interviews 91; 98; 99; 101). In December 2007, the Managing

[100] The reasons why rationing/scheduling water is harmful to the water system was explained earlier in this Chapter under the Amman management contract case study, see section 3.2.1 and Table 12 in section 3.2.2.
[101] An accrual system is superior to a cash-based system because transactions are counted when they happen, regardless of when the money is received or paid. Under the cash method, income is counted only when cash is actually received, which limits a company's ability to budget and plan.

Consultant and the PMU requested a series of decisions from the Cabinet of Ministers, which were approved. In total, these three Cabinet Decisions "really shifted the contract to something like a management contract" (Interview 91). The first decision was a delegation of authority and responsibility to the Managing Consultant team in accordance with their actual job description in the contract. These delegated authorities were enshrined in the original contract, but were never enacted. The Cabinet drew on the Article 28 provisions of the *WAJ Law,* as amended.[102] The second decision had to do with NGWA's staffing policy. Prior to the Cabinet decisions, WAJ was in charge of all staffing decisions. Indeed, in January 2008 NGWA remained considerably over-staffed, employing some 1780 employees (i.e., more than it had in 2004). This was mainly attributable to an increase in the transfer of employees from WAJ to NGWA, which in itself was a breach of the contract. It also presented a major obstacle to the Managing Consultant in trying to reach a key goal in its business plan of reducing staff by 10% by the end of the contract in 2009. The Cabinet decisions stated that from then on, the Managing Consultant had to approve any employee transfers from WAJ. The Cabinet decisions also revised the recruitment procedures for new staff. This was previously carried out in accordance with WAJ regulations, resulting in all new NGWA recruits requiring the approval of WAJ, the Civil Service Bureau, and even the Prime Minister. With this decision, the Managing Consultant could recruit from the market with no interference from WAJ. The third decision had to do with NGWA's procurement policy. As described earlier, the single biggest obstacle to actually spending capital investment funds and improving the water network was the frustratingly slow and bureaucratic procurement process. WAJ's Special Tender Committee would no longer dominate the procurement process, and as a result of the Cabinet decision injected a potentially faster and more efficient procurement system.

[102] The *WAJ Law* is discussed in section 3.2.3 of this Chapter.

However, complications remain. Specifically, the rights granted by these decisions are still dependent on negotiations between WAJ and NGWA/the Managing Consultant, and KfW needs to clear any changes as well. For example, senior Managing Consultant members informed me that, in March 2007, four months after the Cabinet decisions, the Managing Consultant's new Recruitment Policy was still not approved. WAJ and KfW still need to clear every tender that the Managing Consultant issues for procurement and only in April 2008 was the new Procurement Manual, as put forth by the Managing Consultant, approved. Also, WAJ's revisions to the Managing Consultant's new staffing policy have in effect made it even more restrictive than the original encumbering procedures that required change in the first place (Interviews 99; 101).

(ii) Governance structure and legal setting

Like many elements of this partnership, the governance structure looked impressive theoretically, but its actual implementation was rife with pragmatic challenges. The Managing Consultant is responsible for producing various "plans"[103]that essentially set the framework for improving NGWA's performance and the first 18 months of the three-year contract were dedicated to preparing these plans. *Inter alia,* they comprise an Annual Business Plan, a Five-Year Business Plan, a Human Resource Development Plan, a Commercial Management Plan, and a Public Relations Plan, among others. In theory, this level of planning is inherent to a good governance structure because it takes stock of the utility's situation, sets specific goals for the utility's various functional units, and hopefully provides a vision for all employees to embrace and buy-in to. Despite the hundreds of pages written by the Managing Consultant team, the

[103] According to the contract's Service Appendix, there are nine plans that the Managing Consultant is responsible for preparing (i.e., Preliminary Business Plan; NGWA Business Plan; Annual Business Plan Review; Human Resources Development Plan; Energy Management and Savings Plan; Commercial Management Plan; Customer Service Plan; Rehabilitation and Repair Fund Program Plan; Non Revenue Water Reduction Plan) (WAJ, 2006b). However, to date at least 20 plans have been prepared and more might be prepared based on need.

struggle with implementation centered on a real unwillingness with some senior NGWA staff, both at headquarters and in the four regional offices, to actually read any given "plan" , learn from it, and commit to its implementation. This could be because the plan reports are prepared in English (as stipulated in the contract), with only the executive summary being translated into Arabic (Interview 38).

There is also an elaborate governance arrangement for decision-making in NGWA that involves actors both inside and outside NGWA. The two main bodies in NGWA's governance arrangement are the Management Steering Committee and the Executive Management Board. The contract required the creation of both. WAJ delegated responsibility for the strategic management of the Managing Consultant contract and the management of the interface between WAJ and NGWA to the Management Steering Committee, when it was created. This group includes the following members: the Minister of Water and Irrigation (i.e., as Chairman of the Management Steering Committee); Secretary General of WAJ; Director of the PMU; Ministry of Planning and International Cooperation; KfW; Managing Director NGWA; and the Managing Consultant. The membership is varied in order to represent the interests of the key stakeholders in the strategic management of NGWA. The Management Steering Committee is viewed as a board of directors that strategically orients the company (e.g., evaluate performance indicators, approve policies), but do not interfere in day-to-day operations and activities. As one WAJ official stated "creating the Management Steering Committee was part of the contract in order to increase the corporate culture within NGWA" (Interview 91). According to the Managing Consultant staff, one of the Committee's shortcomings is that the Minister of Water and Irrigation and the Secretary General of WAJ wield disproportionate amounts of power and influence. As a result, they end up intervening in daily activities from which they are supposed to remain at arm's length (Interviews 38; 99).

The Executive Management Board is a group that is charged with managing the day-to-day operations of water and wastewater services, and prepares the Business Plan and associated plans. Its objective is to achieve the 105% operating cost recovery, and transform NGWA into an operating company. Initially, the Executive Management Board members included the Managing Director of NGWA (Chairman of the Board), the Managing Consultant staff, and the four Governorate Directors (NGWA staff). However, the Executive Management Board has demonstrated considerable resistance to change according to the Managing Consultant staff, and as a result, is not functioning smoothly. The October 2007 Management Steering Committee meeting therefore brought two changes to bear on improving the situation. First, the Executive Management Board membership became limited to just the Managing Consultant staff, and the Managing Director (basically, apart from the Managing Director, no NGWA staff sit on the Board any longer). Second, day-to-day affairs were taken over by a newly created sub-committee of the Executive Management Board and referred to as an Operating Management Board, thereby leaving the Executive Management Board as the ultimate decision-making body (MaCo, 2007). The Executive Management Board now meets monthly and is still in charge of preparing and implementing NGWA's Business Plan, developing a corporate management style within NGWA (i.e., in support of NGWA's planned transformation into an operating company), and advising the Management Steering Committee on necessary reform and development of policies, strategies, and the like. For its part, the Operating Management Board focuses on measuring progress against key performance measures (NGWA, 2008d).

The legal setting is the same as the one described previously in the LEMA management contract case study in section 3.2.3. The two laws that primarily influence the Managing Consultant contract would be the *WAJ Law No.18* (1988), and the *Emeri Law*. The provisions of the latter are not being enforced, and the Managing Director has decided not to attempt to enforce it which makes it even more difficult to recover NGWA's significant financial losses (Interview 106).

In sum, the contract, governance structure, and legal setting - all facets of the institutional arrangement - have adversely affected NGWA and the Managing Consultant's ability to form an effective partnership and provide water and wastewater services to its customers. The Co-Managing Director (as a Managing Consultant member) described it as all coming down to not being able to *implement* the necessary changes: "the initiatives we have taken we have not been able to realize them, because we are down to implementation, and we do not have the power within the Managing Consultant to enforce and impose a modern utility organizational structure and modern practices on the staff in NGWA" (Interview 38).

It was surprising that the other two institutional features that I thought would shape the effectiveness of the partnership (i.e., policy development and improved information channels) were barely mentioned by my interviewees or cited in the voluminous documentation that was provided. In terms of water policies that might have affected the Managing Consultant/NGWA partnership, the only reference made was to Jordan's Water Strategy and Policies, prepared and adopted by the Council of Ministers in 1997. This I described in more detail in section 3.2.3 (ii) under the Amman management contract case study (MWI, 2007). Although, not explicitly mentioned by any interviewees, there is one national policy that is particularly relevant to the NGWA Managing Consultant partnership, namely the push to establish water companies across the width-and-breadth of Jordan. This originates in a 2003 MWI study entitled "The Concept of

Commercial Companies in the Water Utility Policy Sector." It concludes that the MWI has crafted a strategy of "corporatisation" and increased PSP in which creating water companies is critical (MWI, 2003). Reforming NGWA into a water utility that can then become an Operating Company (or public company) upon termination of the Managing Consultant contract in April 2009 is the key contractual target for the Managing Consultant team. In NGWA's most recent Five Year Business Plan (2008-2012), there is a section which proposes the model under which NGWA could become such an Operating Company using its current governance structure. Basically, the assets would remain owned by WAJ, or another WAJ-owned holding company. This would lead to a first phase of delegation functions to NGWA, with quality control being held by the Executive Management Board, which includes members from the Managing Consultant team. This would be followed by the establishment of a NGWA Operating Company as a public shareholding or limited liability company (NGWA, 2008d). Perhaps having this MWI policy in place, which calls for corporatization of water utilities in Jordan, has reinforced the government's commitment to establishing water companies so that they are not just a contractual target, but actually a national objective for all water utilities.

As for information channels, it appears that the main issue is the communication between the Managing Consultant team who work from NGWA headquarters in Irbid, and NGWA staff in the ten Regional Operating Units across the service area (Interviews 38; 98; 99). The Regional Operating Units are in charge of day-to-day operations of water and wastewater services in their respective locations. However, they are not coordinating with the Managing Consultant, and some still apply their own rules and billing systems for example. The reasons for this could be that there are no Managing Consultant staff physically present at any of the regional operating unit offices, as well as the challenges presented by language difficulties. Nevertheless, as with

LEMA, NGWA's interactions with its customers vastly improved as a result of the Managing Consultant team's expertise in designing a state-of-the-art customer call centers, staff training, and operating the customer call centers 24 hours a day continuously throughout the entire week (Interviews 99; 55).

(iii) Intervening factors

There are, not surprisingly, intervening factors that play a significant role in influencing the effectiveness of partnerships in the Jordanian water sector. The Managing Consultant contract shares two of these intervening factors with the Amman management contract: the company-wide shift to a more commercially-oriented approach; and the transfer of knowledge between the Managing Consultant and NGWA staff. However, the effectiveness of the Managing Consultant/NGWA partnership also seems to have been influenced by what I term innovative organizational arrangements.

The Managing Consultant team has faced at least two big challenges in attempting to instill a greater corporate culture in NGWA. The main obstacle has been that NGWA, and WAJ in general, is primarily an engineering-minded organization, and lacks sensitivity to, or appreciation of a commercially-oriented approach to running a water utility (Interviews 54; 56; 99). As a few respondents explained, almost all problems, whether they are technical, managerial or administrative in nature, are tackled with an engineering solution in mind. Little thought is given to the financial implications of procuring an item and very little accountability is evident when it comes to justifying expenses. The Managing Consultant has tried to rectify these identified weaknesses by preparing a Commercial Management Plan (this 165-page plan proposes improvements for consumer bill collection, customer service, billing procedures, etc.) (NGWA, 2006c). According to NGWA's Commercial Services and Finance Director (as a Managing

Consultant team member), a specific example of this problem is the manner in which "the concept of customer service is so subordinated in what is an engineering-led organization" (Interview 99). The Regional Operating Units do not acknowledge the authority of NGWA's Customer Service Director, whose job it is to implement the customer service policies and practices through each of the Regional Operating Unit directors. The Regional Units are running customer services as they see fit and fail to take the Co-Managing Director (an expatriate) seriously. The second obstacle is that most NGWA staff is simply not accustomed to adhering to or building a corporate culture (i.e., preparing and presenting business cases for procurement, reading lengthy plans and reports, undertaking intensive upgrade-training in operational, financial, and/or customer service functional areas, etc.) (Interviews 71; 98). I was told by a few respondents (Interviews 79; 91; 98; 100) that current leadership (in 2008, at the time of writing) at the Ministerial level (Minister of Water and Irrigation) is a proponent of PSP and is also very business-minded, as illustrated by his very supportive votes on the series of Cabinet Decisions discussed previously . It would appear that the Minister may keep egging NGWA on in his efforts to see the Administration adopt a more corporate culture. Unfortunately, the caveat is a very high turnover at the Ministerial level. In only the past 10 years since 1997, there have been no less than eight ministers, with three of them in 2007 alone. WAJ is, for the purposes of administration of the contract, represented by the PMU. Based on my observations and discussions with the PMU, staff it was clear to me that the PMU specifically uses their financial and commercial know-how to help bridge the gap between local NGWA staff and the Managing Consultant team and (the head of the PMU was the Deputy Executive Director of LEMA until 2004 so he has ample experience in PSP).

Knowledge transfer is one of the Managing Consultant's responsibilities as stated in the contract's Service Appendix. According to the contract, the Managing Consultant is to "implement programs to train and advance the skills of persons assigned to NGWA and participate in training programs" (WAJ, 2006c, p.3). The training and development is detailed in the Human Resources Management Plan (NGWA, 2006d). This Plan involves: management development programs for directors and managers; specialist training in certain areas; practical training for field staff; and overseas study tours where possible. Progress has been made on a number of fronts. Training capacity has improved thanks to the new internal training facility in NGWA's Irbid headquarters, which I had the opportunity to visit. The Managing Consultant has also asked Jordan's University of Science and Technology to conduct some of the needed training. Additionally, examples include: 53 employees trained in leakage detection; 12 in GIS; 18 in International Accounting Standards; 3 in project evaluation; and 10 in commercial awareness monitoring. This is in addition to daily on-the-job training that NGWA staff receives from Severn Trent's employees (Interviews 54; 55; 71).

Lastly, the intervening factor that I think influenced the effectiveness of the Managing Consultant/NGWA partnership is what I call innovative organizational arrangements. The concept of innovative organizational arrangements refers to novel ways of organizing people and ideas. Interestingly, this did not emerge as a key consideration in the Amman management contract case study. My interview and document analysis revealed that there were many novel concepts (i.e., applicable to Jordan, and/or more broadly to the Middle East region) introduced in the Managing Consultant/NGWA partnership. Most of these were tailored to transforming NGWA into a more efficient and effective utility, with the Managing Consultant team's help. I am referring specifically to many of the institutional features already discussed in this Chapter, such as:

- amalgamating the four northern governorates' utilities into a single entity known as NGWA, in 1999;
- appointing a Managing Consultant (i.e., the first in Jordan, and as far as my extensive research indicates, the first in the region) to provide management, operational and maintenance support to the Managing Director of NGWA and his staff;
- setting up high-level committees such as the Management Steering Committee, Executive Management Board, and Operating Management Board, so as to guide NGWA in implementing its Business Plan, achieving defined service objectives, and attaining the prime objective of 105% operating cost recovery and evolving into a public company;
- running a public utility according to a Business Plan for the first time in Jordan;
- incorporating fundamental modern principles of utility management such as the establishment of review committees for investment projects (Capital Expenditure Committee), preparing business cases, installing a customer information and billing system, writing management reports; and
- introducing a micro-PSP concept into NGWA, which is essentially the outsourcing of a specific business activity to a local company. For example, the Managing Consultant is planning to outsource the entire customer service function in one of the governorates and this will include billing and debt collection (Interview 99).

3.3.4 Historical influences on these two urban partnerships

For both the Amman management case study and the Managing Consultant contract in the northern governorates, the influence of antecedent water management arrangements did not appear to have much influence. The most salient factors influencing these two partnerships (as described throughout this Chapter) are not rooted in historical arrangements. However, there is one important cultural feature that a few respondents alluded to, that has and could continue to influence the effectiveness of partnerships in the water sector (Interviews 16; 38; 95; 99; 100). This is the concept of "patrimonialism", which is linked to Jordan being a "semi-rentier state."

Major oil exporting states are commonly referred to as "rentier states." Rentier states are countries that receive, on a regular basis, substantial amounts of rent paid by foreign individuals, corporations, or governments. Such rents include, for example, payments for the passage of ships through the Suez Canal, oil revenues, and/or payments by foreign countries that allow the transportation of oil through pipelines built over the given rentier's territory (Mahdavy, 1969). A "semi-rentier state" is one that *relies* on external rents. In lieu of revenues from domestic oil production for example (i.e., where the exploitation of which might have been handed-over to foreign multinationals and taxed per barrel extracted), the semi-rentier country would depend upon the likes of international development aid or their nationals' worker remittances back to their families at home in the semi-rentier state (e.g., in this case mostly when nationals travel for work in the oil-exporting countries of the region). Jordan is therefore clearly a case in point of such a semi-rentier state (Greenwood, 2003). Jordan's dependence on foreign aid and remittances dates back at least to the early 1950s when British (and later U.S.) grants accounted for an average of 30% of all government revenue between 1952 and 1966. This increased in the 1970s, commensurate with a spike in oil prices, such that remittances reached a peak of US$1.2 billion in 1984 (i.e., more than a quarter of Jordan's then-GDP) and foreign assistance reached 55% of government revenue (Brynen, 1992). The ultimate effect of this is that the semi-rentier state's public sector becomes increasingly powerful as it becomes the largest employer, and the main distributor of services and wealth (Rath, 1994). In Jordan, state-benefits were often parceled out to an elite of tribal leaders , landowners in the Jordan Valley, or professional cliques in the public sector. This essentially created a system of powerful neo-patrimonial networks based on family, tribe, and proximity to the ruling elite (Brynen, 1992). One consequence is that economic interests can "best be pursued informally, through personal access and quiet lobbying of the King, members of the political elite, well-placed co-tribalists or extended family members, and patron-client linkages" (Brynen, 1992, p.83). These groups are effectively engaging in societal rent-seeking. The Arabic term used in the region is "*wasta*", which is a word that basically captures the endemic cultural practice whereby one's personal/family connections are used to obtain privileges and rewards for friends, relatives, or business partners (Schlumberger, 2002). This has a number of effects as Schlumberger (2002) points out. It can de-link knowledge, skills and capability from reward, undermines formal institutions and laws through selective enforcement and the like, and increases transaction costs (e.g., time, money, energy, and gifts involved). It also adversely affects the development of civil society because pursuing interests through personal relationships is favored over pursuing them collectively (Brynen, 1992). Schlumberger (2002) astutely describes today's Jordan as one that has the formal institutions of a market system, but works along the informal lines of interaction (i.e., *wasta*, rent-seeking, and patronage networks) inherited from the previous rentierist system. He describes Jordan's economic order as "patrimonial capitalism" (Schlumberger, 2002, p.246). As I noted above, this might explain the various comments some respondents offered regarding the seemingly arbitrary manner in which some decisions by local staff are made (e.g., in procurement or customer management). Similarly, how the need to effectively manage staff seemed to be inextricably tangled with nepotism and corruption, or how a Minister is disproportionately powerful are also illustrative consequences of *wasta* as a cultural-cum-business phenomenon in the Middle East. Preserving this particular societal practice will remain unhelpful to a government claiming its seriousness about fostering economically effective partnerships in management of their water sector, in either urban or rural settings (i.e., the latter being the subject of investigation in Chapter 4).

3.4 Summary table of key points related to each of the two urban partnerships

Table 17 summarizes the main points raised in this Chapter regarding the Jordanian urban partnership water-management case studies I have chosen for analysis and consideration. The table is divided into four sections: (i) measures used to evaluate the partnerships; (ii) intervening factors that influenced partnerships; (iii) historical influences on partnerships; and (iv) institutional facets that I argue are the main influences on the effectiveness of these partnerships.

At the beginning of this inquiry I hypothesized that it was the institutional arrangements that constituted my independent variable. These arrangements included the formal and informal rules spelled out in contracts, policies, legal requirements, governance structures and information channels, and represented the factors that I believe account for different levels of effectiveness of water partnerships. More specifically, I suggested that partnerships can be effective if institutional arrangements allow for the following: (i) contracts that allow the service provider sufficient autonomy to be effective and efficient; (ii) governance structures that include end-users in decision-making and implementation; and (iii) polices, legal settings, and information channels that are adequately accountable to constituencies. I also suggested that intervening factors can also influence the effectiveness of such partnerships, and that this was true for both urban case studies undertaken. The intervening factors are: a shift to a more commercially-oriented approach; knowledge transfer; and innovative organizational arrangements.

To what extent did these five facets of an institutional arrangement influence the success of the Greater Amman water supply and wastewater services management contract, and the NGWA Managing Consultant contract? The contracts in both case studies were not particularly helpful in that they were both inflexible and restricted the private sector partner's ability to make timely decisions regarding major operational issues (e.g., staffing policy, procurement, and capital investment). However, both contracts fostered accountability to their customers because of the rigid set targets. This was especially the case in Amman management contract that incorporated a measurable performance-based standard covering over 60 targets. By comparison, the governance structure was more favorable in the NGWA Managing Consultant contract, because it was and remains a more elaborate arrangement which allows for the participation of all interested parties (i.e., the Managing Consultant team, local NGWA staff, WAJ officials, and KfW). The latter contract also required that detailed Business Plans be drafted so as to map out goals for every functional unit in NGWA and this has also enhanced planning and decision-making. There were a few key policies that I identified as both relevant and significant to both partnerships. However, I believe it is noteworthy that in both case studies, respondents barely mentioned the notion of "policies" being a factor in influencing the effectiveness of the partnership. Among these was "Jordan's Water Strategy and Policies" that was adopted by the Council of Ministers in 1997, which included the integral sub-component of a Water Utility Policy. The NGWA Managing Consultant contract is also directly affected by the MWI's strategy of "corporatisation" in the water sector given that the contracts primary objective is to transform NGWA into a public water company.

The legal setting in both cases had a mixed effect on the partnerships. There were six Jordanian laws of specific pertinence to urban partnerships. Four of these laws constrained LEMA's and the Managing Consultant's efforts to fulfill their contracts' objectives. Arguably, this improved the lines of accountability between the water utilities and their customers because the rules and regulations were clearly laid out. The other two laws (*WAJ Law No.18* (1988) and the *Emiri Law*) were very useful. The *WAJ Law* opened the door to allow WAJ to engage in PSPs and the *Emiri Law* potentially helped the water utilities' finances because it required that all water bills be paid regardless of whether a customer's account was/is in arrears.

Information channels had a positive impact on both partnerships because each prioritized improving the company's interactions with customers. This was largely achieved as a result of the introduction of modern technology, training of customer service staff, and around-the-clock service of customer call centers. This certainly improved accountability between NGWA and its customers, as it also does between LEMA and its customers. However, both partnerships suffered from weak corporate communications within the water utility itself. In LEMA's case, the rift was between junior and senior staff, and in NGWA's case there was strained communication between the Managing Consultant team and NGWA staff in the ten Regional Operating Units.

Thus, I would suggest that my hypothesis is confirmed. The five facets of an institutional arrangement that I studied are indeed major factors of the success of these two urban partnerships. Although contract stipulations and the legal setting had a mostly negative effect on the partnerships, governance structure was positive at least in the case of the NGWA Managing Consulting contract , and policies coupled with improved information channels had positive effects on both partnerships.

Table 17 - Summary table of main points in Chapter 3 for urban partnership case studies in the Jordanian water sector

	Greater Amman water supply and wastewater service management contract*	**The NGWA Managing Consultant contract ****
Measures of an effective partnership		
Water quality	• Over 99% compliant with Jordanian water quality standards for chemical, bacteriological, and algae/nematode samples from effluent. • Increased monitoring of water quality and introduction of databases.	• Over 98% compliant with Jordanian water quality standards for chemical and bacteriological samples from effluent. • Recurring water quality problems caused by cesspools contaminating drinking water (Mafraq incident in July 2007). • Have started auditing all water sources.
Sustainability of supply	• Production of water reached 128.1 MCM in 2006. • LEMA never exceeded maximum allowable production limit from wells.	• Investigations into fairly high failure rate of wells. • Preparation of NRW Reduction Plan. • Improved well monitoring practices.
Affordability and financial arrangement	• Insufficient capital investment funds under LEMA's control (Operating Investment Fund US$ 32 million). • Debt ratio (debt to billing revenue) decreased from 0.65 to 0.5 in 2006. • LEMA collected 97% of what it billed in 2006. Water sales collection increased from US$25.7 million in 1999, to US$56.9 million in 2006. Operational deficit in 1999 became a profit of US$16.4 million by 2006. • Staff productivity improved from 5.6 to 3.4 staff per thousand water connections in 2006. • Two new computerized customer call centers established (equipped with databases and GIS). • Over 200,000 meters replaced. Also introduced hand-held computers for meter reading and automated billing system.	• NGWA collected 96% of what it billed in 2008. • Operating cost recovery in 2006 was 83%; 2007 was 85%; and 80% in 2008. • Staff productivity was 7.8 staff per 1000 water connections in 2008, and 22.9 to 1000 for wastewater connections. • Created a Capital Expenditure Committee to approve investment spending. • Introduced a standardized billing system, purchased more accurate C-class meters, and started an automated billing system. • New Call Center at NGWA headquarters in Irbid with 24-hour service and GIS.
Efficiency of service	• Almost 99% of Amman's service area receives access to drinking water, and 80% receives wastewater services. • Close to 98% of all water meter connections were read in 2006, compared to 75-80% in 2000. • Reduction of NRW from 54% in 1999 to 41.6% in 2006. • Compliance to water rationing schedule always exceeded 100% on average i.e., LEMA supplied more hours of water than projected.	• About 95% of NGWA's service area receives access to drinking water, and 65% receives wastewater services. • Water and wastewater connections have risen since start of contract, reaching 217,297 and 74,127 respectively in 2008. • NRW was at 43% 2007, and 39% in 2008. • Largest proportion of complaints relate to "no water." • Water scheduling: customer can expect between 12 to 24 hours of water once a week.

	• Response time to wastewater complaints reduced to under 2.2 hours on average, and less than six hours for drinking water complaints.		• Average response time to complaints is 6-7 days.	
Intervening factors that influence the partnerships				
Shift to a more commercially-oriented approach	• LEMA management encouraged better commercial practices and a business spirit among all staff.		• The Managing Consultant produced a Commercial Management Plan to begin orienting staff to better commercial practices.	
Knowledge transfer	• Major technological improvements in the customer call centers. • Staff was afforded over 100,000 hours of training in total.		• The Managing Consultant has introduced training in specific fields (GIS, accounting, etc), management training, and practical training for field staff. • New headquarters training facility built.	
Innovative organizational arrangements	--		• This includes, for example: creating NGWA; setting up high-level committees; running NGWA according to a Business Plan; and introducing micro-PSPs.	
Historical influence on the partnerships	• Jordan is a semi-rentier state (depending on foreign aid and remittances). State benefits have created neo-patrimonial networks based on family, tribes, and proximity to elite. These patronage networks engage in societal rent-seeking to get things done. This, in turn, undermines formal institutions and encourages nepotism and corruption.			
Five facets of an institutional arrangement that influence the partnerships	**Positive or negative effect on partnership**	**Degree of accountability, flexibility, and/or participation**	**Positive or negative effect on partnership**	**Degree of accountability, flexibility, and/or participation**
Contract	• Overall, negative effect on partnership. • Degree of flexibility in terms of the ability to review and modify the contract i.e., two Memoranda of Understanding. • Inflexible in terms of not giving LEMA sufficient autonomy to be effective and efficient (e.g., staffing policy, Capital Investment Program). • Fostered accountability to their customers and government because performance standards	• Minimum flexibility. • Medium accountability.	• Overall, negative effect on partnership. • Inflexible because of insufficient autonomy to the Managing Consultant to be effective and efficient (e.g., recruitment, budgeting, procurement, etc.). • Accountable to its customers because of need to focus on its only contractual target with a financial incentive (i.e., the Managing Consultant needed to achieve	• Minimum flexibility and accountability.

	were quite onerous, indeed essentially unattainable.		an operating ratio of 105% and a balanced cash flow)..	
Governance structure	• Overall negative effect on partnership. • LEMA had inadequate decision-making power in coordinating the Capital Investment Program. • No business plans prepared.	• Minimum participation and accountability.	• Overall positive effect on partnership. • Preparation of a Business Plan and associated plans. • Elaborate governance arrangement (Executive Management Board, Management Steering Committee, and Operations Management Board).	• Medium participation and accountability.
Policies	• Overall, positive effect on partnership. • Most important policy for PPP is "Jordan's Water Strategy and Policies" (specifically the Water Utility Policy). • No water conservation policy that LEMA was contractually required to follow or establish.	• Medium accountability.	• Overall, positive effect on partnership. • Most important policy for PPPs was "Jordan's Water Strategy and Policies" (specifically the Water Utility Policy). • The MWI has a strategy of "corporatisation" and increased PSPs in which creating private water companies is critical.	• Medium accountability.
Legal setting	• Overall, mixed effect on partnership. • Four laws that hinder partnerships in the water sector and two that help them. • Unclear who is regulator in water sector. • Private water tanker-trucks not sufficiently regulated.	• Maximum accountability. • Minimum flexibility.	• Overall, mixed effect on partnership (same issues as in Amman management contract case study).	• Maximum accountability. • Minimum flexibility.

Information channels	• Overall, mixed effect on partnership. • Effective customer call centers and customer surveys conducted. • Little effort in soliciting feedback from staff or customers.	• Medium accountability and participation.	• Overall, mixed effect on partnership. • Effective customer call center. • Weak communication between the Managing Consultant and NGWA staff in the ten Regional Operating Units.	• Medium accountability and participation.

* This column summarizes key points as of the end of 2006 (i.e., the end of the management contract).
** This column summarizes key points as of the end of 2008 (the time of writing).

CHAPTER 4: Rural case studies of partnering for improved irrigation water services

4.1 Overview

The water user cooperatives in the Jordan Valley and the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa are the first of their kind in Jordan. In this Chapter, I will: (i) describe how each partnership was formed; (ii) evaluate their effectiveness using the measures listed in Table 2 (see Chapter 1); (iii) summarize the key factors that appear to account for the effectiveness of each partnership; and (iv) discuss various historical influences on the structure and operation of these partnerships. The principal difference between these rural case studies and those rooted in a more urban setting, is that the latter provide both potable drinking and wastewater services, while the rural partnerships are involved in managing water for agricultural irrigation purposes alone.

The evidence I have relied on is primarily documented through reports prepared by the rural partnerships, as well as the extensive interviews I conducted with farmers (including both members and non-members of water user cooperatives), senior officials in the JVA, and the GTZ team.

4.2 Water user cooperatives in the Jordan Valley

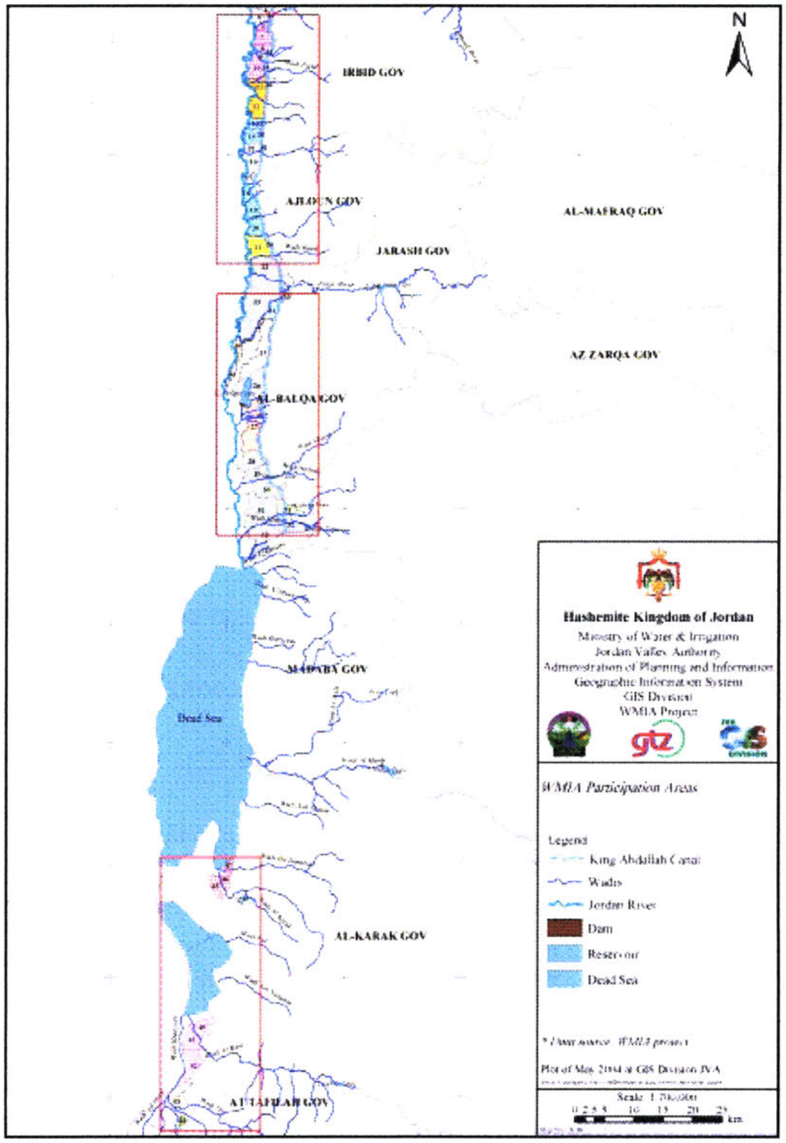
4.2.1 The context of launching the water user cooperatives in the Jordan Valley

The current water user cooperatives in the Jordan Valley were created as a result of a German-funded project launched in June 2001 called "Water Resources Management in Irrigated Agriculture" (Interview 5). The German government's international development arm, GTZ, has been managing the project since its launch. GTZ sees its main role as "facilitating" the interaction among the farmers in the cooperatives and between the cooperatives and the JVA. As

I explained in Chapter 1, the principal objective of creating water user cooperatives is to improve the efficiency of irrigation in the Jordan Rift Valley, which is an area running between Lake Tiberias (also known as the Sea of Galilee) and the Red Sea. The specific area where the water user cooperatives are located is in the Jordan Valley, between Lake Tiberias and the Dead Sea, as well as the area immediately south of the Dead Sea, known as the Southern Ghors.

The map below in Figure 5 shows the location of the Jordan Rift Valley and the areas served by the water user cooperatives.

Figure 5 - Location of the water user cooperatives in the Jordan Rift Valley



Source: GTZ, 2003.

The idea behind involving water users in this effort - the farmers - is that their participation would hopefully support the reduction of inefficiencies in water distribution in the end branches of the network i.e., the branches that reach the individual farms. The partnership has involved building relationships among individual farmers, as well as between farmers and the JVA (i.e., a governmental organization with about 1800 staff responsible for the social and economic development of the Jordan Rift Valley[104]). Table 18 lists the water user cooperatives that have been created since 2001 in the four sections of the Valley. These four sections include a Northern Directorate, a Middle Directorate, the Karameh (south) Directorate, and a Southern Ghors Directorate. The latter is the only directorate south of the Dead Sea. There are 16 water user cooperatives that have been created thus far, as well as one water user council and another water user committee[105]). The Jordan Rift Valley consists of about 35,000 hectares of irrigable farmland, which represents 40% of the total irrigated area in Jordan (GTZ, 2003). Close to 85% of the arable land lies to the north of the Dead Sea (GTZ, 2000). It is estimated that approximately 63% of farm units across the Jordan Rift Valley are farmed by members of a water user cooperative[106] (GTZ, 2008). The data on water user cooperatives in Table 18 is accurate as of May 2009. Most cooperatives are organized according to pumping stations, and are usually referred to by a pumping station number (e.g., PS 22). The backbone of the irrigation scheme is the open King Abdullah Canal, which delivers water via pumping stations and is connected to pressurized irrigation pipelines which distribute water to individual farm units. The pumping stations are numbered according to their distance from the intake of the King Abdullah Canal on the Yarmouk River i.e., PS 22 is 22 km from the intake). However, some sections of the pressurized irrigation networks are not connected to the King Abdullah Canal. Further south in the Karameh Directorate of the Jordan Rift Valley, water is supplied by dams. In the Southern

[104] The JVA is responsible for the area that extends from the Yarmouk River in the North to the Red Sea in the South (JVA, 2008).
[105] Section 4.2.3 explains the difference between these groupings. Basically, the "councils" and "committees" are forms the groups take prior to officially registering as a cooperative.
[106] The entire Rift Valley consists of about 7,834 irrigated farm units. One farm unit does not correspond to one farmer i.e., there is no accurate number of the total number of farmers in the Jordan Rift Valley. Some units are co-owned by several family members through inheritance, while in other cases a single farmer could own 10 units. The estimate is that there are about 7,834 single farm units in the Jordan Rift Valley, and some 4,955 of these units (i.e., 63%) are under participative irrigation management (see Table 18). In other words, the farmers of these units are members of a water user cooperative (GTZ, 2008).

Ghors, the supply is mainly from springs.[107] From hereon, I will refer to the area in this case study as the Jordan Valley (i.e., in lieu of the Jordan Rift Valley).

Table 18 - A list of the water user cooperatives that have been created since 2001 in the four sections of the Jordan Valley

Sections of the Jordan Valley	**Location (pumping station)**	**Area (hectares)**	**Farm units**	**% Membership**		**Start of participation**	**Status/ number of members****
				% of farmers	% of farm units		
North	PS 14	1028.7	314	15	25	2007	Council
	PS 22	113.4	29	33	80	2006	Committee
	PS 28	714.6	205	80	90	2002	Cooperative/118
	PS 33	963.5	217	70	85	2004	Cooperative/75
	PS 41	545.7	115	45	55	2004	Cooperative/43
Middle	PS 50	900.0	230	30	70	2003	Cooperative/30
	PS 55	1065.4	268	40	75	2004	Cooperative/51
	PS 78	980.0	246	40	70	2007	Cooperative/39
Karameh	PS 81	1397.2	352	10	40	2007	Cooperative/20
	PS 91	1380.1	373	13	35	2003	Cooperative/26
	PS 95	1092.5	303	30	55	2006	Cooperative/68
	Kafrein	889.7	234	25	60	2001	Cooperative/43
	Hisban	1044.4	316	30	65	2001	Cooperative/60
	South Shuna	150.0	200	30	80	2007	Cooperative/22
Southern Ghors	Mazraa & Haditha	1467.0	489	40	90	2003	Cooperative/104
	Safi	2670.0	890	10	55	2003	Cooperative /46
	Fifa	363.0	121	80	85	2003	Cooperative /80
	Khunezira	165.0	53	80	95	2003	Cooperative /33
Total participation		16,930	4955				858

Source: GTZ, 2009.
* As explained in the footnote above, a farm can consist of one or more farm units.
** The number of members is not static given that enrollment remains open to new members (numbers as of May 2009).

In order to understand the data presented in Table 18, it is important to consider the main features of water management in the Jordan Valley, prior to the formation of these water user cooperatives. The following expands on the points described in Chapter 1 regarding the history of the Jordan Valley, and how it relates to the evolution of water management since the 1920s.

[107] Irrigation water can be pressurized in two ways: the pressure generated from the pumping station, or the pressure generated by gravity i.e., the difference in elevation.

In 1925, the system of land management in the Valley, termed *waqf* (in Arabic) was cancelled by the government of then Transjordan. *Waqf* was a system whereby revenues collected by the government were appropriated for religious or charitable entities. In its place, land was distributed as *musha* (in Arabic) to the tribes occupying it. *Musha* land is held in common by a tribe or village; individuals can claim a share of the total land, but not a particular plot. Those who had a claim were given plots for a limited period, and water rights were assigned in proportion to their share of land (DOS, 1961). In the years that followed - between 1928 and 1933 - boundaries between villages were fixed by a land settlement program, again launched by the government. The government achieved this by basing the new boundaries on older, less well-defined boundaries established in the previous century, and for the first time the property rights of villages and tribes were clearly defined. At the same time, there were improvements in the enforcement of law and order and this made conditions generally more favorable to a more sedentary form of agriculture (DOS, 1961). A point worth reiterating from Chapter 1 is that water rights for irrigation were linked to ownership rights of the land to be irrigated. The source of water rights was Islamic *Sharia* law. An important task of the Department of Lands and Survey, which took charge of Jordan's water resources in 1946, was to issue new title deeds for lands already irrigated with water from springs, streams or rivers. These replaced the deeds of the Ottoman period. The actual amount of water needed to irrigate the land had to be determined. This procedure involved creating "water rights schedules", a procedure that dates back to 1937. This was the responsibility of the Department of Lands and Survey (Ghneim *et al.*, 2005). The deputy governors (*Mutasarif*) of each of the 12 governorates of Jordan, are the only officials authorized by law to enforce the implementation of the water rights schedules issued by the Department of Lands and Survey. The *Mutasarif* is also the mediator between parties when conflicts related to irrigation arise. The water rights schedules are a way of dividing water shares according to land size. The water rights schedules prepared by the Department are made public in a given village for 30 days. During this period landowners are able to voice any objections. At the conclusion of the 30-day comment period, the schedule is approved and made official. In traditional water management, the responsibility for ensuring that water rights were adhered to fell either to a water user group, a mediator, or the local government in some cases (Ghneim *et al.*, 2005). The *katib idhara* (water logistician or clerk), organized the tribal rotation of water time-shares. The unit for water distributed was based on lapsed-time usage (i.e., numbers of hours), and therefore not specifically volumetric (i.e., cubic meters) (Interview 29). Thus the concept of water user groups existed in traditional water management in Jordan. Today, the JVA arranges the water schedule according to crop licenses, while the water supply is allocated according to the requirement of the licensed crops. Officially, farmers have no control over the time or amount of water received. However, some farmers now do use unofficial channels to influence the JVA staff to their benefit. Farmers typically receive eight hours of water twice a week during the summer months (GTZ, 2002; 2003).

Up until the 1950s, the Jordan Valley was sparsely populated and dependent on subsistence agriculture. Farming practices were primitive (DOS, 1961; Courcier *et al.*, 2005). The major turning point occurred in the aftermath of the 1948-1949 war, which led to the creation of the state of Israel, and a massive influx of Palestinian refugees into the Valley. The international community strongly supported Jordan's economic development as a way to alleviate social tensions linked to the influx of refugees.[108] As a result, donors were quick to fund large irrigation works to spur the development of irrigated agriculture in this part of the country (Courcier *et al.*, 2005). The cornerstone of these major infrastructure projects was the East Ghor Canal. Construction began in 1958 and lasted till 1966. This 100 km open canal runs parallel to the Jordan River and diverts water from the Yarmouk River to irrigate the eastern Jordan River Valley. This waterway was later renamed the King Abdullah Canal.[109]

In 1959, the *East Ghor Canal Law* was enacted and the first "Authority" in Jordan was created (CESAR, 1997). The East Ghor Canal Authority was mandated to plan, design, operate and maintain the Canal. The land to be irrigated by the canal was subdivided into farm units of three to four hectares, and it would be redistributed to owners and landless farmers which included Palestinian refugees (CESAR, 1997; Haddadin, 2006). Later in 1973, the Authority was renamed the Jordan Valley Commission, and then the Jordan Valley Authority (JVA) in 1977 (Haddadin, 2006). This new regional Authority owned the water resources and oversaw their management and distribution, essentially replacing tribal management of water resources in the area. This effort to do away with tribal water management persisted through the 1980s (Van Aken, 2003).

A key trend, to which I will return later in this Chapter, is that since the 1950s the planning of water distribution in the Jordan Valley has been top-down and centralized. Little attention was paid to the participation of local communities. A study by Van Aken *et al.*, (2007) on the history

[108] The Palestinian refugees in Jordan totaled around 450,000 after the 1948 war. It isn't clear what proportion of refugees settled in the East Bank of the Jordan River (i.e., the Jordan Valley). One estimate is that the population was 8000 in 1940 and almost 30,000 in 1952, and then soared to 220,000 by 2002 (Van Aken *et al.*, 2007).

[109] The King Abdullah Canal basically links the Yarmouk River in the north to the Dead Sea in the south of the Jordan Valley. It was originally 67 km in 1966, and was then extended twice in 1978 and 1988 to reach its final length of 100 km. It also received additional water supplies from dams that had been built on side *wadis* over the past 50 years. The King Abdullah Canal was originally designed for gravity irrigation with side canals supplying water from the main canal to the farmers' fields (Van Aken *et al.*, 2007).

of the Jordan Valley, noted that "centralized management has allowed both the large settlement of new regions and an intensification of agricultural production, but it engendered mistrust between farmers and the institutions responsible for water management" (p.108). Exploitation of water resources dramatically increased between 1975 and 1995, especially in the Jordan Valley. This cross-Jordanian increase in water usage resulted from the undertaking of a number of major hydraulic projects: opening the King Abdullah Canal, introduction of storage dams on side *wadis*, and the construction of a pressurized water network to replace surface irrigation[110] (Courcier *et al.*, 2005).[111]

The change from surface irrigation to a pressurized network is at the core of the current water user cooperatives in the Jordan Valley, and warrants further elaboration.[112] The construction of the King Abdullah Canal facilitated surface irrigation for farmers in the Valley, but surface irrigation had been the norm even before the canal was built. Prior to the 1970s, irrigation water in the Jordan Valley was apportioned based on a common property regime that involved the distribution of river water among landowners, as a function of the cultivated area they held, and seasonal water availability. Beneficiaries of the irrigation built canals which, in turn, channeled floodwater to the designated plots of farmland. They also agreed amongst themselves on the time and duration for opening the canals. With the construction of the King Abdullah Canal, the management of water distribution remained fairly straightforward. However, as with more traditional irrigation, efficient water distribution required an extensive knowledge of water flows, as well as a good understanding of how water quality changes depending on the season, and how

[110] Surface irrigation is one of the oldest methods of irrigating fields and it is also known as flood or furrow irrigation, where farmers let water flow down small trenches running through their crops.
[111] Each farmer received water once a week, and would then convey this water across his plots through earth channels (Van Aken *et al.*, 2007).
[112] Approximately 75% of the irrigated area of the Jordan Valley has been converted to the pressurized pipe system (USAID, 2004a).

absorptive capacity changes according to different soil types. An operator (known as a "ditch rider") from the JVA would control the gates along the canal and balance inflow and outflow into the secondary canals (i.e., lateral canals or pipes that bring water to individual farms). The ditch rider would do this according to a schedule based on time-shares for each farmer[113] (Van Aken *et al.*, 2007).

In the 1970s, the more sophisticated and highly efficient on-farm drip irrigation techniques spread from neighboring Israel to the Jordan Valley. The problem was the mismatch between the existing surface irrigation system in the secondary canals and the drip irrigation systems on the farms. On-farm drip irrigation required a reduced flow, higher pressure, and increased frequency of water application - all features of a pressurized underground water distribution network.

The second impetus for constructing a pressurized distribution network was that in 1985, a regular transfer of freshwater from the northern section of the King Abdullah Canal to Amman started.[114] This meant that it was even more imperative for the JVA to modernize its open channel system, and replace it with a more efficient underground pressurized network to better conserve its resources as to have the additional water volumes necessary for routing to Amman. Thus, the 1980s and 90s saw the progressive overhaul of the open channel system to a pressurized network. The pressurized network is essentially an arrangement of buried ductile iron pipes, ranging from 80 to 600 mm in diameter. They carry water that is pressurized either

[113] Water allocation had always been decided based on crop water requirements. Volumetric pricing started in 1961 at US$ 0.0014 per cubic meter of water (Van Aken *et al.*, 2007).
[114] This transfer of water was to assist in meeting water demand that sky-rocketed as a result of both the immigration to Amman from other parts of the country, and the return of Jordanian laborers from Gulf countries (notably Kuwait) in the aftermath of the first Gulf War in 1991. The transfer, according to a senior engineer in the JVA's Control Center in Deir Allah reached 60 MCM in 2007, which is 40% of the total water entering the King Abdullah Canal (Interview 49).

by a pumping station, or by the difference of elevation between two points in the Valley. The latter involves creating pressure in the network by gravity (i.e., about one-third of farms in the Jordan Valley are located on the Jordan River terrace which, is about 30-40 meters below the King Abdullah Canal, and this difference in elevation creates pressurized water).

A number of important changes accompanied the shift to a pressurized network, and were the factors that most affected the dynamics of the water user cooperatives. These changes included the following:

- A device called a Farm Turn-Out Assembly (FTA) replaced the gate through which farmers previously received water from the open channels. The FTA is a concrete box with a metal cover and consists of a gate valve, a water meter, and a flow limiter. Initially, FTAs were locked, and only the JVA staff could access them in order to monitor and maintain them.
- An advanced telemetry system, which was financed through both German and French support, and completed in 1998. It is designed to read and record various measures along the King Abdullah Canal (e.g., inflows, outflows, status of the pumps, reservoir levels). These data are then transferred to the JVA Control Center located in the town of Deir Allah, where it is analyzed using appropriate state-of-the-art software. Thus, the Control Center can remotely monitor and control the main hydraulic infrastructure along the Jordan Valley. This is a big difference to the traditional system of having a local *sheikh* (the Arabic word for the head of a tribe) or a *katib idhara* - someone familiar and in close proximity to the farmers - control delivery.
- The actual analysis of the water network data (e.g. pressure, volume, flow) is done using a decision-support model referred to as a “Water Management Information System.” It

allows for precise operation and monitoring of the 45 control points and 37 cross-check gates on the King Abdullah Canal, as well as the 8000 individual FTAs (i.e., water distribution to each farmer). The Water Management Information System also consists of a database on cropping patterns, water distribution to farmer, water resource availability, and other relevant information.

- Farmers had to adjust their ideas about water allocation. They were accustomed to time shares of water (e.g., 18 hours in the winter and 8 hours in the summer, twice a week). However, with pressurized pipes and drip-irrigation, the paramount factors became pressure and flow. The system worked optimally when flow was 6 liters/second (l/s) (i.e., as opposed to 25 l/s as it was before), and pressure was high and consistent across the network, ideally at 3 bar (nota: flow and pressure are inversely related). Pressure is also the chief indicator of equitable distribution. If a number of farmers illegally open their FTAs out-of-turn, the pressure decreases and the efficiency of distribution is adversely affected (i.e., farmers will not receive their allotted water in terms of quantity or optimal pressure for their drip irrigation systems). To this day, this remains a serious and ongoing problem in the Valley. Moreover, although the JVA operates the pressurized system, the farmers themselves need to understand and be trained about its operational complexities. Adherence to the system's parameters is fundamental to its functioning properly.[115] This concept emerged throughout my interviews, and will be discussed later in this Chapter.

- The pressurized network requires that at any given point in time, only a subset of farms should be receiving water simultaneously. As a result, there is a new sense of interdependence among farmers. If farmers adhere to the water rotation schedule, the better and more equitable the pressure is delivered. In certain areas of the Jordan Valley, the ditch rider is still the employee in charge of operating the FTA at each farm, thereby controlling the water reaching each enterprise.

Given this backdrop, there were two principal forces driving the establishment of the water user cooperatives spearheaded by GTZ in 2001. The first, was the growing awareness among water users, government, and donors of the imminent water crisis facing the country in the early 1990s, as a result of the events that had unfolded over preceding decades (Interviews 5; 13;73; GTZ, 2002; 2006b). There were a number of indicators of this imminent water crisis. For example, Syria has been exceeding its share of water from the Yarmouk, as agreed to in the 1955 Jordan Valley Plan. Evidence of this is that prior to 1950, the total available surface water resources in the Lower Jordan River basin (which includes the Jordan Valley and Amman) was on average 550 MCM. The Yarmouk River's flow - the main source of water into the Jordan Valley, once at 470 MCM, dipped to 360 MCM in the mid-1990s, and has been about 150 MCM for the past five years (Van Aken *et al.*, 2007; Interview 49). In addition, the transfer of water from the King

[115] The Government of France, through its Regional Mission for Water and Agriculture (MREA) in Jordan, has been particularly active with respect to training farmers on the pressurized irrigation network. In 2000 the MREA, in close collaboration with the JVA, launched a six-year project called 'Irrigation Optimization in the Jordan Valley.' This initiative aimed to optimize water distribution at both distribution network levels in the Jordan Valley, and on-farm irrigation in specific pilot areas (MREA, 2007). Also, in 2000, after an appraisal of the management of the JVA and 'on-farm' networks, this joint Jordanian-French project secured a decision from the JVA to shift all flow limiters to 6 liters/second in the northern branch of the network. MREA supported the farmers in adapting their irrigation systems to the new conditions (Mazareh *et al.*, 2004).

Abdullah Canal to Amman in order to meet the City's increasing demand, has grown steadily since the initial decision was made to transfer this water to the capital in 1985. It reached over 41 MCM in 1999, and was approximately 60 MCM/year in 2007. This accounts for 40% of the water that enters the King Abdullah Canal, and 46% of the total amount of water supplied to Amman each year (Interview 49; LEMA OPS, 2007). Another manifestation of Jordan's water crisis was the severe drought in 1997, which lasted until 2001. It was another reminder to farmers that they are among the worst affected in Jordan since droughts mean lower yields and virtually no income from summer crops (GTZ, 2002). A further stress on water resources in the Jordan Valley is that since the mid-1980s, because of technical improvements in agriculture, through the likes of greenhouses, drip irrigation, fertilizers, an influx of Egyptian workers, and more market opportunities, farming in the Jordan Valley has become much more intensive and production has soared. This has happened at the expense of sustainable water use thanks to the increase in cultivation of very water-intensive agricultural undertakings such as small-scale olive and citrus groves, and banana plantations (Venot, 2004; Courcier *et al.*, 2005).

The second driving force behind the GTZ project, which helped create these water user cooperatives, was the inability and unwillingness of both farmer and the JVA to operate the pressurized network in an optimal way. In 2000, approximately 40 % of the farmland was still being irrigated using surface application methods that required higher water flow rates. Consequently, the system's delivery rate was raised to 9 l/s, at the cost of overall system stability. The resultant line pressure losses made it impossible for some of the farmers to get the volume of water within the allotted time that they were guaranteed through their respective FTAs (GTZ, 2000). As both senior officials in the JVA and members of the water user cooperatives explained to me, it was clear early on that most farmers did not readily welcome the modern pressurized system. They thought the lower flow (i.e., as required by its design) was insufficient and they simply preferred the more straightforward open channel that existed previously. The biggest issue was the rampant theft of water by farmers in their quest to augment the water supplied to their farms. Farmers managed this by: making illegal connections; opening their FTA when it was not their turn to do so; and/or toying with the flow limiter in their FTA to increase flow to their farms. As explained above, the consequence was disastrous in terms of water distribution efficiency. Illegal water use meant that more water was being taken out at any given time than the system was designed for. This lowered the pressure in the network which, in turn, altered the frequency and quantity of water delivered to farmers, as well as undermined their ability to properly use drip irrigation on-farm (Interviews 5;41;47;70). As the Director of the Northern Jordan Valley Directorate explained:

> When the move to the pressurized system came, the farmers were suspicious of the system and did not like it, because it was a different move. Some farmers insisted on staying with the open channel system, mainly because the pressurized system gave them 6 liters/second, which was less than what farmers had received before, and 6 liters is not enough. ... Still, some farmers preferred the open channel, and were not using the pressurized system correctly. But there is progress now in using the pressurized water, because of the water shortage. So the farmer is forced to use the pressurized system. (Interview 47)

The GTZ project leader for the water user cooperatives explained that:

> The main challenge was that farmers used to interfere in water distribution, trying to help themselves to more water. That led, gradually, to a breaking down of the regular water distribution service. It also caused a lot of physical damage to the infrastructure. The challenge was, at first, to identify suitable organizational forms that are both accepted by the farmers, and also by partner organizations like the JVA. There was quite a struggle over a year and a half, until the first group decided to become a water user council in 2001. And a little bit later, the first water user cooperatives were founded. (Interview 5)

The prerequisite for the pressurized network to work optimally is that all farmers must accept their allotted share of water and under no circumstance should then tamper with the system in an effort to obtain more water. Forming water user cooperatives was viewed as a way to organize and educate farmers about how to eventually achieve this outcome.

The following is intended to show that the illegal use of water by farmers has changed, and why this has occurred. The JVA was also at fault for not operating the pressurized system effectively. The root of the problem was that an increasing number of farmers adopted the more efficient drip-irrigation system which required a reduced flow, higher pressure, and increased frequency of water application - all features of a pressurized underground water distribution network. Once the pressurized network was in place, more farmers adopted drip irrigation systems; however, there was insufficient financial and technical support offered to farmers to help them adapt their new on-farm systems to the pressurized network. There were also problems related to filtration and clogging. The result was that farmers who used drip irrigation and those who still depended on surface irrigation rejected the idea of having a pressurized water distribution system predicated on a decrease in flow (25 l/s down to just 6-9 l/s). Farmers assumed a decrease in flow would mean a decrease in the volume of water reaching them. Their resistance to this change persuaded the JVA not to adhere to the proper design of the pressurized network. This meant the JVA agreed to allow a flow of up to 15 l/s. In addition, they did not implement the strict rotation schedule limiting the number of farms obtaining water simultaneously. This drastically lowered the pressure (to 1 or 1.2 bar, as opposed to the target 3 bar), and did not allow the new on-farm drip irrigation systems to operate as intended (Interviews 5; 13; 17; 75). Training farmers on the proper use of the pressurized network and drip irrigation systems was the responsibility of a French team. One of the team's consultants told me that "the water user cooperatives have a problem, which is that some farmers used to steal water. So the JVA decided to open all the secondary pipelines to the farms together - so the water flowed like it would in an open channel system - to avoid this problem. But the solution should be more training for farmers, and more control by the JVA. The JVA should monitor, but they do not want to do extra work so they take the easy way out, which is to do nothing" (Interview 75). Again, as the GTZ project leader explained, the idea is that the formation of water user cooperatives would convince ever-greater farmer numbers of the advantages in adhering to the water distribution procedure required by the pressurized network. This involves encouraging them to work with the JVA to implement the system rather than having them thwart it (Interviews 5; 17; 23; 86). These two key forces converged to make it clear to GTZ that a more effective partnership among farmers as well as between farmers and the JVA, was crucial to sustaining water resources and farmers' livelihoods. There were also other factors at play that came to the fore in 2000, including the following (GTZ, 2002):

- The JVA's lack of planning for water distribution made it nearly impossible for farmers to organize their cropping plans for the coming season. Farmers complained that the JVA did not announce its distribution plans far enough in advance, nor did it stick to the plan it announced. Clearer and more frequent communication between farmers and the JVA was needed, and water user cooperatives could help with this.
- The majority of the JVA's staff in 2008 is nearing retirement age due to a hiring freeze. This means that the bulk of knowledge about managing the irrigation system will likely be lost. Passing on to farmers the expertise gained through many years of investment in human capital formation, coupled with the substantive information base built up over the past several decades, in an organized fashion such as through a water user cooperative, would preserve the knowledge accumulated in the JVA.

- Farmers themselves have an excellent pragmatic understanding of the specific improvements the irrigation system might benefit from, and the JVA could learn a great deal from them. However, open dialogue between the two was sorely lacking. The idea being introduced was that the JVA would attend meetings of water user cooperatives periodically, and this would provide an ideal platform to enhance an information exchange between these entities.

In November 2000, GTZ submitted a feasibility study to the MWI and the JVA (the JVA became an arm of the MWI in 1992) titled "Irrigation Water Management in Jordan." The feasibility study was actually a response to a project application submitted by the JVA to the German government, which asked for assistance in improving the conveyance efficiency of the irrigation system in the Jordan Valley (Interview 111).

This feasibility study outlined the technical and managerial situation in the Jordan Valley and it underscored all the issues discussed above. It stated that in the long term, no gains in the efficiency of irrigation could be expected unless the water users are involved in the operation and maintenance of at least the "lower parts" of the system (i.e., the pipes between the pumping stations and the farms). In an early report, they stated that "a sustainable improvement of water distribution services was only possible through an active farmers' role. Only organized farmers could effectively protect the system from transgressions and beggar-my-neighbor practices, by using group action to pressure, monitor and reduce theft and corruption. Farmers' cooperation in the final tributaries of the irrigation network brings together skilled local know-how and makes the water distribution services more cost efficient or affordable. In order to organize farmers' contribution, communities of farmers must be established on the level of their shared common interests, and preferably as legally recognized bodies" (GTZ, 2002, p.11). The JVA did not anticipate that the Germans would propose forming water user cooperatives as a response to the irrigation water distribution problems in the Jordan Valley, and the Authority only "half-heartedly agreed to give it a try in one or two pilot areas" (Interview 111). The project agreement (which took the form of a grant) was signed by a German diplomatic representative (from their Embassy in Amman), and a Jordanian representative from the Ministry of Planning and International Cooperation.[116]

As discussed in more detail in section 4.2.3, this was not a contract per se, as in the urban partnerships we examined in Chapter 3. It was a German donor-funded initiative that started in 2000, with the actual funding and project management by GTZ being set to end in late 2009. The German project is unique in that it is the only one of its kind to "focus specifically on the farmer's role in irrigation management, as well as technical improvements in water distribution" (GTZ, 2002). Water user cooperatives did not exist in the Jordan Valley until the launch of this project. However, there are other farming communities across Jordan that have devised ways of sharing and managing a water source according to traditional water irrigation management, and these could provide insight about the use of incentives, rules, and effective approaches to conflict

[116] The proposed GTZ project for water user cooperatives in the Jordan Valley was built on more than ten years of work in irrigated agriculture in Jordan. This past work had focused on identifying problems that both JVA and the farmers faced in managing irrigated agriculture and formulating technical and organizational solutions to the problems in the Jordan Valley (GTZ, 2002).

resolution of use to the water user cooperatives in the Jordan Valley (Ghneim *et al.*, 2005; JVA, 1999).[117]

The next section examines the effectiveness of the partnership among farmers. I evaluate this effectiveness by considering the improvements that have occurred to the water user cooperatives themselves, as well as to the partnership between the water user cooperatives and the JVA.

4.2.2 Evaluating the effectiveness of the partnership

As outlined in Chapter 1 (Table 2) there are four broad measures that I propose to use in assessing the effectiveness of the four cases under study. These are: (i) quality of the water; (ii) sustainability of water supplies; (iii) affordability and the financial arrangements; and (iv) the efficiency of service. The primary challenge of assessing the effectiveness of the partnership among farmers in a water user cooperative, and between the cooperatives and the JVA, is that evaluations done by GTZ and the JVA have been fragmented (i.e., evaluations are not done on a regular basis, nor do they cover every water user cooperative). Also, they have not used a pre-defined set of either quantitative or qualitative indicators. Having said this, I was able to compile various reports and evaluations that do exist, and I have drawn on these in conjunction with

[117] In most cases of communal water management, there are essentially four models from which a choice is usually adopted. One of these model is based on a locally managed water user group operating on an informal basis. Tasks are distributed among tribe or family members according to the terms of their local agreement. It is the responsibility of each user to know the exact time and duration for receiving his water share. If a conflict or water theft occurs, the affected farmer reports the incident to the head of the tribe. If the water user group comprises multiple tribes, then a committee is formed consisting of representatives from each family. The other models consist of a water user group which engages either a water mediator or a *Mutasarif*, or both. In these cases, the water user groups share resources according to either a consensual agreement of the Department of Land and Survey's water rights schedule. The water mediator is usually a person well known to all users as being honest and wise and is typically elected by all farmers. The mediator fulfils a number of tasks that include the following: calculates the water time share schedule; operates the water flow in the distribution system; monitors any violations; settles disputes and implements sanctions; and collects user fees. The role of the *Mutasarif*, according to Jordanian law is to settle disputes on water rights schedules. The key benefit to involving a *Mutasarif* is that farmers know that he is able to impose immediate and official sanctions against any violator (as well as arbitrate water disputes regarding financial issues i.e., collection of fees, payment of the water mediator, etc.) (Ghneim *et al.*, 2005; JVA, 1999).

farmer-interviews and focus-group discussions, to measure "effectiveness" as best as I can through such proxies.

(i) Irrigation water quality

The quality issue related to irrigation water is not the most straightforward parameter to use in measuring effectiveness. This is mainly because there is little farmers can do to affect quality of the water they receive. The focus of water user cooperatives is on the distribution of water. Water quality is usually referred to as a "north-south" issue in the Jordan Valley because the Valley is irrigated from different water sources of different qualities.

In the northern section, water is conveyed via the King Abdullah Canal and is a blend of good quality freshwater form the Yarmouk River, the Tiberias North Conveyor, Mukheibeh wells, Wadi Al-Arab Dam and other side *wadis*. The middle of the Valley receives King Talal Reservoir water, comprised of floodwater from the Zarqa River mixed with poor quality treated wastewater from Amman. The southern portion of the Valley (Karameh) receives water from Shueib, Kafrein and Karameh Dams, as well as water from the King Abdullah Canal that is a mix of freshwater and treated wastewater form King Talal Reservoir. The water sources for the area south of the Dead Sea (i.e., the Southern Ghors) are local wells coupled with a mix of King Abdullah Canal and King Talal Reservoir waters (Ecoconsult, 2007). Thus, the northern section of the Valley is clearly at an advantage in terms of water quality, and farmers across the Valley were always quick to point this out to me (Interviews 27; 29; 41; 43; 45; 75). As the President of water user cooperative PS 33 in the northern section of the Jordan Valley stated "water quality is very good, there is no industry and no wastewater that would affect water. The water is clean and is drinkable" (Interview 27).

Numerous farmers and German and Italian irrigation experts working in the Valley all described how the area from the middle to the southern section of the Jordan Valley (particularly the southern Karameh section) is plagued by two major water quality problems. One is excessive sediment and particles (large suspended solids) that get carried downstream in the King Abdullah Canal. They eventually clog the filters along the Canal, thereby diminishing their effectiveness. Organic matter such as algae also gets trapped in the filters downstream in the Canal (Interviews 23; 42; 44; 84). The other water quality problem is chemical, resulting from the treated wastewater from the King Talal Reservoir mixing with the freshwater in the King Abdullah Canal and waters the southern sections of the Jordan Valley. The treated wastewater originates from Jordan's largest plant of its kind (As-Samra Wastewater Treatment Plant) which processes effluent which originates in Amman and Zarqa. The treated wastewater contains a high concentration of salts (i.e., nutrients such as sulfate, potassium, calcium, magnesium, boron and carbon) from both domestic and industrial effluent. Such salts can substantially decrease the fertility of soil and pose a significant environmental hazard to sustainable agriculture. Water quality data from the JVA show that salinity, as measured by electrical conductivity (EC), ranges from 1.5 to 2.8 deci-Siemens in the King Talal Reservoir, and in the southern portion of the King Abdullah Canal. These are relatively high levels[118] (see Table 19).

Table 19 - Salinity measures by electrical conductivity at various points in the Jordan Valley

Source of irrigation water	Range (deci-Siemens)
Northern section of King Abdullah Canal	1.0 – 1.2
King Talal Reservoir	2.0 – 2.8
Southern section of King Abdullah Canal	1.5 – 2.5

Source: GTZ (2006a).

[118] Electrical conductivity measures the ability of an aqueous solution to carry an electric current, thereby estimating the total dissolved salt. A nutrient-rich solution will have a higher electro-conductivity than a solution with less ionic salts. Ideally irrigation water should not exceed 1 deciSiemen (Interview 92).

Although, I began this section by hypothesizing that improving water quality is generally beyond the scope of water user cooperatives, my study did nevertheless reveal that there are at least two advantages to farmers in this regard. First, donor agencies prefer working with farmers organized in water user cooperatives. Second, the farmers have more leverage with government when united as members of a cooperative, than would clearly be the case in acting individually. The preference of donor agencies is illustrated by the case of a major Italian-funded project which was started in 2003 called "Improvement of irrigation water management in Jordan" (Interview 84). The project's technical report states that, "all the [project's] support was given through farmers' water user cooperatives to encourage membership, enhance participation, increase visibility and ensure sustainability to the project activities. Furthermore, the payment to the water user cooperatives of 20% of the value of the equipment received by the pilot farmers contributes to the sustainability of the associated activities and a sharing of the benefits with other water user cooperative members" (Peyre *et al.*, 2008, p.4). Their work has focused on the southern part of the Jordan valley because it is the area with the most serious water quality issues (Interview 84). The project tackles two major issues related to water quality: over-fertilization which does not take into account the already saline soils,[119] and ineffective filtration [120]which is a problem because drip irrigation requires a good on-farm filtration system to prevent the clogging of the emitters (Peyre *et al.*, 2008). Also, it has been suggested that the water user cooperatives create a more cohesive group of farmers, and as a result the farmers are better able to lobby the JVA. As a cohesive group, they are better positioned to suggest specific interventions that could

[119] The technical solution proposed is something called "fertigation optimization." This is an improvement in dosage, distribution and scheduling of fertilizers which leads to a reduction in the amount of fertilizers required while still being able to maintain yield levels (Peyre *et al.*, 2008).
[120] The most common type of filtration device used by farmers is an inexpensive screen filter that is actually problematic because the mesh is too large, and is easily damaged when manipulated. In their place, the project introduced vertical sand filters to remove larger suspended solids. These suit the filtration requirements of a pressurized system in the Jordan Valley. Also, disc filters were introduced and these remove very small suspended particles, are easier to clean, and are more durable than the screen filters (Peyre *et al.*, 2008).

improve, for example, installing improved filters at key points along the King Abdullah Canal in order to improve irrigation water quality (Interview97).

(ii) Sustainability of supply

In sub-section (i) above, I listed the various sources of irrigation water in the Jordan Valley, which include the King Abdullah Canal, wells, and side *wadis*. To get a better appreciation for how the various sources of water have changed over the past decade, I compiled data from the JVA Control Center in Deir Allah, which as explained above is the central node responsible for amassing all water data. Table 20 lists the Valley's total inflow and outflow into the Valley between 1997 and 2006. The largest source of outflow is the transfer of water from the King Abdullah Canal to Amman. This outflow has steadily increased since 1985, reaching approximately 60 MCM/year in 2007, which is 40% of the water that enters the King Abdullah Canal (Interview 49; LEMA OPS, 2007). Farmers are aware that during a season when rainfall is unexpectedly low, the priority is to transfer water from the Canal to Amman. This is the expense of farmers in the north of the Jordan Valley, who rely primarily on water from the Canal for irrigation (Interviews 5; 13; 29; 75;). There has been a marked reduction in inflow of almost 100 MCM per year into the King Abdullah Canal, since it opened in 1997, and this makes it imperative for farmers to do their part to ensure that the irrigation allotted to them is distributed as efficiently as possible. The best way of doing this is to take the measures necessary to the proper functioning of the pressurized network.

Compared to the open channel system, water loss in the pressurized network (conveyance system) has been significantly reduced. Efficiency in the network ranges from 75-85% (Van Aken *et al.*, 2007), but it can be further improved with the cooperation of farmers. My findings suggest that water user cooperatives have indeed contributed to an improvement in the economics and operation of the pressurized network.

Table 20 - Jordan Valley total inflow and outflow between 1997 and 2006

Inflow and Outflow (MCM)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total inflow*	314.5	289.9	212.5	239.7	114.7	234.0	357.3	266.0	254.7	210.5
Total outflow**	204.1	232.5	175.9	170.2	124.4	148.9	208.1	222.9	206.6	169.9

Source: JVA, 2007.
* The inflow refers to the sources described earlier i.e., Yarmouk River, Lake Tiberias,, wells, and side *wadis*.
** The outflow refers to the water that is transferred to Amman, water that is pumped to Wadi Arab Dam, and water storage in Karameh Dam.

Water user cooperatives have also helped ensure the proper operation of the pressurized system because it requires farmers to follow a strict water rotation schedule in order to attain the required homogenous water pressure they need. Farmers taking water out-of-turn can lower the water pressure. Having farmers adhere to the water rotation schedule is achieved more easily when they are part of an organizational form that encourages information exchange about why receiving water of higher pressure is best-suited to their on-farm drip irrigation systems. In short, there is clear self-interest at stake through appropriate behavior. This also encourages trust-building, in that farmers begin counting on their neighbors not stealing extra water out-of-turn, which would foil the proper operation of the system[121] (Interviews 13; 27; 28; 46; 47; 48; 49). The latter point was emphasized by the JVA Director of the Northern and Middle Directorates of the Jordan Valley: "the water user cooperatives bring the farmers together, and

[121] According to the GTZ Project Leader, there is a trend of sharply reduced penalties issued by the JVA for violations such as illegally connecting pipes to the network, or damaging the network, or tampering with the flow limiter in FTAs, all of which are methods aimed at obtaining extra irrigation water, in all areas of the Jordan Valley where water user cooperatives exist. But it is very difficult to prove this numerically. For example, based on the scant data that exists on penalties per year, the water user cooperative PS 28 has seen penalties decrease from 134 in 2002 to just 27 in 2007) (GTZ, 2008). Besides the reduced number of penalties, there are other indicators which point to reduced violations on the network by farmers: (i) operating pressure in the supply lines is generally high and stable, whereas before it took hours to stabilize pressure at the target level; (ii) calculated discharge for the entire pumping station is generally not exceeded. This is monitored centrally at the control center. If it is exceeding, the control center calls the head of the pumping station to reduce the discharge; and (iii) control visits of irrigation lines show little or no cases of tampering with meters or flow limiters. In Kafrein not a single illegal joint was detected since the rehabilitation of the area in 2002/2003. There are however illegal joints at a conveyance line to another area.

gives them a stronger sense of cooperation, so they start not wanting to steal irrigation water because the farmers build feelings of closer ties to the community, and indeed closer friendships with their respective counterparts. In short, the cooperatives brought about a new culture of cooperation" (Interview 48).

The lead agricultural expert of the French-financed irrigation optimization project in the Jordan Valley offered a comment that was echoed by farmers and donor agencies alike:

> Let's say, we'll improve the conditions inside the distribution network, but to have it sustainable, you need to have all the stakeholders, so all the farmers of the different branches, to follow the new rules. In a pressurized system, for example, if one farmer illegally steals water, it will affect his neighbor, who will not receive his water. So we implement, with the JVA, a system of controlling the rotation schedule, but the farmers have to follow the rules. So, through the water user cooperatives that GTZ helped create, the idea was, ok, we should have a counterpart to the JVA. The JVA implements the rules, but the farmers' cooperatives - the counterparts - will guarantee that the rules are respected by all, to keep the good level of [irrigation water distribution] service (Interview 13).

Another way in which the presence of water user cooperatives has improved the operation of the irrigation network and promoted water conservation is that the flow of communication between officials and cooperatives about technical problems has dramatically improved. For example, problems with the water distribution infrastructure (i.e., water meters, valves, pipes) are discussed during the weekly meetings, and this has improved the reaction time for repairing and maintaining the network (communication and governance is discussed in more detail in sub-section 4.2.3). Also, excessive leaks from damaged pipes are an obvious source of water loss and the JVA has been much more receptive to responding to these issues when the complaints come from representatives of cooperatives, rather than individual farmers (Interviews 41; 42; 45; 75). The Secretary of water user cooperative PS 50, in the northern section of the Valley, made a comment echoed by other farmers I spoke with, "it is better with water user cooperatives, in the sense that if we have any problem we can tell the cooperative, and they take it to the JVA, and the JVA will come at once and fix the problem. Before the existence of the cooperative, nobody listened to our complaints" (Interview 45). In certain areas of the Jordan Valley, the number of repair and maintenance incidents has dropped markedly and the JVA staff attribute this to the increase in cooperation with the cooperatives: in PS 28 registered maintenance cases were close to 425 per year until 2002, and dropped to 115 in 2007 (GTZ 2008). Likewise, PS 50 saw a similar drop in maintenance cases from 175 to 60 cases per year in 2006 (GTZ, 2006b).

Many farmers in the Jordan Valley have been resorting to over-irrigating their fields through the storing of as much water as possible in the rooted zone of the crops because of unreliable irrigation water in terms of quantity and timing (Regner, 2006). This can lead to excessive water consumption, and also adversely affect plant development and yields. GTZ evaluation reports (GTZ, 2006c; Regner, 2005; Regner *et al.*, 2006) suggest that because the water user cooperatives have become significantly more active in promoting more efficient water distribution, the reliability of the water supply has improved and farmers are less inclined to over-irrigate. One indirect indicator used to measure this is the increase in the number of greenhouses (i.e., more land being irrigated) in the areas since the start of water user cooperatives PS 50 and 55, as shown in Table 21.

Table 21 - Change in number of greenhouses at two pumping stations (PS).

PS Location	2003	2004	2005
PS 50	3245	3850	4459
PS 55	1678	1962	2067

Source: GTZ, 2006c.

(iii) Affordability and financial arrangement

The German project to create water user cooperatives in the Jordan Valley, was launched in June 2001, and is funded by the German government through its Ministry of Economic Development and Cooperation. Technical cooperation takes the form of a grant (not a loan), which is handled by GTZ (Interview 111).

The total project budget is 5.4 million Euros (US$7.7 million) extending over the period 2001-2009. However, establishing water user cooperatives is only one of three objectives for which German funding is provided. The other two components of the larger "Water Resources Management in Irrigated Agriculture" initiative are a groundwater management project in the Jordanian Highlands, and a project dealing with the safe use of treated wastewater in agriculture. The water user cooperatives project consumes a 60% (US$3.2 million) lion's share of the total funding. This covers: (i) project staff (which absorbs most of the funding) including one full-time German GTZ (the Project Leader) employee in Jordan, plus one part-time German employee, and 6 full-time local Jordanian GTZ employees (all agricultural engineers by training and living in the Jordan Valley); (ii) transportation for all GTZ employees; and (iii) contributions to the water user cooperatives (e.g., water meters, construction of modest offices, computers, study tours to other water user cooperatives in the region, workshops/conferences)[122] (Interviews 5; 111).

The most important aspect of a farmer's financial situation, whether or not a member of a cooperative, is irrigation water pricing. As with drinking water, the irrigation water tariff is set by the highest political level and is not something a water user cooperative can much influence.[123] It is still worth noting that the irrigation water tariff is heavily subsidized, and that the cost to the JVA of producing and distributing water for irrigation is far more than the water

[122] Other donors also make direct contributions to the water user cooperatives. For example, as mentioned earlier, the Italian-funded 'Improvement of irrigation water management in Jordan' project contributes 20% of the cost of a piece of equipment (such as a filtration machine) purchased by the cooperative. The funds go into the cooperative's shared pool of funds (Interview 10, Peyre *et al.*, 2008).
[123] Formal tariffs for irrigation water charged to farmers are not regulated and are modified by a Council of Ministers whenever the Council deems necessary.

tariff (GTZ, 2003). The irrigation water tariff ranges from US$0.01 for consumption of up to 1000 cubic meters, to US$0.05 for 3000 cubic meters and more (Interviews 45; 70). The JVA has been under pressure from government and donors alike to increase tariffs to cover at least the cost of operation and maintenance (GTZ, 2003).

The actual financial arrangement of the water user cooperatives is straightforward. As farmers across the Jordan Valley explained to me, there is a membership fee for farmers to join a cooperative which ranges from US$70.60 to US$141.20. The actual level of the fee applied depends on what the farmer can afford, and most cooperatives additionally require a one-off initiation fee. The membership fees are pooled in a shared fund for a given water user cooperative, which the members then collectively decide to spend at their discretion (Interviews 10; 29; 32; 45; 65; 80). For example, some cooperatives purchase tractors and other large equipment, while another water user cooperative (i.e., PS55 in the middle section of the Jordan Valley) allocated US$3,531 toward the construction of office space to hold their meetings and room to organize, manage and store necessary paperwork and hard-copy original records. GTZ contributed to the construction of this building (Interviews 23; 65). The membership fee is generally not a deterrent to joining, except in the case of farmers who lease the land and are not owners themselves. They have little interest in paying a membership fee and investing time and money in a cooperative given that they might only occupy a given farming location for a short period (Interview 45). It was difficult to get farmers to openly discuss cost saving as a result of more efficient water distribution and water use thanks to the presence of the cooperative. However, one farmer in water user cooperative PS 55 told me that he is probably saving around US$5.70 to US$7.00 per month in water bills. He is currently paying around US$17.00 to 19.80

per month. Before, his bills were closer to US$26.80 a month (Interview 29). Such savings can make a significant difference to a farmer's income.

(iv) Efficiency of service

In order to determine whether irrigation water distribution became more efficient with the establishment of cooperatives, I investigated the reliability of the irrigation water; the response of the JVA to quantity or pressure issues; and whether the water user cooperatives have promoted any technical efficiencies. My findings generated a few significant considerations.

Farmers who are currently members of water user cooperatives noted that prior to creating the cooperative, they always felt unsure as to whether or when the next rotation of water would arrive. This was generally attributed to the widespread theft, which reduced both water supplies and pressure. Missing a rotation in the summer months is devastating to a farmer's yield. Reported cases of tampering with the network and taking water out-of-turn have generally declined (as discussed in sub-section (ii) above), and this makes the water rotation schedule more reliable in terms of quantity and pressure (Interviews 5; 13; 41; 47). As a member of a water user cooperative in the southern part of the Valley pointed out:

> Before everyone use to steal water to get as much as they could, which resulted in chaos in planning which crops to plant and when. But now there is order and a system that farmers in the cooperative follow, and the farmers feel equal in terms of water distribution. So the incidents of water stealing almost do not exist. I feel secure when I plant crops because I know I have a certain amount of water that I should get. If I do not receive my share of water, I go through the water user cooperative to the JVA and the engineers or employees at the JVA always help. They come and inspect the water, and try to solve any problem we have. (Interview 41)

Another aspect of more reliable water distribution is that quantity and pressure has improved, and farmers are better able to irrigate according to given crops' water demand, rather than which crop will generate the most revenue. This is again because of farmers' tendencies in a water user cooperative to work together and not take water out-of-turn. The result is more irrigated crops across a farm area and an intensification of agriculture which, in turn, means increased yield and income for the farmer (Interviews 5; 17; GTZ, 2006c; Regner, 2005; Regner *et al.*, 2006).

An equally important, albeit indirect, indicator of reliability is that in some areas of the Jordan Valley, farmers use their own storage pools and pump to irrigate their crops. Farmers across the Valley do this because the pressure of the water that reaches their FTAs is consistently too low. To compensate for this, farmers store their allotted water in a pool that they build and purchase a diesel-generated pump to move water from the pool at the pressure required for their drip irrigation systems (GTZ, 2006c). The results as to whether this problem has improved because of the increased reliability of water distribution since the creation of the cooperatives, are mixed. Most pools are in the northern section of the Valley. Some 25% of farm units continue to rely on pool-and-pump technology, and most of these are still used because farmers are not satisfied with the pressure of the water being delivered (MREA, 2007). The pools can be a financial burden because some farmers spend US$2119 a year on diesel to operate the pumps (Interview 75). However, there has been some limited progress, including lower dependence on the pool-and-pump system because the problems with maintaining adequate pressure levels have been reduced. For example, PS 28 in the North witnessed half of its farms abandoning the use of pools by 2006, choosing to connect directly to the FTA (GTZ, 2006c).

The reliability of quantity and pressure has improved as a result of water user cooperatives in that the JVA's response time to complaints about insufficient pressure or quantity of water is almost immediate, when compared to the two to three week wait that farmers previously faced. This is mainly because the communication between farmers in a cooperative and the JVA is much more organized. One representative from the water user cooperative relays complaints from many farmers to the JVA Director, in an orderly fashion. This compares to previously having individual farmers continuously contacting the JVA about the same issue (Interviews 5; 42; 45). As the GTZ Program Leader described, "you have to imagine that the JVA director for a specific area of the Jordan Valley has an office filled daily with a large number of complaining farmers. ... before the water user cooperatives it was very difficult for the JVA personnel to distinguish between justified complaints and unjustified complaints, and they always had to send some people there to check at first whether a claim was really justified or not" (Interview 5).

Finally, the efficiency of water distribution has also improved as a result of starting the gradual transfer of more management responsibility from the JVA to the farmers in the cooperatives (known as "irrigation management transfer"[124]as discussed in more detail in section 4.2.3 (iv) below). This results from an agreement between the farmers, the JVA, and GTZ. Part of this transfer includes expecting farmers to open and close their own FTA, which is now the case for most farmers in the Valley. The FTA at each farm has always been handled exclusively by the JVA (the ditch riders specifically), because opening and closing the FTA directly controls the amount of water allocated to each farm. Farmers from the northern, middle and southern parts of the Jordan Valley raised this point as evidence of a substantial change and improvement in water distribution efficiency (Interviews 27; 29; 41; 86). As the President of water user cooperative PS 55 (located in the middle of the Valley) told me "now with the water user cooperative, it is the farmer who opens and closes the FTA and it is more efficient because the farmer does not have to wait for the JVA staff that might not come or come late. The farmer as a result has benefited a

[124] As Groenfeldt (2004) explains, the main feature of irrigation management transfer is the shifting of the system's management out of the government's and into the users' hands. The existence of a water user cooperative is a pre-requisite to the irrigation management transfer process because there must be a legally recognized farmer body that can accept legal responsibility for the system's management upon the transfer.

lot. The situation is now better, because the use of the water is more efficient and the distribution is better because farmers do self operation" (Interview 27).

Another technical improvement that has made water distribution more efficient is the replacement of old water meters that did not function properly. About 200 water meters have been replaced by GTZ. This has made a major contribution to increasing the efficiency of water distribution (Interviews 5; 29; 31). The water meter is a critical component of a FTA for obvious reasons. It is the instrument that shows which farmer has opened his FTA out-of-turn and drawn more than his share of irrigation water. Farmers believe that having a more accurate check on water distributed to farmers improves both the equity and efficiency of the system (Interviews 29; 46).

In sum, the partnership - among farmer and between farmers and the JVA - can be considered a success based on these four measures (water quality, sustainability of supply, affordability and financial arrangement, and efficiency of service). The section below dissects the various explanations of why this partnership has worked as well as it has.

4.2.3 Explaining the outcomes: What influenced the effectiveness of the partnership?

It is the institutional arrangements, namely the formal and informal rules spelled out in contracts, policies, legal requirements, and understandings between groups and individuals, that I hypothesize account for different levels of effectiveness in the partnerships. I also suggest that there are other intervening variables that might play a significant role in influencing this same effectiveness. This section explores the five facets of each institutional arrangement: governance structure, legal setting, the contract, policies, and information channels. I also discuss intervening variables including transfer of responsibility from the JVA to the water user cooperatives, knowledge transfer, and innovative organizational arrangements.

(i) The governance structure

References to the governance structure of the water user cooperatives, particularly with respect to how a cooperative makes decisions amongst its members, how it negotiates with the JVA, and how conflicts between farmers or between farmers and the JVA are resolved, seems to be the dominant factor influencing the effectiveness of partnerships according to my interviewees.

Water users can take on one of three organizational forms, as either a committee, a council, or a *de jure* cooperative (GTZ, 2003). Reaching the formalized cooperative structure is an end-goal. It is registered with the Jordan Cooperative Corporation (JCC) and it is the only legally recognized form of a farmer organization. As shown in Table 18, there are 16 registered water user cooperatives.[125] By contrast, the water user committees are based on the traditional forms of farmer management that existed prior to the JVA's creation in 1977. Forming a water user committee is the first step in establishing the basis for a more formal structure. The water user council is more formal in structure than committees, but is still based on traditional water management. Each council has 15 elected farmers that act as a "board" and is presided over by the *Mutasarif* (i.e., the deputy governor of a governorate), as Council Chair. Members discuss problems and solutions and ways they can support the JVA in providing more efficient irrigation water distribution. There is no legal definition or mechanism for establishing a council and thus, it has no legal authority to hold violators accountable (GTZ, 2003).

[125] This was the number of cooperatives as of January 2008. This number is not static as there are always new cooperatives being formed or preparing to be formed. Also, the cooperatives are always open to recruiting more members.

This study has focused on water user cooperatives. Discussions with farmers across the Valley in various cooperatives highlighted certain aspects of the governance arrangements of the cooperatives (Interviews 27; 29; 41; 42; 43; 44; 45; 66; 70). Each water user cooperative has an elected "board", which is basically a management committee. The board is comprised of farmers that take on, typically, five clearly defined roles: the president/head of the cooperative (usually a successful farmer and a *sheikh*), deputy head, secretary, treasurer, and a monitoring team. Most respondents noted the monitoring team to be the critical component of the cooperative, as it joins a JVA and GTZ staff member in conducting bi-weekly inspections of each farm in its area. This happens whether the farmer is member of the cooperative or not, and the inspections cover checks on pressure, flow, and any tampering with the FTA to gain more water[126]). The board generally meets weekly, whereas the general assembly for all members of a cooperative convenes once a year to decide on major issues e.g., electing a new board or modifying any procedures are required. In fact, the GTZ Project Leader (Interview 86) informed me that when a general assembly convenes all farmers, both members and non-members of a cooperative alike, are invited to attend. This is done in order to garner as much support as possible for decisions that impact all farmers, such as the transfer of more responsibility from the JVA to the certain cooperatives (discussed in more detail in section (iv) below). Membership to a water user cooperative is not mandatory for farmers. Interestingly, although in theory membership in a cooperative is open to all farmers in the corresponding area, farmers did inform me that once a cooperative is established, its members become vocal about refusing entry to farmers who they

[126] Penalties for various kinds of violations by farmers (such as making illegal connections to pipes, opening their FTA when it is not their turn to receive water, or toying with the flow limiter to increase flow to their farms in their respective FTAs) can only be issued by the JVA. Part of the water user cooperatives job is to help monitor the occurrence of violations by farmers and to report them to the JVA. In terms of penalties, the first time the farmer would receive a warning, the second time he would pay a US$35.30 penalty, and then a US$70.60 penalty on the third infraction, and so on. The penalties are high because they want them to be a real deterrent. Members and non-members of the cooperative are penalized in the same way. Since the creation of the cooperatives, the number of penalties issued has been reduced by around 90% (Interviews 28; 45).

believe will not be committed to the cooperative and its governing rules. The President of water user cooperative PS 91 explained that "we do refuse the farmer who we believe will not be active, or who will not do his work and abide by the rules in the cooperative. The idea is not just for the cooperative to collect membership fees. It requires cooperation, so you need people who are able and willing to work … because everyone is equal in the cooperative … This makes our cooperative productive and effective" (Interview 43).

Farmers also explained that each cooperative devises its own internal statute, which is required upon registering with the JCC. Most of these statutes are very similar, listing the primary objectives of a cooperative (the focus is always on improving water distribution), and the rules that frame decision-making (Interviews 27; 28; 29). Another important point is that both members and non-members can benefit from the services that a cooperative offers. Examples include using the office space, attending workshops on irrigation techniques, seeking advice from the cooperatives' board, etc. The idea is that this will demonstrate to non-members what the cooperative actually does, and hopefully encourage more farmers to join (Interviews 41; 65; 86).

Based on my discussions with farmers and the JVA, it became apparent to me that the cornerstone of water user cooperatives' governance structure is the increase in communication with the JVA. This applies to both the frequency and scope of the communications flow. There is a sense among farmers in cooperatives and the JVA Directors that this level of joint decision-making and negotiation has transformed the relationship between the two groups (Interviews 29; 47; 66; 70). JVA staff usually attends the meetings that the cooperatives' boards hold weekly (Interviews 5; 45; 86). The JVA also agreed to allow cooperatives to choose the JVA staff member who will work with them in increasing farmer participation in water distribution. This allows a cooperative to ensure that their JVA counterpart is supportive of their mission (GTZ, 2003). Meetings between cooperatives and the JVA are usually facilitated by GTZ project staff. However, more recently, some cooperatives have accumulated the know-how to approach government officials in the JVA and the MWI on their own without GTZ's assistance. The GTZ sees this as an indication that the cooperatives have a strong sense of ownership and understand high-level negotiations. According to the farmers and the JVA officials I spoke to, the topics discussed have covered a range of issues that have included the following (Interviews 5; 10; 23; 45; 47; 48; 70) [127]:

- having the JVA agree to allow farmers in certain cooperatives to operate the FTAs themselves, in an effort to transfer more responsibilities ;
- calculating and setting water distribution schedules with farmers' participation; and
- taking stock of farmers' requests to the JVA about replacing faulty or old devices in the irrigation system such as flow limiters or water meters, as well undertaking needed rehabilitation work on dams for example.

As the Director of the Northern Jordan Valley Directorate commented, "the cooperatives help and facilitate the farmers in presenting their problems or demands to the JVA. ... When the demand is presented through a cooperative, it carries more weight, because it represents the voice of a group" (Interview 47).

Another aspect of governance that has greatly improved since the creation of the water user cooperatives is the ability of the cooperatives and the JVA to resolve conflicts around irrigation issues. At almost every visit I made along the Valley, farmers and the JVA officials recounted

[127] Having been afforded occasion to read the minutes of several meetings between farmers, JVA, and the GTZ team confirmed that substantive topics are discussed and actions to resolve problems are agreed to in most cases (GTZ, 2003-2007).

experiences of solving problems jointly that, prior to the cooperatives, would have been largely ignored. In many cases where problems were resolved, the president of a cooperative would act as mediator between farmers (usually where one farmer took water out-of-turn) (Interviews 27; 41; 42; 43; 45; 47; 66).[128] This is one example as recalled by the Director of the Southern *Ghors* Directorate:

> In Wadi Karak, during the flood, the water had excessive sediments for two weeks. So we could not supply the farmers with water for two weeks, this was a very big problem. The farmers, through the water user cooperative, complained and kept pressure on us to do something about this problem. The farmers asked us to build a tank or reservoir for the water so that the sediments could settle and the water could then be used for irrigation in an emergency like this one. This issue was discussed for 2 years ...and we finally decided to build a storage tank that could hold about 80,000 cubic meters of water so the sediments could settle. So, now we have the tenders for the construction and in two weeks a company will start the job. The cooperative helped in speeding up the decision-making process and I know that without the demands of the farmers through the cooperative, may be it would have taken two or three more years to solve this problem. (Interview 66)

(ii) The legal setting

Water user cooperatives are the only legally recognized form of farmer organization for the management of water distribution. These cooperatives have a legal affiliation to the JCC. Cooperatives are governed by the *JCC Law No.18* (1997), and Regulation No.13 (1998). Registration with the JCC can be cumbersome for farmers because registered cooperatives are required to submit annual audits. The latter have to be conducted by a third party, can cost up to US$240, and involve completing "masses" of paperwork (Interview 23). The JCC is designated by law as the body responsible for registering cooperatives. Registered cooperatives must

[128] The water user cooperatives do not yet have a formal dispute resolution system. Disputes that cannot be resolved among farmers or between farmers and the JVA are dealt with by the deputy governor (*Mutasarif*) of their governorate. However, these days very few actually rely on the deputy governor. The GTZ project team is in discussions with the cooperatives about forming some kind of independent group of legal experts who would be trained specifically in issues as they relate to irrigation systems. Such third parties could then act as arbiters (Interview 23).

operate according to internal statutes that specify the objectives, capital, membership, procedures and financial and administrative regulations (GTZ, 2003; Interview 29).[129] The members of a cooperative select a small sub-group of farmers to draft their internal statutes. These are then reviewed by a lawyer, sent to JCC, and distributed to all members (Interviews 27; 44). Although the JCC does not require it, all water user cooperatives are non-profit bodies (Interviews 46; 63; 80).[130] From the outset, the GTZ project team insisted that the cooperatives must be legal entities. This way, the JVA has a legally recognized "partner" to which it eventually can transfer irrigation responsibilities (Interview 5). Farmers also feel that a clear advantage to being a legal entity is the added leverage they have when presenting their problems to the JVA (Interviews 27; 42; 45). For example, the President of cooperative PS 33 recounted how," during the summer of 2006 there were water shortages and the JVA mismanaged the water distribution to farmers. The cooperative complained as a group, wrote a letter to the JVA, the Secretary General of the MWI, and the Prime Minister. And the cooperative's complaints were recognized and responded to because they are a legal entity" (Interview 27). Therefore, it is clear that the water user cooperatives are legal entities as a result of registering with the JCC.

[129] I read the internal statute for cooperative PS 55. It is a detailed document that covers almost every aspect of the cooperative: financial commitment of members; basis for denying membership; allowed sources for cooperatives securing loan financing; convening emergency meetings; basis for accepting aid from donors; coordination of work with the JVA (e.g., inform of violations so JVA can issue penalties accordingly); description of roles of members on the elected board; voting procedures; etc. (PS 55, 2004).

[130] An important point is that none of the cooperatives to date have ventured into business i.e., marketing, buying supplies, etc. The GTZ project team has never encouraged farmers to take on business activities because the cooperatives are geographically defined according to the irrigable area supplied by a pumping station, and their focus is on water distribution. And a business cooperative would be more effective if farmers with similar crops, agricultural needs, and economic interests joined forces and formed a separate marketing-oriented group (Interviews 70; 84; 86). The President of the Hisban cooperative explained that "the main reason for establishing the cooperative is to contribute toward water distribution. After we reach that goal, and we have more authority for water management, then maybe in the future we will get into marketing and exporting our products in order to increase our income, why not? But that is in the future. For now, water management is the main reason for establishing the cooperative" (Interview 70).

Another key question I asked my interviewees regarding the legal setting was whether there was any legal framework that recognized the relationship between the water user cooperatives and the JVA. The response to this question was divided. A number of farmers and the JVA officials pointed out that the amended *JVA Law No.30* (2001)[131] opened the way for private sector participation in the JVA's activities (a private operator includes farmers) in managing water resources. This supports the cooperatives' rationale of helping to bring about more efficient water distribution, as well as the cooperatives' ultimate goal, which is to take over certain responsibilities from the JVA in the near future (Interviews 47; 70; 80; 86). Directors in the JVA reiterated that the water user cooperatives are an example of a private sector actor (Interviews 47; 70), "the *JVA Law* gave us the authority to work with the private sector, and it explains what type of authority the JVA could consider giving to the private sector, which include the water user cooperatives" (Interview 47). The pertinent clause in the *JVA Law* (2001) is Article 3: "[t]he Authority may by a decision of the Cabinet of Ministers upon recommendation from the (JVA) Board, entrust any of the projects it has implemented or implementing or is managing, to any entity from the private sector whether by leasing, management or operation, in accordance with the effective laws and regulations" (JVA, 2001, p.4).

As important as the amended *JVA Law* is, I agree with a report drafted by Klemm (2002), which indicated that the amended law does not mention how farmers, specifically, can take over certain JVA activities with respect to water distribution. Nor does it provide guidance on how to implement irrigation management transfer. This is a clear shortcoming of the law, because it leaves too much room for interpretation by both proponents and opponents of irrigation management transfer.

[131] *JVA Law No.30* (2001) is an amendment of *JVA Law No. 19* (1988), that was an extension of the temporary *JVA Law No. 18* (1977), which initially created the JVA itself.

Another key amendment in the *JVA Law* (2001) is the emphasis on illegal acts to the irrigation system as stipulated in Article 31 (a) and (b). This is clearly instrumental for the JVA and the water user cooperatives, because one of the main tasks they are jointly working on is more careful and regular inspection of anyone tampering with the irrigation system. The Law states that anyone caught damaging or sabotaging any of the JVA's infrastructure or equipment will be punished by imprisonment (between 3 and 12 months), or heavily fined (between US$282 andUS$1,412). The same consequence meets anyone taking more than their rightful share of water (JVA, 2001).

However, other farmers were not as optimistic that the amended *JVA Law* provides the water user cooperatives with a sufficient legal framework for collaborating with the JVA. Nor do they think the Law endowed the cooperatives with the authority it needs to be effective in decision-making about water distribution (Interviews 29; 43; 45; 64; 76; 80). For example, the cooperatives' monitoring teams are tasked with conducting bi-weekly inspections of each farm in its area to check on pressure, flow, and any tampering of the FTA to gain more water. This occurs whether the farmer is a member of a cooperative or not. However, some monitoring committees complain that they have little clout and cannot enforce the law given that the legal ground to issue penalties remains in JVA's hands (GTZ/JVA, 2007). An assessment of the cooperatives by a French consultant pointed to a related shortcoming in their current form - namely, that they are legal organizations without any technical responsibilities. The assessment went on to say that if more responsibilities are to be transferred from the JVA to the cooperatives, as planned, and then this will require the preparation of protocol agreements that clearly define the role and responsibilities of the two parties (Sanfilippo, 2006). This refers to the lack of any formal document that explicitly states what a cooperative is technically responsible for (i.e., besides operating the valves at the FTA level which is what many are already doing). The President of cooperative PS 91 summed up many of the key grievances that other farmers had with the current legal framework:

> But the cooperative does not have a strong legal ground. The JVA still controls and decides everything, water distribution, fertilizer, electricity, penalizing farmers who tamper with the water system – this is all under the JVA's control. The JVA has a wide range of authorities. ...we need to feel more independent; we cannot do anything without the agreement of the JVA. We should have some legal contract between the cooperative and the JVA to specify the responsibility of the cooperative, and that of the JVA. (Interview 43)

Although the farmers' perception of the legal framework is not unanimous, the *JVA Law* (2001) is considered a helpful piece of legislation, and without it the water user cooperatives would have little basis to request more cooperation with and transfer of responsibility from the JVA.

(iii) Other important institutional factors: the contract, policies, and information channels

Unlike the two urban partnerships analyzed in Chapter 3, the water user cooperatives do not have formal contracts with each other or with the JVA. That is, there is no single document listing the services to be delivered, performance standards, staffing policy, etc., as was the case with the contracts in the two urban partnerships. The closest approximation to a contract was the project feasibility study submitted by GTZ in 2000 to the MWI, titled "Irrigation Water Management in Jordan." It outlined an initiative to create water user groups in the Jordan Valley in order to increase irrigation water distribution efficiency (GTZ, 2000). As stated in the feasibility study, the objective of the water user cooperatives project in the Jordan Valley is to "contribute toward the more efficient use of irrigation water" (GTZ, 2000, p.15).[132] This objective is very broad; moreover, the initiative lacks a text that clearly defines a set of indicators to determine whether the singular objective is being achieved. This set of indicators should have been defined from the outset, shared with the cooperatives and the JVA, and regularly assessed. The GTZ is clearly knowledgeable of the kind of indicators that are relevant to gauge whether water distribution and farmers' participation has changed,[133] but these are assessed on an ad hoc basis, rather than in a systematic manner that involves the stakeholders (farmers and the JVA). The heads of both the French and Italian teams working in the Jordan Valley on irrigation projects that involve the cooperatives, lamented that the specific objectives and roles of the cooperatives are not sufficiently defined. They complain that this can lead to misunderstandings on the donors' side and more importantly among the farmers (Interviews 13; 84), "I would say *many* farmers enter into the cooperative thinking they can be a lobby, and they will put pressure on the government to get more water. ... I do not think that's the mission of a water user cooperative. So, they always are a little disappointed. They thought they would have more water, but, actually, they are not getting more water. They just have to manage better the little water that is given to them" (Interview 13). Although a firm supporter of the water user cooperatives, the Director of the

[132] The project feasibility study also made reference to the concept of gradually transferring more responsibility from JVA to the water user cooperatives, "at least several of the 'affected' JVA staff members can be expected to oppose the transfer of responsibilities to the water users. Also, the farmers' motivation to participate in the operation and management of the irrigation system still requires closer investigation. ... The project makes a flanking contribution toward proving that the combination of an altered role perception with the transfer of competence to the still-to-be-established water user cooperatives can reduce water consumption without prejudice to present levels of agricultural production. This presupposes the deregulation of the JVA and the creation of an appropriate regulatory context for the establishment of water user cooperatives. Likewise, the water user cooperatives must be empowered for the optimal management of the irrigation periphery, for the effective control of water distribution and utilization, and for the financing of secondary-system and tertiary-system maintenance via a fees collection system" (GTZ, 2000, p.15 and p.21).

[133] There are numerous presentations prepared by the GTZ team that list the key indicators for assessing the improvement in water distribution services (e.g., decreased level of transgressions, less need for maintenance, stable and high operation pressure in pipelines , intensified and extended cultivated area, higher farm incomes), and indicators of farmers' participation (e.g., organizational form, monitoring water distribution , level of FTA operation by farmers, participation in preparation of irrigation schedule) (GTZ, 2006b; 2006c).

North and Middle Directorates in the Jordan Valley noted that the water user cooperatives have not achieved as much as they could have, mainly because of an ill-defined strategy, "since the project to form water user cooperatives started in 2001, we should have achieved more progress. This is true and the problem was that there was no clear target level for the project, and no clear process to follow. There was no strategy for the project" (Interview 48).

The relationship between the cooperatives and the JVA has improved a great deal; however, it is not cemented by any formal contract. There is a document explaining the role of the cooperatives and requiring their involvement in water distribution. It is endorsed by the Secretary General of the JVA and sent to the various directors in the Jordan Valley (Interviews 45; 23). When it comes to coordinating inspections of farms (i.e., checking on farmers taking water out-of-turn), and convening meetings between the cooperatives' board and the JVA, these are mostly verbal agreements (Interviews 23; 29; 45). Trusting each other's word seems to be the more appropriate approach in the Valley, "the cooperatives' board members asked for an official agreement or a contract between the JVA and themselves at the beginning in order to ensure the attendance of the JVA at the cooperative's board meetings. But it did not happen. It is okay because we are a society made up of *qabaail wa ashaayer* (tribes and clans) and we believe and trust each other's word" (Interview 45).[134] By 2010 or thereabouts, the connection between the JVA and the cooperatives may become formalized (through a contract) once the irrigation management transfer gets underway. This transfer will involve the cooperatives operating and maintaining the irrigation system on their own and the cooperatives will need to accept legal responsibility for the system (Interviews 47; 48; 70).

[134] One reason the JVA did not agree to signing a contract with the cooperatives is because the concept of water user cooperatives was not readily accepted by all JVA staff. Some resisted the idea particularly of transferring more responsibility to the cooperatives (Interview 47).

There are a limited number of policies that underpin the rationale of the water user cooperatives in the Jordan Valley. However, very few farmers or the JVA officials I spoke to mentioned them. Rather, the GTZ project team informed me that they were not widely circulated or discussed among farmers or the JVA (Interviews 32; 86). As early as 1997, Jordan's "Water Strategy and Policies" was prepared and approved by the Council of Ministers the following year (MWI, 1998). One of these was the Irrigation Water Policy. It contained a clause that calls for increasing farmers' participation in irrigation management and an eventual transfer of more responsibility from the JVA to the cooperatives. This is in fact the backbone of the water user cooperatives project, "[g]overnment shall gradually phase-out of the business of irrigation water distribution, as is feasible, as soon as possible. … Pilot irrigation areas shall be designated to test the workability of Participatory Irrigation Management (PIM), where farmers will assume the responsibility of water delivery to their farms. When found successful, PIM will be extended to the Jordan Valley irrigation systems" (MWI, 1998, p.73).[135]

A few years later in 2002, the Agricultural Committee within the Economic Consultative Council of the Royal Hashemite Court prepared the "National Strategy for Agricultural Development" (RHC, 2002). Reports produced by The Royal Hashemite Court are endorsed by the King and carry considerable political weight. The "National Strategy for Agricultural Development" is a lengthy Arabic document, which contains a small section dedicated to water user cooperatives. The Strategy explains that the formation of cooperatives in the Jordan Valley is needed because there is an absence of justice in the distribution of irrigation water. It further identifies the

[135] It is important to distinguish between participatory irrigation management and irrigation management transfer. Participatory irrigation management emphasizes the participation of individual farmers in the management of the irrigation system that they rely on. Whereas, what is central to irrigation management transfer is the transfer of management out of government's and into users' hands (Groenfeldt, 2004). The water user cooperatives in the Jordan Valley are trying to espouse both principles (Interview 86).

desired goals of the cooperatives to be the fostering of participation between the cooperatives and the JVA, and to increase awareness about how to properly operate the pressurized irrigation system in the Valley (RHC, 2002). This is yet another example of high-level political backing for the establishment of water user cooperatives.

In 2002, the "JVA 2003-2008 Strategic Plan" was prepared by the JVA with support from USAID. The plan was a response to how the JVA could and should reposition itself in light of its revised mandate, as spelled out in the amended *JVA Law* (2001) (JVA, 2002). The relevant part of this Law with respect to the water user cooperatives is that the JVA could involve the private sector in its operations where appropriate and beneficial. This includes irrigation system management and water distribution. The "JVA 2003-2008 Strategic Plan" states that there are four goals that the JVA should strive to fulfill as part of its new mission (JVA, 2002). One of these goals focuses on making water supply and distribution more efficient and equitable, and involving the private sector. The two strategies associated with this goal include implementing a contract for irrigation water management, and involving farmers in the management of the water distribution system. The latter is certainly in-line with the on-going activities of the water user cooperatives; however, the idea of generating a management contract was not something the MWI or the JVA considered seriously (Interviews 23; 80). In 2003, the Minister of Water and Irrigation and the Secretary General of the JVA rejected the conventional approach to private sector participation (i.e., a management contract that involved handing over the irrigation network to a private company) that was suggested in the "JVA 2003-2008 Strategic Plan." Nevertheless, they were much more open to the idea of forming water user cooperatives - another form of private sector participation - to help move the JVA towards the vision set out in the amended *JVA Law* (2001) (Interviews 23; 80). A local senior GTZ project staff member, who has had discussions and been in meetings with the Secretary General of the JVA, explained that "the JVA Secretary General, upon discussing the idea of a management contract with the directors in the JVA, decided that such a contract would be suicide for Jordan, because the solution for effective water management in the Valley should come from the full participation of the farmers with the JVA, and that can only happen through the cooperatives. ... So the JVA really wanted the cooperatives and the transfer of responsibility to them to succeed, because these farmers care most about the Jordan Valley, and this would be the better and more permanent solution" (Interview 80).[136]

Although these policies are not legally binding and implementation is left to the discretion of the key stakeholders - the farmers and the JVA - I do think there is some virtue in having these policies as reference points. High-level government bodies endorsed all of these, which means that supporters of the water user cooperatives could always refer to them if the "cooperatives' rationale" were to be challenged.

As I discussed in sub-section (i), the cornerstone of the water user cooperatives governance structure is the increase in frequency and scope of communication with the JVA. Some farmers feel that the most tangible benefit that they have derived since joining a water user cooperative is the increased dialogue and information sharing with officials in the JVA. This occurs primarily during the weekly cooperatives' board meetings at which JVA staff is frequently in attendance

[136] A progress report prepared by the GTZ project team (GTZ, 2003) summarized the outcome of a workshop titled 'Strengths, Weaknesses, Opportunities, and Threats' of the project held in June/July 2003. The summary included a quote by the Secretary General who attended the workshop. He stated that "the government has suggested a management contract. We said 'we can cover our own needs with our own hands.' We[the JVA] have made errors; the farmers have made errors. The only alternative is farmer participation: we and you together to solve the problems. It *has* to succeed" (GTZ, 2003). This having been said, it does not mean that there is no role for private companies as the JVA proceeds in transferring responsibilities to private actors. The operations and maintenance of the dams in the Valley and the operations of the canals, for example, would best be taken over by the by private sector (rather than the water user cooperatives), because their operation is very technically demanding (Interview 86).

(Interviews 29; 41; 42; 47; 66; 70). Members of cooperatives work with each other and the JVA so as to better operate the pressurized irrigation system, ensure equity of access to irrigation water, and protect the irrigation system from water theft and damage. All these positive outcomes are predicated on drastic improvements in information sharing and open channels of communication when problems arise. When I asked farmers how their lives had changed since joining a cooperative, one farmer interviewee's comment illustrates a recurring theme that echoed through a number of discussions (Interviews 41; 42; 47; 66; 70):

> The farmers now have a voice unlike before when no one would listen to us and we could not reach anyone in the JVA when we had a complaint or problem with some aspect of the irrigation system. And now we can reach even senior officials in the JVA and they try and solve our problems quickly. We feel more secure and more supported. There is more trust between us and the JVA. There was no real cooperation for the past 30 years; there were barriers between farmers and the JVA. The communication was very weak (Interview 29).

During the project's early years (2002 and 2003), the GTZ spent most of its efforts seeking support from both the JVA and farmers for establishing water user cooperatives. It organized a number of workshops to not only build support for the project and equally important, to enhance communication between farmers and the JVA officials (GTZ, 2003). The workshops (hosted by the GTZ staff and a few led by international experts) specifically targeted improvement of interpersonal communication skills, community mobilization skills, and problem identification (with respect to water distribution services) through intensive discussions between farmers and JVA attendees (participants ranged between 50 and 70 equally split between farmers and JVA employees). Another potentially significant contribution to improving information exchange and communication is the quarterly newsletter "*Sharik*" ("Participate") which has been published jointly by the JVA-GTZ since July 2006. The newsletter usually runs a few pages and is circulated to farmers across the Jordan Valley. Its content is intended to reflect the views of anyone who is involved with the cooperatives (farmers, the JVA, donors). In reading the newsletter, one is informed on a broad range of issues: regional delegations visiting the Jordan Valley to learn about the cooperatives; interviews with officials from the JVA and GTZ about their views on the cooperatives; vignettes on prevalent challenges and successes of various cooperatives as told by the farmers themselves; summaries of relevant workshops held in the Valley; and technical explanations about new irrigation technology (e.g., the replacement of screen filters by vertical sand filters to remove larger suspended solids) (GTZ/JVA, 2006-2007). I think it is clear that the GTZ project staff have adopted a multi-pronged approach to enhancing communication channels among farmers and between farmers and the JVA. This has proven a most effective tool in reaching out to a diverse audience about a variety of topics of direct relevance to their economic wellbeing.

(iv) Intervening factors

There are a number of intervening factors (in addition to the five features of institutional arrangements) that appear to have played a significant role in influencing the effectiveness of the partnerships under consideration. These include the transfer of responsibility from the JVA to the water user cooperatives, knowledge transfer, and innovative organizational arrangements.

It was envisioned, even prior to the start of this GTZ water user cooperatives project, that the JVA's role would be significantly transformed as farmers eventually took on many of the responsibilities from the JVA i.e., irrigation management transfer. Planning for this transfer of responsibility to either private companies or the farmers themselves has been the subject of numerous reports and projects since 2000 (GTZ, 2003). The actual GTZ project (as noted in their 2000 feasibility study) also planned to take steps to assist cooperatives in assuming this greater level of responsibility. The Secretary General of the JVA is predicting that the JVA might cease to exist as an entity by 2015 and that it would be dramatically streamlined into a much smaller (e.g., 40 employees as opposed to 1800), leaner irrigation directorate in the MWI that would simply ensure that water standards are met and that water is distributed equitably (Interviews 23; 86).[137]

With all this talk of transferring responsibility from the JVA, I asked what it would mean, in practical terms, to the cooperatives. GTZ has taken steps to prepare the cooperatives to assume many of the tasks that the JVA will eventually hand over. A workshop held in Aqaba in October 2007, convened GTZ project staff, farmers and the JVA staff. It was jointly decided that the JVA should begin to transfer some of its responsibilities to a few "ready" cooperatives. In mid-2008, two pilot areas were selected (cooperative PS 33 and cooperative Hisban) to test the logistics of transferring responsibilities.[138] These two would also serve to demonstrate to other cooperatives what the farmers will actually be doing, which responsibilities they will assume, and what kind of problems they might face along the way (Interviews 5; 27; 29; 44; 46; 86).[139] To start with, the JVA will hand over the operational tasks of distributing water (i.e., operating all valves, reading water meters, and monitoring any illegal abstraction of water). One-year service contracts have been signed between each of the cooperatives with the JVA. Later on,

[137] As explained in the JVA 2003-2008 Strategic Plan, when the JVA was founded in 1977, it was tasked with attracting and sustaining a larger population in the Valley. This it managed to do as the Valley's population increased from 70,000 to 300,000. It was also charged with establishing a modern agricultural sector and managing Jordan's bulk water supply. The JVA went beyond just serving the agricultural sector, it built schools, roads, health clinics, power grids and government buildings. However, in the late 1990s, it became clear that other government agencies more appropriately meet the needs of Jordanians residing in the Valley, and the JVA was becoming a cost rather than a revenue source for the Treasury. The major problems included the following: an insufficient water tariff that does not allow for cost recovery or water conservation; an aging infrastructure; rampant corruption; over-staffing in general and a dearth in senior-level staff; and a lack of business-oriented management practices. The Government of Jordan wanted the JVA to become a smaller, more efficient entity and to this end, to start involving the private sector (farmers or companies) in taking over some of its functions (GTZ 2002; JVA, 2002; Interview 29).
[138] By mid-2009 four other cooperatives had signed one-year service contracts with the JVA, they were PS 28, PS 55, Kafrein, and Khunzeira (Interview 101).
[139] The pilot cooperatives were chosen on the basis of which were best equipped in terms of technical skills and leadership. Each pilot cooperative also had to convene a general assembly meeting to secure the support of their members (Interviews 27; 86).

other tasks such as maintenance responsibilities for the system will be transferred as well. The cooperatives will be paid monthly by the JVA for handling these responsibilities (Interview 112). The initial transfer includes asking the farmers to open and close their own FTA, which is already the de facto case for most farmers in the Valley. As well in each of the pilot areas, the cooperative must hire 10 farmers to handle the 10 water distribution lines. While these individuals do not need to be engineers, they must be trained and competent in water distribution. They have to dedicate two or three days a week to work on water distribution (the rest of their time would be devoted to their farming activities) (Interviews 46; 86). The intent is that the cooperatives will be responsible for the irrigation water "after the pump station" stage, which refers to the secondary water distribution lines to each farm. The JVA would remain responsible for manning the pump station (Interviews 29; 48; 80). Transferring the management of certain activities will happen incrementally, beginning with operating the secondary lines (i.e., opening and closing the valves on these lines). Eventually, other tasks will be transferred to the cooperatives. Such tasks will include carrying out maintenance of the water network, collecting water bills from farmers, managing the accounts, compiling data on the cropping pattern and providing it to the JVA for use in determining the water allocation and water rotation schedule, and monitoring each farmer's FTA to ensure they are receiving the correct flow and volume of water (Interviews 28; 29; 47; 48; 63; 66; 86).[140]

Although most farmers support the transition, which is currently underway , and welcome the opportunity to formalize and legalize their relationship with the JVA (Interviews 29; 41; 43; 45; 64; 70; 80), other farmers are anxious about taking on responsibilities that they felt technically

[140] Most of these tasks are currently the responsibility of the JVA ditch riders, which means that once responsibilities are transferred to cooperatives the ditch riders would be redundant. The JVA would need to either find them other employment in another Ministry, or the cooperative itself could employ a ditch rider in their area to assist in the water distribution tasks for their cooperative (Interviews 23; 28; 44).

unprepared to assume (Interviews 27; 47; 80). The GTZ project staff allayed any fears by constantly telling farmers that technical training would be provided and the transfer of responsibilities would be gradual. During the inaugural meeting of the Safi water user cooperative in December 2007, a senior member of the GTZ project team explained that:

> We will take a pilot cooperative, like PS 33, and we will make it a model of what the transfer of responsibility will look like and then other farmers will come and learn from them. The idea is for all the other water user cooperatives in the Jordan Valley to see and learn from PS 33 for a year or two. And if PS 33 does not succeed the first time we will do it again and again and other farmers will come and learn. We are not bound by time and there is no deadline to do the transfer of authority. If in the long run the water user cooperatives were not able to take on the transfer of authority and responsibility and things failed, then as the Secretary General of the JVA said in his words, we would have to bring a private sector entity in to manage the water distribution. (Interview 80)

I believe that this process of transferring increasing power and responsibility for water distribution services to the water user cooperatives will not only solidify the effectiveness of the partnership between farmers, but also empower farmers to manage irrigation water, and by extension their livelihoods, more sustainably. This notion of empowerment is also reflected in the second rural case study - the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa - as I discuss later in this Chapter.

Establishing the water user cooperatives also targeted a major problem area: the lack of education among many farmers about both the severe water scarcity in Jordan and the principles of the pressurized irrigation system. The need for knowledge transfer on these issues is recognized by donors, the JVA directors, and farmers alike (Interviews 13; 45; 48; 75; 76). Some believe that the main reason for the deficiency in technical knowledge about the irrigation system is that the farmers were not properly trained to understand why the pressurized system has been implemented and how it works (Interviews 13; 48; 75). The JVA Director of the

Northern and Middle Directorate recounts that "when the JVA moved to the pressurized irrigation system in the 1980s, there again was a mistake on the JVA's part. This resulted from the move from open channel to the new system, without the carrying out of an awareness campaign that would educate the farmer about the reasons for this new technology and about the promise that it held" (Interview 48). I was told that a significant challenge to educating farmers is that their diversity - from agricultural engineers, to professionals (business men or doctors) who manage their farms remotely from Amman, to illiterate farmers - has meant that education levels vary widely (Interviews 63; 74; 75). The majority of farmers in the Jordan Valley are not highly educated. Most are very traditional in their ways and are not always keen to accept new ways of doing things, whether it be operating a new irrigation system or implementing a new technology (e.g., an improved filtration system) on their farms. The partnership has tried to tackle this by encouraging improved knowledge transfer via the GTZ project staff. It has been providing continuous technical training to farmers on how they can contribute to improving the operation of the pressurized network by monitoring the system, identifying technical problems, and developing and testing solutions. GTZ also supports the JVA in the rehabilitation of distribution lines and provides technical assistance (Interviews 10; 17; 29; 41; 48; 66; 70) GTZ, (2003).[141] GTZ's intention was to "involve farmers from the start in order to enable these farmers to discuss technical problems, as well as managerial problems with the JVA. To do this, farmers have to learn about the operational characteristics of the system … such as the rationale for lowering flow and increasing pressure, the maintenance of air vents, and cleaning the settling

[141] The GTZ project staff does not engage in routine rehabilitation or maintenance. Assistance can include improvements to FTAs, repairing/replacing water meters, rehabilitating pressurized pipelines, and correcting the design of the system e.g., low water pressure as a result of altitude. Rehabilitation work on the water distribution network can include identification of illegal joints in the pipes, leakage detection, and calibration of flow along pipelines (GTZ, 2003).

ponds at the pumping stations" (Interview 17). A number of farmers made comments similar to the following (Interviews 10; 29; 41; 66; 70):

> Before we did not understand anything about pressurized water and why it is better. The farmers used to open their FTAs at the same time and the water was weak and had lots of sand in it. Many farmers at the beginning opposed reducing the flow of water to 6l/s because they are used to water flowing like it does in an open channel and taking as much as they could. But once we received training from GTZ and a few new JVA engineers we realized this new pressurized system is much better for us and is a fair system. (Interview 41)

In my view, this partnership has demonstrated innovative organizational arrangements, which I think, will help it to continue to achieve its principal goal of more efficient water distribution. As described in Chapter 3, innovative organizational arrangements refer to novel concepts introduced through the partnership and tailored to help ensure its effectiveness. The innovative organizational arrangements that I am referring to in this particular case are the concept of irrigation management transfer, as well as something I have not yet mentioned which is the concept of forming a "specialized water user cooperative." This specialized water user cooperative is a federation or union of sorts, representing water user cooperatives across the Jordan Valley (Interviews 13; 32; 86). The GTZ project staff explained to me that although water user cooperatives are growing in number by the day, they still only account for 35% of the area in the Jordan Valley. The GTZ wanted the cooperatives to have a higher political profile and be better able to negotiate their needs with senior government officials. To this end, in 2004 the GTZ initiated the establishment of what it calls a "think-tank of important farmers who excel in one way or another, be it by their volume of production, adoption of technology, ability to export what they produce. ... This is a think-tank of farmers who will act as a partner for government bodies, like the MWI or the Ministry of Agriculture ... they would visit the Parliament and Ministries from time-to-time to convey their views and visions about the development of the Jordan Valley" (Interview 86). The first 15 members were chosen by GTZ. Then, this specialized cooperative selected other members. What distinguishes this group from the individual water user cooperatives in the Jordan Valley is that this specialized water user cooperative focuses on discussing water distribution more generally or in macro terms for the entire Jordan Valley.

This specialized group was eager to obtain some kind of legal status because they thought this would improve their standing when negotiating with government officials. Legal status would likewise allow them to take on meaningful work, and essentially be hired by government to conduct surveys or launch education outreach campaigns. This wish materialized in December 2007, when the Ministry of Agriculture issued a law on granting licenses to specialized cooperatives, one of them being for the water user cooperatives in the Jordan Valley (MOA, 2007). Thus, this specialized group is registered as a cooperative under the Ministry of Agriculture, not under the JCC (as is the case with the geographic-specific water user cooperatives). This could potentially increase the exposure and scope of all water user cooperatives in the Jordan Valley, but it remains too early to make that determination. One possible issue that this specialized water user cooperative might face is that its accountability could be challenged given that it is not a democratically elected body. Its members are basically appointed.

4.3 Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa

This case study, as with the Jordan Valley water user cooperatives case, is also about a rural partnership in the water sector. The main difference in this second case is one of scale: the Red Dam case centers on a small community in a largely isolated area on the outskirts of Wadi Mousa. There are fewer people involved and less documentation available. However, this case study complements the Jordan Valley case because the members in Wadi Mousa are using treated wastewater for irrigation. This is the only Jordanian cooperative of its kind (Interviews 30; 61), and there are lessons to be drawn here about why and how partnerships in irrigation are formed and sustained in this country. A more detailed comparison between the two rural cases will follow in Chapter 5.

4.3.1 Launching the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa

Unlike the others, where the stakeholders in the water partnerships have been the Government of Jordan and a private water company (the two urban cases), or the government and farmers (the rural case previously examined in this Chapter), the Red Dam case centers on the government working with a traditionally nomadic tribe of Bedouins[142] who essentially become farmers. Internationally, the term "water reuse" refers to reusing treated wastewater: as drinking water (e.g., Singapore); in industry (e.g., in power plant cooling towers); in artificial recharge of aquifers; in the rehabilitation of natural ecosystem (e.g., Florida's Everglades); or as irrigation water for agriculture as in this case study (CDM, 2007a). As I mentioned in Chapter 1, the term "reclaimed water" is "wastewater (sewage) that has been treated and purified for reuse rather than discharged into a body of water" (CDM, 2007a, p.20).

In order to appreciate the dynamics of this particular case, it is instructive to consider what is known about the history of the area and the people. The area where this partnership was launched is in the south east of the Governorate of Ma'an, it is seven kilometers from the UNESCO World Heritage Site of Petra and is on the outskirts of the village of Wadi Mousa. The Governorate of Ma'an is part of what is known as the southern Badia region of Jordan (the entire Badia region is comprised of a northern, central, and southern section). The Badia is an

[142] A Bedouin is an Arab of a nomadic tribe in the Middle East.

Arabic word referring to the arid/ semi-arid regions of the Middle East, where annual rainfall accumulation is less than 200 mm (BRDC, 2007). The Badia is a land mass that includes parts of Jordan, Syria, Saudi Arabia and Iraq. In Jordan's case, the Badia is in the eastern part of the country and extends from north to south. Although it covers 80% of Jordan's land mass, it is home to only 5% of its population (BRDC, 2007). In the early 1900s the population of the Badia was made up solely of nomadic Bedouins, whereas today the majority of the population is sedentary having permanently settled in villages scattered throughout the Badia. Only 5-10% remains nomadic (BRDC, 2007). Wadi Mousa is situated in Ma'an - the largest but least densely populated Governorate[143] - as well as one of the poorest[144] and most barren of Jordan's 12 governorates.

Before I discuss how and why the partners in this particular partnership were identified, I think it is important to understand the general role of tribes in Jordan's modern history. As Norman Lewis described in his book *Nomads and Settlers in Syria and Jordan* (1997), "until the Turks began to interfere seriously with [the Bedouins] in the second half of the nineteenth century, the major beduin tribes were strong and almost independent entities, each man of which enjoyed the prestige and support which came from membership of the tribe. The poor tribeless fellahin [peasants] were at the bottom of the social pyramid, fated to a life of labour, exploited by landlords, liable to pay taxes to the government … Bedouin and farmers were both subject to drought, but the mobility of the beduin gave him and his flocks a better chance of survival than the farmer and his crops" (Lewis, 1997). Direct Ottoman rule from the 1850s onwards deprived

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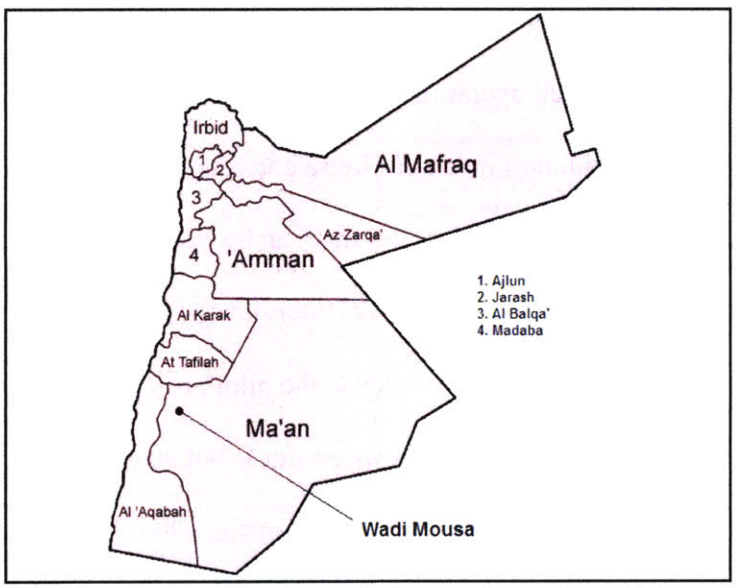
[143] In 2007, the population of Ma'an was 108,800. The Governorate of Ma'an covers an area of 32,832 km^2 with a population density of 3.3 people/km^2. When compared to the most populous Governorate, Amman counts some 2.22 million inhabitants, an area of 7579 km^2 and a population density of 293 people/km^2 (DOS, 2007).

[144] Just over 44% of households are living below the absolute poverty line, which makes it the second poorest Governorate after the Governorate of Mafraq (Tarawneh, 2003).

the Bedouin of the key sources of their livelihood. The Ottoman government: prevented Bedouin tribes from collecting a share of peasant harvests; patrolled so as to limit the ability of Bedouins to raid; and implemented land settlement measures which effectively blocked access to traditional pastures. Moreover, the Ottomans imposed taxes on the Bedouins' chief economic activities such as herding and agriculture (Rogan, 1999). The Ottomans did, however, make efforts to win support from the tribal leaders, the *sheiks*, in an effort to reduce resistance from the Bedouin tribes in general. This was done by awarding them titles, stipends, and paying them to protect convoys of people and animals (Rogan, 1999; Robins, 2004). For the Bedouins in then Transjordan, the situation changed considerably with the arrival of the Hashemites in 1920, who became the ruling family.

There are two key features of Bedouin life in Jordan that are noteworthy: the patron-client relationship between the regime (the monarchy/government) and the tribes; and the Bedouin's role in Jordan's army (Lewis, 1997). The patron-client relationship was forged soon after Amir Abdullah's arrival in Jordan in 1920. He and other members of the Hashemite family began to secure the support of the Bedouin tribes by providing them with compensation for any losses incurred during a raid, or offering them influential government positions (e.g., Ministers, Speaker of the House of Representatives, or high ranks in the army). The Bedouins' role in the army dates back to 1930, when the British (the colonial rulers of Transjordan between 1921 and 1946) assigned British army major John Glubb to secure the cooperation of the Bedouin tribes of Transjordan, and incorporate them into the state structure (Robins, 2004; Anderson, 2005). Glubb established a Desert Mobile Force of about 130 men, and he was particularly skilled at persuading the leading *sheiks* to allow their sons to join the force (Robin, 2004). The Bedouin tribes did not need much convincing because joining an army was perceived as something quite honorable. More importantly, it provided a much needed source of income as a result of the severe droughts of the 1920s and 30s, which had diminished the value of land and killed off most of their livestock (Anderson, 2005). After the creation of Jordan in 1946, the army continued to expand and Bedouin tribesmen made up the largest share of the army. In turn, they were favored by the government and the King (Anderson, 2005). The Bedouins were, and continue to be, fiercely loyal to the monarchy. Figure 6 shows the location of Wadi Mousa in the Governorate of Ma'an.

Figure 6 - The location of Wadi Mousa



Source: DOS, 2007.

There were a variety of factors and considerations at play in bringing together a group of tribes-people and military veterans in Wadi Mousa to form a water reuse cooperative in 2005. The history of this eventual confluence of interests began in 2002, when USAID launched a major water reuse initiative in Jordan. It sought to buttress the Jordanian government's effort to promote the sustainable use of reclaimed water resources for agricultural, industrial and urban landscape uses (USAID, 2006). USAID funded a pilot project called the "Water Reuse Implementation Project" which was implemented by PA Consulting Group between 2002 and2004. This essentially laid the groundwork for the follow-up "Reuse for Industry, Agriculture and Landscaping" (RIAL) project in 2004,[145] which the consulting firm CDM implemented with the PRA, its partner in this regard. The RIAL project (which ended in January 2008) consisted of four pilot projects around Jordan, one of which is the Wadi Mousa water reuse project.[146] The RIAL project's primary objective was to "achieve sustainability of water reuse activities in Jordan by pursuing an integrated approach that addresses issues of technical viability, economic viability, community acceptance, risk management, and environmental protection" (USAID, 2004a, p.1). In Wadi Mousa, the source of the treated wastewater is the Wadi Mousa wastewater treatment plant, which is actually located within the Petra Archaeological Park (which started operating in 2001 and serves an area that is affected by both a rapidly growing resident population in Wadi Mousa and tourist industry in Petra) (USAID, 2007c).[147] The maximum amount of wastewater that can be treated (i.e., the maximum capacity of the wastewater treatment plant) is 3600 m^3/day (Interview 24). The high quality reclaimed water produced by the plant is being used to irrigate the pilot project's plots of alfalfa, cereal crops, and fruit trees. Irrigation using treated wastewater is not an entirely new phenomenon for Jordan; it has been using treated wastewater for irrigation since the 1980s and has 23 wastewater treatment plants across the country (McCormick *et al.*, 2004; Vallentin, 2006). The dominant

[145] The US$3.5 million Water Reuse Implementation Project (2002-2004) set up three water reuse demonstration sites. These sites included Aqaba, Wadi Mousa, and Irbid at the Jordan University of Science and Technology. Specifically, the project operated and managed the demonstration sites; established the Water Reuse and Environment Unit within WAJ in 2003 to monitor and manage water reuse projects throughout Jordan; and developed a public education and awareness campaign on water reuse (USAID, 2006; WAJ, 2006f). The Jordan Badia Research and Development Center was the agency responsible for managing the project at the local level between 2002 and 2004 (PA, 2003).

[146] The four pilot projects include the three mentioned in the footnote above: (i) secondary treated effluent for restricted agricultural irrigation in Aqaba; (ii) water reuse for agriculture in Wadi Mousa; (iii) the reuse of treated wastewater in agriculture on the Jordan University of Science and Technology campus;, as well as a fourth pilot project (iv) the Greater Amman "Environment Street" in which treated wastewater is used in urban landscaping (USAID, 2006).

[147] USAID along with other donors and the Jordanian government designed and built the Wadi Mousa wastewater treatment plant. USAID contributed US$28 million of the total US$45 million cost of the project (USAID, 2007c).

approaches have been to treat the wastewater and either discharge it to the environment where it mixes with freshwater flows and is reused downstream i.e., indirect water reuse, or to directly use the effluent i.e., direct water reuse (effluent is the outflow from the wastewater treatment plant) to irrigate restricted, low-value crops (McCornick *et al.*, 2004). Jordan already uses 75 MCM per year of reclaimed water for industry, agriculture, and urban landscaping, which is 10% of the total renewable water resources in the country (CDM, 2006a). Of this 75 MCM of reclaimed water, 60 MCM are used in the Jordan Valley for irrigation, and about 10-15 MCM are used in other areas such as industry and landscaping (Carr, 2008).[148] Using treated wastewater is not without its challenges; in particular, concern among users who question the health and safety of irrigating with reclaimed water and the potential effect it might have on the ability to sell crops (Jabarin and Knapp, 2003).

For USAID, it was clear that the RIAL project (and its predecessor the Water Reuse Implementation Project) should include a pilot initiative for water reuse in Wadi Mousa's agriculture sector, because the effluent from the Wadi Mousa wastewater treatment plant was seen as an "untapped resource." Until then, the Wadi Mousa wastewater treatment plant (as were the other wastewater treatment plants in the other RIAL pilot project sites) was generating high quality water that was being discharged to *wadis*. Most of it evaporated, although there was some incidental vegetation uptake) (Interview 30). This waste of reclaimed water in a country facing severe water shortages propelled USAID's Jordan Mission Environment Officer to approach the Jordanian government and propose launching the RIAL project (Interview 114). Of course, upon selecting the land near the Wadi Mousa wastewater treatment plant as one of the

[148] Approximately 75% of all wastewater reaching the sewerage system is not lost and is eventually reused. This estimate is based on the population of Jordan and the percentage of the population connected to the sewerage system (Carr, in press 2009).

RIAL pilot projects, the next major issue was assessing who the beneficiaries - the farmers who would use the reclaimed water to irrigate their crops - of the project would be. An anthropological study by Tarawneh (2003) aimed at identifying who the most appropriate beneficiaries should be. The land upon which the farming plots would be developed is state-owed (the state being represented in this case as the PRA). It was annexed by the state in 1992. However, ownership of this land is a contentious issue because the Amareen tribe claims historical rights to this land (Interviews 26; 34; 52; 60; 83). They are a Bedouin tribe that has been settled on this land since the early 1960s[149] (Interviews 34). The study also revealed that the larger Amareen tribe consists of four sub-tribes, two of which, the Showshe and the Salamanieen, had tribal rights to the land that would be used for the USAID water reuse pilot project (Tarawneh, 2003). Because the land that USAID had planned to use for the farming plots is technically state-owned by the PRA, USAID requested the PRA to identify the Amareen tribe as the rightful beneficiaries of the pilot project and permit the two Amareen sub-tribes to use the land for the pilot project (Interview 24; Tarawneh, 2003).

In an effort to fairly distribute the potential benefits of the project, USAID decided to involve members of the largest voluntary association in the area, which happened to be the Wadi Mousa Military Veterans Cooperative (Interview 26). The deciding factor was that the Military Veterans Cooperative had the highest number of tribes from the area represented in its membership - about 23 in total (Tarawneh, 2003; Interview 34). The two Amareen sub-tribes already had their own cooperative, and when they joined the military veterans for the purposes of the water reuse in agriculture pilot project, they formed a new cooperative in 2004 known as the

[149] In 1962, the Ministry of Public Works and Housing began a large-scale initiative of building homes for those Jordanians that could not afford their own home. This, coupled with the increase in cost of living, accelerated the settlement process of many Bedouins (Interview 34).

"*Sed Al-Ahmar* Cooperative for Agricultural Water Reuse." *Sed Al-Ahmar* means red dam in Arabic, and refers to an ancient dam built by the Nabateaan in that area (Interview 52). The 40-member Red Dam Cooperative for Agricultural Water Reuse (referred to hereafter as the Red Dam Cooperative) was officially registered with the JCC in 2005 (Interviews 34; 35; 52; 61; 88; CDM, 2005a). Ten of the 40 members are military veterans and the other 30 members are from the two Amareen sub-tribes, six of them women (Interview 34).[150] There were three criteria for selecting the 40 members: a low annual household income; the ability and willingness to learn to farm; and the head of the household was required to be unemployed (Interview 61). The pilot project covers an area of 106.9 hectares, but only 60 hectares are currently being cultivated because the terrain is either too rocky or dry, or in some sections, the land has archeological value and cannot be cultivated (Interview 24). I observed on my visits that the plots formed a small patchwork of cultivated greens and golds and assorted shades of uncultivated rocky browns and greys framed by jagged barren mountains, largely typical of the *wadi*-geography of the greater Middle Easter-Gulf of Arabia region (see Figure 7).

[150] The total number of members of the Red Dam Cooperative is actually 107, but only 40 of these are direct beneficiaries of the project. The rationale for having more members is that the project will hopefully expand (i.e., this might include cultivating more land or raising livestock) and these other members will eventually benefit either through additional work or additional revenue that could be distributed among members (Interviews 24; 34; 61).

Figure 7 - Plots of land cultivated by members of the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa

Source: N. Odeh, 2007.

Each farmer has a plot of between two to three hectares of land and, on average, this plot consists of 1-1.2 hectares of fruit trees, 0.4 hectares of alfalfa, and 0.6 hectares of winter fodder crops, mainly barley and wheat (Interviews 24; 37).[151] The focus of the farming is on fodder crops (i.e., alfalfa, wheat, barley) targeted mainly at sustaining livestock, as well, as producing a residual amount for sale in local markets (Interview 26).

Besides the study by Tarawneh (2003), there is really no other documentation about the Amareen tribe (Showshe and the Salamanieen sub-tribes), or the Military Veteran Cooperative of Wadi Mousa. Through discussions with them, I gleaned more information about what the situation was like prior to their involvement in USAID's water reuse project. The majority of the population of Wadi Mousa (13,000) and the neighboring villages rely on tourism in Petra,

[151] The fruit trees were planted during the Water Reuse Implementation Project (2002-2004) when PA Consulting was implementing the demonstration projects. Since then, the Ministry of Tourism and Antiquities has enforced the law that no fruit trees are to be planted on the designated project land because they could alter the natural environment of the area. As a result, no additional fruit trees have been planted since CDM started implementing the RIAL project in 2004 (Interviews 24; 26).

agriculture (mostly pastoral farming), and government (primarily military jobs) to earn an income (Tarawneh, 2003; Interviews 34; 36; 37; 59; 116). However, the specific Amareen sub-tribes that were identified to be the beneficiaries of this agricultural water reuse pilot project did have a fair amount of agricultural experience in the larger Wadi Araba area, where they grow watermelons, tomatoes, and citrus crops some twenty years ago (Interview 52). More recently, (but prior to the RIAL project) most Amareen tribesmen plant barley and wheat crops for human and livestock consumption. Very little was sold, so it was essentially subsistence farming (Interview 34). Furthermore, crops were rainfed only. There was no irrigation system they could rely on (Interviews 24; 30; 36). Family sizes are relatively large. The average family has nine children (Interview 60). Timing was a crucial issue with respect to accepting the concept of water reuse in agriculture. Starting in 2000, tourism in Petra which has always thrived and been a major source of income for locals, reached a new low with fewer tourists visiting Jordan (given the volatility in neighboring Palestine and Israel). This slowdown in tourism pushed many in the community back into agricultural activities (Norton and Jabarin, 2006). Another factor was the drought that severely affected agriculture and livestock between 1997 and2001 (Tarawneh, 2003; Interviews 24; 34).

There are various partners in this initiative: the members of the Red Dam Cooperative, USAID, CDM, the PRA, WAJ, and the Hashemite Fund for the Development of the Badia. This case study investigates the role of each stakeholder. I also focus on the partnership among the members of the cooperative, as well as between the cooperative and the government (where the government in this case refers to the PRA and WAJ), and the cooperative and CDM and the Hashemite Fund for the Development of the Badia.

4.3.2 Evaluating the effectiveness of the partnership

As in all previous case studies, there are four broad measures that I use to assess the effectiveness of the partnership: (i) water quality; (ii) sustainability of supply; (iii) affordability and financial arrangement; and (iv) efficiency of service. The primary challenge of assessing the effectiveness of the partnership in this case is that the only published evaluations of the Wadi Mousa component of the RIAL project are the USAID-funded reports that CDM produces bi-annually. There has been no "third party" review of how the RIAL initiative has fared, and certainly nothing focused on the Red Dam Cooperative. This introduces a bias into the reference material I have available. However, my interviews with representatives from all the various partners contribute to engendering a degree of balance.

(i) Irrigation water quality

The water that we are concerned with is the effluent discharged from the wastewater treatment plant. Water quality testing at the Wadi Mousa wastewater treatment plant is conducted periodically by MIWI (as is the case with all other wastewater treatment plants in Jordan) (Interview 24). Since the start of the RIAL pilot project in 2004, that effluent water quality has been described as "excellent" (CDM, 2006a). The treatment plant does both primary treatment (physical removal of solids) and secondary treatment (biological removal of dissolved solids), which renders the effluent suitable for use as irrigation water (Interview 24). The reclaimed water from the Wadi Mousa wastewater treatment plant must meet the Jordanian Standards for Reclaimed Domestic Wastewater (JS 893:2002), produced by the Jordanian Institution for Standards and Metrology. Tests have shown that the water quality of the effluent from the Wadi Mousa wastewater treatment plant has always been superior to the "Class A" end-use which is the most stringent category of reclaimed domestic wastewater quality. Water that meets Class A criteria can be used to irrigate vegetable crops (that must be then be cooked before eating), landscaping parks and playgrounds and roadsides (JISM, 2002).[152] Table 22 details the water quality criteria for meeting Class A, B, and C standards.

Table 22 - Water quality criteria in the Jordanian Standards for Reclaimed Domestic Wastewater

Water quality criteria	**Allowable water quality limit for each end-use (A,B,C)**		
	A – irrigating cooked vegetables, landscaping parks, playgrounds, roadsides	B – irrigating fruit trees, landscaping roadsides outside city limits and green areas	C- irrigating industrial crops and forest trees
BOD_5 (mg/l)	30	200	300
COD (mg/l)	100	500	500
DO (mg/l)	>2	--	--
TSS (mg/l)	50	150	150
Ph (unit)	6-9	6-9	6-9
Turbidity (NTU)	10	--	--
NO_3 (mg/l)	30	45	45
T-N (mg/.l)	45	70	70
E.Coli (MPN or CFU/100 ml)	100	1000	--
Intestinal helminth eggs (eggs/l)	<or=1	<or=1	<or=1

Source: JISM, 2002.

Soil analyses at Wadi Mousa have also consistently been within acceptable limits for all parameters in the regular soil tests (CDM, 2006a). Electrical conductivity, the main measure of salinity, has always been below the critical level, which is evidence that there is no salinity build-up (CDM, 2006a). Heavy metal concentrations are very low (CDM, 2006a: Interview 24) and there have not been any health issues with the livestock since the project began. The farmers are not growing any vegetable crops or any crops for human consumption, the focus is on growing fodder (alfalfa, barley, wheat) for their livestock (Interview 24). One advantage to using treated wastewater for irrigation in this case is that, unlike relying solely on rainfall as farmers did

[152] A revised set of standards for reclaimed domestic wastewater were produced by JISM and issued in 2006. and took effect in March 2007. The main reasons for revising the 2002 standards were to make them more compatible with international norms, and to make them more stringent in order to support the export of agricultural production. The main difference between the 2002 and 2006 standards is that the latter has more stringent levels of the allowable concentration of nitrates that can be discharged into the environment i.e., into streams and other receiving bodies (JISM, 2006).

previously, the effluent from the treatment plant contains nutrients that are beneficial to the soil and reduces the need to add fertilizer (Interview 30).

WAJ owns and operates the wastewater treatment plant and is responsible for monitoring water quality effluent from the Wadi Mousa wastewater treatment plant. Although the partnership has not directly influenced the quality of the effluent, the partnership has attempted to exert some influence on water quality by having CDM, as well as the farmers, act as an external monitor of water quality by checking the data compiled and flagging any issues to WAJ. For example, as the project's Agricultural Task Leader at CDM explained, once or twice a year pathogen levels in the effluent are high and could pose potential health problems (Interview 24). CDM advised WAJ that in these instances, it should notify the farmers immediately, fix the problem, find a way to discharge the effluent safely and close the facility temporarily. However, WAJ has not heeded this advice and luckily there have been no health problems to humans or the livestock (most likely because the concentration of pathogens becomes diluted by the time it reaches the plants). Nevertheless, this is worrisome (Interview 24). The farmers themselves have been known to inform WAJ when the concentration of suspended solids in the irrigation water is high enough that it covers the seeds and adversely affect crop growth (Interview 26). The farmers usually bring their complaints to the head of the cooperative, where a few representatives then discuss the issue with WAJ and show them the clogged pipelines as evidence of the problem (Interview 26).

(ii) Sustainability of supply

Interestingly, sustaining the supply of irrigation water for the farmers is not as important an issue as it has been in the other cases investigated, because a major objective of the water reuse for agriculture at the Wadi Mousa site is to use as much of the available treated wastewater as possible for agricultural production (CDM, 2007b). Again, the rationale as mentioned earlier is to avoid having the wastewater treatment plant discharge high quality water into the *wadis* where most of it would be lost through evaporation (Interview 24; 30). The actual sources of wastewater coming into the Wadi Mousa plant are mainly household connections in the town itself, where approximately 60% of residents are connected to the sewerage system, as well as from the hotels in nearby Petra. This means there will always be a supply of wastewater entering the Wadi Mousa treatment plant. There are no industries supplying wastewater to the plant (Interview 24). The maximum operating capacity of the Wadi Mousa plant is 3600 m^3/day (which it has not yet reached), and the effluent from the plant has steadily increased over the years. It started at close to 500 m^3/day when the plant started operating in 2001, and in 2007 reached almost 1900 m^3/day (CDM, 2007b; Interview 24). CDM devised the cropping pattern which consists of mainly fodder crops such that as much effluent as possible can be used for irrigation. The level of effluent utilization is lowest in the winter months (on average 30%) when rainfall is highest, and peaks during the summer months reaching 90-100% (CDM, 2007b). Alfalfa was selected as the main fodder crop because of its very high water demand; however, it was clear from the beginning that there was not enough treated wastewater for every farmer to grow only alfalfa on their plots. In order for all farmers to benefit (alfalfa is the most lucrative fodder crop) from growing alfalfa, each farmer had to restrict alfalfa cultivation to 0.4 hectares, and plant the remainder of the plot with barley and wheat (CDM, 2007b; Interview 37). Another significant point about the supply of effluent is that there are no water storage facilities on-site, except a 500 m^3 storage pond. This means that farmers cannot always depend on a constant volume of effluent, and that it tends to fluctuate weekly and monthly (CDM, 2006b). The suggestion is that farmers base their cropping pattern on weekly or monthly water availability rather than annual figures (CDM, 2006b).

Thus, in water reuse for agriculture, water saving is not the goal. Rather, water utilization is the aim. Water utilization is lowest during the winter months when most effluent is discharged into the nearby *wadis* because the increase in rainfall replaces the need to irrigate. CDM had asked the farmers to continue to irrigate their plots not because they are thirsty, but to leach (applying a small amount of excess irrigation water) the salts (treated wastewater does have a relatively high salt content) in an effort to avoid a build up of salts in the soil. The farmers cannot afford to do this in the summer when all the water is needed for irrigation (Interview 24). Farmers receive about eight hours of irrigation water once a week (Interview 34). On-farm water efficiency has greatly improved as a result of this partnership. The CDM project site manager trained every farmer on using drip irrigation because farmers were previously using the more wasteful technique of flood irrigation (Interview 61).

My initial assumption before meeting with farmers in Wadi Mousa was that the issue of illegal use of irrigation water (e.g., taking water out of turn or tampering with the irrigation system) would be as important an issue in this case as it was with the farmers in the Jordan Valley. This was not the case. Neither the CDM project managers nor farmers voiced any problems regarding the illegal use of water (Interviews 34; 35; 36; 37; 59; 60; 61; 116). When I raised this point with the head of the cooperative, he advised that there had never been a problem with stealing water and that such an act would be perceived as the biggest *abe* (shame). This is because all members of the cooperative know each other very well (the two Amareen sub-tribes are like extended families, and the military veterans know each other as well). In addition, WAJ is responsible for the operation and maintenance of the wastewater treatment plant, and of the distribution pipelines from the wastewater treatment plants to the farm units' gates (according to the rotation schedule that had been designed by the CDM project staff). Thus, farmers are only in charge of ensuring their filters are clean and opening the head unit on their farm. This leaves little room for improper use of the irrigation system[153] (Interview 37; CDM, 2006b).

(iii) Affordability and financial arrangement

Given the central role that USAID played in establishing the water reuse project for agriculture in Wadi Mousa, it is important to understand how capital and operating costs are funded. From the outset, USAID's and CDM's intent has been that they will cover nearly all costs of the project for 3.5 years. The Red Dam Cooperative will subsequently become financially self-sufficient. Steps have been taken in this direction as I explain below (e.g., charging for equipment rental, establishing a revolving fund, learning to manage the irrigation network, etc.). As for the project's capital and operating costs, these totaled US$441,000 over the 3.5 years. The capital costs included purchasing equipment, land surveys, and the like, while the operating costs covered, *inter alia*, electricity, irrigation system maintenance, office supplies, and salaries for the site manager, guards, and daily laborers for general maintenance (CDM, 2007c). Table 23 lists the various costs incurred.

[153] Unlike the pressurized irrigation network in the Jordan Valley for distributing irrigation water, the system here is a network of pipelines, but on a much smaller scale and not pressurized.

Table 23 - Costs associated with the water reuse project for agriculture in Wadi Mousa

Types of costs	Operating Cost (US$ per month)	Total Cost (US$ over 3.5 years)
Capital costs:		
Tractor with mower and baler	NA	62,374.12
Farm expansion	NA	162,062
Survey work	NA	703.23
Land leveling	NA	3206.75
Sand filters and winter irrigation equipment	NA	12,897.65
Cut flower bulb/seedlings	NA	5568.90
Alfalfa cutter	NA	7000
Horse	NA	1000
Ride-on mower and chisel blow	NA	7000
Sub-total		**261,812.65**
Operating costs:		
Site manager salary and benefits	2752.47	115,604
Guards salary and benefits	233.23	9796
Laborers	545.70	22,919
Electricity	42	1764
Balor twine	70	2940
Horse fodder	42	1764
Irrigation system maintenance	140	5880
Mower maintenance and oil	47.6	1999.2
Tractor maintenance and oil	35.42	1487.64
Mobile phones and office supplies	35	1470
Vehicle maintenance and gasoline	420	17640
Tractor and mower diesel*	50	2093.28
Irrigation water from wastewater treatment plant*	490	20580
Tractor, baler, and mower operators*	16	672
Sub-total	4919	**206,609**
TOTAL	4919	**468,422**

* The cost of these three budget items were incurred by the cooperative.
Source: CDM, 2007c.

In terms of understanding the issue of affordability, I gathered data on what the farmers earned by selling their fodder crops, their expenses with respect to farming, as well as how the cooperative manages its funds. A Memorandum of Understanding between the PRA, WAJ and the Badia Research and Development Center (the Center is an NGO that conducts research and implements projects) governs the delivery of treated wastewater from the Wadi Mousa plant. This Memorandum guarantees farmers access to the treated irrigation wastewater for a fee of US$0.014/cubic meter (CDM, 2004a). The tariff is set by the government and is applied to the reclaimed domestic wastewater across Jordan i.e., not only in Wadi Mousa (Interview 24). Paying for their irrigation water is one of the farmers' expenses. On average it amounts to US$14-17 per month, or about 7% of their annual income from selling their production of their respective plots (Interview 37; 61;107). Farmers' next biggest expense is their annual fee for membership in the cooperative. This amounts to an annual US$127 per farmer, which is approximately 4% to 5% of a farmers' annual income (Interview 107). This fee allows them to produce on their plot and the payments go into the cooperative's communal fund, which is then spent on general maintenance and up-keep of all the plots of land. The farmers' third major expense is the cost of renting machinery, all supplied by USAID namely, a tractor, mower, and a baler (which is a machine that compresses the fodder once harvested and dried, making it easier to transport and store) (CDM, 2007b). In 2006, the cooperative decided to charge members for using the machinery so that rental fees could be pooled and spent on operation and maintenance costs,[154] in an effort to start saving funds and become more financially self-sufficient[155] (CDM, 2007b; Interviews 24; 35; 50). There are two individuals responsible for the operation and maintenance of each machine. They are farmers who have been trained and are compensated by the cooperative from funds garnered through the machines' rental fees (CDM, 2007b). On average, each farmer spends close to US$70.60 per annum to rent these three farming machines (Interviews 37; 61; 107).

[154] The cooperative charges the following for using the machinery: US$3.50 per 0.1 hectare for the alfalfa mower; US$7 per hour for tractor use; and US$0.28 per spool of baling twine for use on the baler (CDM, 2007a). In 2006 the cooperative recouped close to US$3,107 in charges for renting these three machines to farmers (CDM, 2007a).
[155] Encouraging the individual farmers, not just the cooperative as a whole, to save their earnings and become more financially independent has been met with some reluctance. Some farmers complained that they were still waiting for the CDM project staff to buy him more drip irrigation pipes (CDM distributed the same amount of pipes to each cooperative member), and they shunned the idea of using their own savings to purchase additional pipes (Interview 60).

With respect to the income component of the equation, the average income for a farmer from selling fodder crops (the fruit trees are still too immature for meaningful production, only the olive trees have been a minor source of income) is considerably greater than his/her expenses, and most farmers do enjoy a profit (Interviews 24; 37; 61; CDM,2006[156]). In 2007, 1 tonne of alfalfa earned US$56.50 and farmers were able to produce 15-18 tonnes of alfalfa per 0.1 hectare. On average therefore, a farmer could earn US$2825 per year for their 0.4 hectares of alfalfa. The other 0.6 hectares of fodder crops (barley, wheat, and vetch) brought in US$706 per year for each farmer. This yields an average gross total annual income of US$3531 (Interview 24). This is a big increase over the average gross US$508 annual income of these farmers prior to the formation of the cooperative. In 2005, the total annual income was closer to US$2119, and in 2004 the alfalfa only brought in US$706 (the increase over the years has to do with increasing the area given over to alfalfa reaching 0.4 hectares in each farmer's plot, and also being better able to market the production). The CDM Agricultural Task Leader explained that annual income for beyond 2007 is expected to increase further because there are plans for the farmers to expand the area seeded to alfalfa still further (Interview 24). To date, the farmers sell their production to small-scale, local animal producers who need fodder. The demand is high mainly because Wadi Mousa has a very large demand for alfalfa fodder in particular, and only the Red Dam Cooperative produces it locally. Most wheat and barley is imported, and is only sold in limited quantities at a subsidized price to farmers by the government (CDM, 2006b). One limiting factor to a farmer's income is that although most, if not all, the fodder crops are supposed to be sold for income generation according to the project's guidelines, many farmers

[156] A socio-economic survey conducted in 2006 by a consultant hired by CDM compiled data on many potential impacts of the pilot project on water reuse in Wadi Mousa. One of the impacts investigated was the proportion of farmers that have accrued a profit by selling their agricultural production. Approximately 76% of the respondents indicated that they had made a profit (CDM, 2006c).

do not sell all their winter crops (barley and wheat), choosing instead to consume most of it themselves for food purposes, or use it as fodder for their own animals (Interviews 24; 35).

I will add here that farmers' ability to continue to afford the inputs necessary to sustain farming using reclaimed water, will likely be greatly assisted if the revolving fund is actually established. This fund has been suggested since 2004, when it was proposed by the CDM project team. The aim of the fund is "to provide farm credit access to improve livelihoods, by start up funding for income-generating activities, with particular preference given to ventures that further the goal of increasing use of reclaimed water in the project area" (CDM, 2005b, p.3). A proposal for creating the revolving fund has been prepared by CDM and this was proposed to Jordan's parliament so that a law for the revolving fund could be enacted. However, the proposal was turned down most likely because the Parliament deemed that the Red Dam Cooperative did not have sufficient skills to manage a revolving fund (Interviews 24; 26). There are renewed efforts by the new managers of the pilot project in Wadi Mousa who took over from CDM in January 2008 - the Hashemite Fund for the Development of the Badia - to work with the appropriate government officials to issue a regulation mandating the creation of a revolving fund. As of early 2009, the Fund was still working on developing the appropriate regulation and this issue area is discussed in more detail in section 4.3.3 below) (Interview 113).

(iv) Efficiency of service

The service being provided in this particular partnership is the provision of treated wastewater to irrigate fodder crops and fruit trees. The main factor that could potentially influence the efficiency of service is the supply of irrigation water, which as discussed in sub-section (ii) above, has so far been constantly reliable because there will always be domestic wastewater flowing into the treatment plant. To date, farmers have not been involved in any kind of illegal use of irrigation water i.e., taking water out of turn, tampering with the irrigation system, etc.

The other aspect of this partnership that has helped maintain a reliable supply of irrigation water (that I have referred in other sections above) is the manner in which crop patterns and area allocated for farming has been carefully calculated and monitored by the CDM project team since 2004 (Interviews 24; 35; 36; 60; 61; 116). The agricultural experts have given much thought to the type of fodder crops that should be grown. The site manager initially experimented with several crops such as millet, corn, sudan-grass, barley, alfalfa, and cassava, until he determined that alfalfa (which grows year-round), and two winter crops (barley and wheat) would be the most productive and suitable for the soil (Interview 35). An equal amount of effort went into calculating the proportion of each plot that should be dedicated to the main fodder crop - alfalfa - and the other winter fodder crops, according to the volume of effluent from the treatment plant. If more effluent than expected is generated from the wastewater treatment plant, then the cropping pattern can be modified and each farmer will be allowed to farm an additional 0.1 hectares of alfalfa. Farmers are not permitted to change the cropping patterns on a whim because this could disrupt the balance between the crops' utilization of water and the supply of treated wastewater from the plant (Interviews 24; 35; 60). The efficiency of providing the irrigation water to the farmers depends on the expertise of the CDM project staff, which will likely be an issue that the new managers of the pilot project (the Hashemite Fund for the Development of the Badia) will need to address. However, there has been a fair amount of knowledge transfer from CDM to the farmers that has already taken place (I discuss this in section 4.3.3 below).

This case study focuses on a partnership among the members of the cooperative, as well as between the cooperative and the government (where the government in this case refers to the PRA, WAJ), and the cooperative and CDM and the Hashemite Fund for the Development of the Badia. It has been effective - measured in terms of all four indicators of effectiveness - for the 3.5 years that CDM that implemented the pilot project (until January 2008). The section below analyzes the factors that underlie these positive outcomes.

4.3.3 Explaining the outcomes: What influenced the effectiveness of the partnership?

As in the three preceding case studies, it is the institutional arrangements that I believe account for the varying level of effectiveness in the partnerships. I also suggest that other intervening variables play a significant role as well. This section explores the institutional arrangements that seem most important: governance structure, legal setting, the contract, policies, and information channels. I also discuss three intervening variables: sustainable livelihoods, knowledge transfer, and innovative organizational arrangements, that were also significant influences on the success of the partnership.

(i) Governance structure

As with the water user cooperatives in the Jordan Valley, much of the governance structure of the Red Dam Cooperative is guided by the requirements of the JCC (which registered both cooperatives). The Red Dam Cooperative has an elected "board" (as is the case with the water user cooperatives in the Jordan Valley) comprised of six members plus the president/head of the cooperative. Elections take place on an annual basis (Interviews 36; 52; 116). This includes the election for the head or president of the cooperative. Currently, the presidency is held by the *sheikh,* who is the tribal leader of one of the Amareen sub-tribes (the Showshe sub-tribe), which has historical tribal rights to the land being farmed. He was unanimously elected when the cooperative was officially registered in 2005, and will likely remain the head over many annual confirmatory votes to come, given the tribal custom of placing their *sheikh* at the head of any decision-making body (Interview 26; 34). There is an annual meeting for all members. However, any technical problems that require immediate attention have been directed to the CDM project site manager (Interview 116). The board acts much like a management committee. They meet once a month and discussions center around the water rotation schedule, maintenance of the farm machinery, proposals for new ideas (e.g., new machines), the cropping pattern, financial reporting (e.g., tracking machine rental payments), and admitting new members. The CDM project site manager is always present at the monthly meetings (Interviews 36; 107). The site manager told me that he performs a dual role of advisor and trainer. The latter is crucial so that the cooperative can eventually become self-sufficient (Interviews 26; 36). Two of the seven members of the board are women and they have told me that they try to be as vocal as possible regarding their needs and concerns (Interview 37). The participation of women in this cooperative is a significant achievement because although women are generally involved in farming activities at the household level across Jordan, it is not common for them to take on managerial roles. Further, the six women chosen to be members of the cooperative were the ones most in need of help. That is, they were widowed, divorced, or unemployed. They came from one of the Amareen sub-tribes that had historical tribal rights to the land (Interviews 30; 37; 52).

The only point of contention the farmers mentioned having to grapple with is the initial resistance from the Amareen tribesmen to having members of the Wadi Mousa Military Veteran Cooperative join the cooperative. Unlike the Amareen, the veterans do not have any historical rights to the land (Interviews 52; 61).

The cooperative also has a system for issuing warnings to members of the cooperative who have not done an adequate job of taking care of their farm plot, or who have fallen behind in paying their annual membership fee (Interview 34). These warnings, signed by the board, advise the farmer of his/her wrongdoing, and inform them that they have one week to resolve the issue or else their land will face confiscation (RDC, 2005a). The board is strongly encouraged to issue these written penalties. However, many times they are reluctant to do so, and prefer to issue verbal warnings because it is more customary for tribe members to interact with each other through discussion (Interview 52). Also, much like the water user cooperatives in the Jordan Valley, the Red Dam Cooperative has its own internal statute. This is a long, detailed document that explains the membership process, governance of the board/management committee, management of pooled funds, and objectives of the cooperative (RDC, 2005b). I would venture that having rules and decision-making processes spelled out in clear terms would likely improve any group's governance arrangement.

What I think is noteworthy is that much of the governance structure and processes were generated by the CDM project staff. The CDM project staff, such as the site manager, has attended every one of the cooperatives' meetings (board meetings and annual members meetings). They also initiated and moderated the initial meetings in 2004, between the various partners involved (i.e., the Amareen Cooperative and the Wadi Mousa Military Veterans Cooperative [this was before the Red Dam Cooperative was created]), the PRA, WAJ, and the Hashemite Fund for the Development of the Badia) to discuss each groups' interests and vision for the future management of water reuse for agriculture (CDM, 2005). I believe one potential governance obstacle that existed when CDM managed the pilot project (and may or may not continue to be an obstacle under the management of the Hashemite Fund for the Development of the Badia) is that very few, if any, ideas and concepts applied in this project are "homegrown." Everything from the technology to the cropping patterns, the financial management, and the business plan have been produced by outside experts. Although, the farmers have been trained extensively in many aspects (as I will discuss in sub-section (iii) below), and participated to the extent that they can in developing various plans and processes to guide this project, there is very little local knowledge built into the institutional arrangements. The learning curve on technical and managerial issues remains steep for this cooperative (Interviews 50; 60; 88). This may mean that it will take considerable time for it to stand independently, and function without any outside support.

The one facet of this partnership's governance arrangement that I believed would be the most straightforward, is the relationship between the cooperative and the relevant government partners, mainly the PRA.[157] As I learned more about this partnership, it became clear that the government's role is ill-defined. The main government partner is identified as the PRA, primarily because it is the owner of the project's land (USAID, 2004b), and according to its mandate has "full responsibility to develop all areas of the region[158] … and develop the social status of the population including supporting the establishment of special non-governmental organizations, in order to give the people the opportunity to participate effectively in the development of the region" (PRA, 2004). The PRA was created in 2001 and its mission is akin to that of a municipality. The area under the PRA's jurisdiction includes (in addition to the city of Wadi Mousa and the land on the outskirts of Wadi Mousa where the pilot project is located)

[157] The other principal government partner is WAJ and their responsibility is the operation and maintenance of the wastewater treatment plant and the distribution of water to the farmers' plots, as well as the collection of irrigation water fees. However, their interaction with the cooperative is minimal (Interview 60).
[158] This includes activities related to landuse planning, infrastructure project (roads, parks, wells, etc.), and tourism (PRA, 2004).

the Petra Archaeological Park, the protection of which is the focus of its work (PRA, 2004; Interview 83). The PRA is managed by a council of 13 members (six are officials from various ministries e.g., Ministry of Environment, Ministry of Interior, and the other seven are local community members), headed by the Authority's General Manager. The latter reports directly to the Prime Minister (Interview 83).

CDM had originally outlined a fairly ambitious role for the PRA within the context of the water reuse pilot project. This included developing a contractual relationship between the Red Dam Cooperative and the PRA, as well as building the PRA's capacity to eventually take over the management, operation and maintenance of the project after CDM's departure from the initiative in January 2008 (CDM, 2004b). However, the PRA performed a considerably less active role than the one originally envisioned. The PRA was usefully involved mainly by having one of its employees seconded (compensated by USAID) to work with the cooperative, the CDM project site manager and WAJ operators of the Wadi Mousa plant from the beginning (CDM, 2004b; Interviews 26; 50; 83; 88). However, the PRA did not have the intention of becoming very familiar with the technology and management of the water reuse project, nor did it aspire to taking it over after CDM left at the end of 2007. As the General Manager of the PRA explained to me "when CDM started implementing the water reuse project in Wadi Mousa in 2004, the PRA became unofficially involved ... it is not within our mandate to help the Red Dam Cooperative, but we still try but we are not that involved ... there is no involvement financially like maintaining their farming machinery, because that is a cost and the cooperative is supposed to be financially self-sufficient ... so we might lend them a piece of machinery or provide advice during a meeting but nothing more" (Interview 83). In fact, in 2003 the Jordan Badia Research and Development Center prepared a contract between the PRA and the Amareen tribe's cooperative (before the Amareen tribe joined forces with the military veterans to form the Red Dam Cooperative) that outlined the responsibilities and rights of each actor within the context of the water reuse project (BRDC, 2003). The contract was never implemented because the PRA refused to sign on the grounds that it did not want to be more formally engaged with the cooperative (Interview 60). There is speculation that the PRA did not welcome the increase in workload it would have assumed, nor did it see any direct benefits from formalizing their relationship with the cooperative (Interviews 26; 60; 88). Farmers advised me that none of them had strong views about the PRA and a few did not perceive them as a key government partner, or indeed did they even know very much about them (Interviews 34; 59; 61; 116). In my view, this is a problem because the minimal interaction between the PRA and the cooperative increased the reliance of farmers on CDM for technical and managerial expertise and support and has failed to forge a functioning partnership between the cooperative and their government partner.

The entity that is seen as a proxy government partner to the Red Dam Cooperative is the Hashemite Fund for the Development of the Badia (Interviews 26; 34; 89). The Fund was formed by the Royal Hashemite Court and the Court itself is essentially the bridge between the monarchy and the government (RHC, 2007). The head of the Fund is a member of the Jordanian royal family - a *Sharifa*[159] - whose ancestors are from the Badia, and who is very knowledgeable about the Badia region in Jordan (Interview 89). The *Sharifa* has worked extensively on the development of the Badia region as both finance manager of the BRDC until 2003, and now founder of the Hashemite Fund for the Development of the Badia, which supports diverse social and economic initiatives across the entire Badia region in Jordan. The *Sharifa* has been involved with the USAID water reuse initiative in Wadi Mousa since 2002, when it was just a

[159] A *Sharifa* (feminine of *Sharif*) is an honorary title given to a high-ranking member of the Jordanian Royal Family. The specific member of the Royal Family will remain anonymous, as with all my interviewees.

demonstration site. She has been a supporter of water reuse in Wadi Mousa since day-one. She was instrumental in encouraging the Amareen tribes-people to consider using reclaimed water for irrigation, despite their serious reservations. Urging the Amareen to participate in all major decisions about creating a joint cooperative with the veterans and including women members was also one of her key accomplishments, as was the proposal for a revolving fund, and the future of the pilot project (Interviews 26; 34; 52; 89). In September 2007, a Memorandum of Understanding was signed between the Hashemite Fund and CDM, stating that as of January 2008 the Fund would be fully responsible for the management of the water reuse pilot project in Wadi Mousa.[160] The *Sharifa* has a long and positive history with the Amareen tribe, and has a number of ideas about the future of the project. She has brought other Bedouin tribes from around Jordan to witness first-hand the experiences of a Bedouin tribe using treated wastewater for irrigation (Interview 52).

> I'm lucky to say that I have had a good relationship with them for 20 years or so ... and when you talk about development in the Badia of Jordan, I think there are such opportunities, and when this water reuse project started, I said to the Amareen tribe "one day you are going to be a model for others in Jordan" because water is such a topical issue. We are such a water poor country, and this is in fact what happened. ... What I hope can happen in the future is that we can expand the use of treated wastewater ... I would like to see, particularly, more and more cooperatives working ...We as a fund also want to see what can we have as spin-off projects from this ... could the unemployed youth in the project area be involved in ecotourism, bee-keeping, dairy cattle. I'm keen to move on to the next generation. (Interview 89)

It looks like the Hashemite Fund has been, and will hopefully, continue to a reliable and dedicated partner to the cooperative. I think the Fund will play a continuing and significant role in sustaining water reuse for irrigation.

[160] These responsibilities include, *inter alia*, representing the cooperative in meetings with various government agencies or donors; monitoring water quality effluent from the wastewater treatment plant; assisting the cooperative with the irrigation schedule, cropping pattern, and operation and maintenance of the machinery; paying the salaries of the project staff hired; and assisting the cooperative in managing the revolving fund once it is established (CDM, 2007e).

(ii) The legal setting and the contract

The only legal framework that the cooperative is required to abide by is the rules and procedures for cooperatives put forth under the *JCC Law No.18* (1997) (Interviews 26; 83; 88). The JCC plays more of an active role in this case than it does with the water user cooperatives in the Jordan Valley for example, because the JCC as a national body has a local chapter based in Wadi Mousa. This chapter oversees all cooperatives in the area including the Red Dam Cooperative. The head of this local JCC chapter monitors the Red Dam Cooperative to ensure they are in-line with JCC requirements, and this involves reviewing the cooperatives' documentation, auditing its financial records, and attending the cooperatives' monthly and annual meetings (Interview 26). There are also several Jordanian laws that refer to how treated wastewater should be handled, monitored, and used for agriculture[161] (Norton and Jabarin, 2006). What might matter most to the members of the Red Dam Cooperative is that using treated wastewater for irrigation is permitted according to Islamic Law as a result of a special *fatwa* (which is a ruling on a point of Islamic law given by a recognized authority) issued in 1978 by the Council of Leading Islamic Scholars in Saudi Arabia (Faruqui, 2001).

There are a few contracts that deal with various aspects of this partnership in Wadi Mousa. The main one is the project agreement, in the form of a grant between USAID and the Government of Jordan to launch the RIAL project. It allocated US$7.1 million to all four components of the RIAL project (USAID, 2006).[162] The water reuse for agriculture pilot project in Wadi Mousa is

[161] The relevant Jordanian laws include the following: Administrative Organization Regulation MWI No. 54 (1992); *Jordan Valley Development Law No.19* (1988) amended in 2001; *Water Authority Law No.18* (1988) amendments 16 (1998) and 62 (2001); *Law of Agriculture No. 44* (2002); *Environmental Protection Law No.1* (2003); *Public Health Law No. 54* (2002); *Underground Water Control By-Law No.85* (2002) (Norton and Jabarin, 2006).

[162] In addition to the Wadi Mousa water reuse for agriculture pilot project, there were three other RIAL pilot projects: (i) secondary treated effluent for restricted agricultural irrigation in Aqaba; (ii) the reuse of treated wastewater in agriculture on the Jordan University of Science and Technology campus; and (iii) the Greater Amman "Environment Street" in which treated wastewater is used in urban landscaping (USAID, 2006).

one of these components and, as explained in section 4.3.2 (iii) above, the Wadi Mousa budget amounted to just over US$469,000. As I have also mentioned earlier, there were two important Memoranda of Understanding: one centered on the delivery of treated wastewater from the Wadi Mousa wastewater treatment plant is between the PRA, WAJ and the Badia Research and Development Center[163]; and the second is between CDM and the Hashemite Fund for the Development of the Badia. It concerns CDM handing over all the project management responsibilities to the Fund in January 2008. Noteworthy is that there is no contract between the PRA and the Red Dam Cooperative outlining what each can expect of the other and what activities they are expected to coordinate. This did not happen because of the reluctance of the PRA to formalize its engagement with the cooperative. Such a contract might have made a substantial positive impact on the cooperative's activities because it would have provided these organized farmers with an official government partner, which, in turn, would have brought extensive local knowledge, as well as in-house technical and managerial expertise to bear on the initiative. This might have diminished the heavy reliance of the cooperative on external help from external consultants.

(iii) Information channels and policies

The monthly and annual meetings between the members of the cooperative and the fact that the meetings were attended by the CDM project site manager, a couple of officials from the PRA, and occasionally the *Sharifa* from the Hashemite Fund, meant that all parties had numerous

[163] The main points covered in this particular MOU, signed in January 2003, are the following: the members of the cooperative are charged US$ 0.014/m^3 for the treated wastewater used for irrigation ; WAJ is to supply the farmers in the cooperative with treated wastewater of a quality that is compliant with Jordanian standard JS893:2002; WAJ has the right to reduce or stop the distribution of reclaimed water for any reason (technical problems, upgrading of the plant, etc.) and without any obligations to compensate users; WAJ is permitted to perform its crop and soil monitoring program; and PRA should provide WAJ with any study results performed on the site (CDM, 2006d). WAJ also signed an agreement directly with the Red Dam Cooperative. It is basically the same as all agreements between water users and the government, and includes all the main points that are in the MOU signed between PRA, WAJ, and the Badia Research and Development Center (CDM, 2006d).

opportunities to express concerns or raise issues (Interviews 26; 52; 83). It also allowed for a constant exchange of information between the farmers and both the PRA and CDM (Interviews 34; 36; 37; 50; 59; 61; 116). Having a CDM project site manager based in Wadi Mousa meant that he interacted with the cooperative every day, and could relay information and feedback from the farmers to his colleagues at CDM and the Hashemite Fund (Interview 59).

It was somewhat surprising that none of the interviewees mentioned the existing policies on treated wastewater and the degree to which they influenced the effectiveness of the partnership. There are several national-level policies regarding wastewater reuse in Jordan and these engage various ministries. However, such ministerial responsibilities very often overlap, and there is inadequate clarity on how to actually apply the policies. To be clear, the problem is not a lack of well-articulated polices, rather it is the weak implementation of the policies. Below is an overview of the policy and regulatory framework, and an identification of what key gaps exist (CDM, 2007a; MWI, 1998; 2002a; 2007):

- There are three principal national-level policies that address using treated wastewater: the "National Agenda 2006-2015" (which predicts the construction of 17 new wastewater treatment plants in addition to the 19 that exist); the "2002-2010 MWI Action Plan" (MWI, 2002a); and "Jordan's Water Strategy and Policies" which includes a Wastewater Management Policy (1998) that states that "[t]reated wastewater effluent is considered a water resource and is added to the water stock for reuse. … priority shall be given to agricultural reuse of treated effluent for unrestricted irrigation" (MWI, 1998, p.92). What is missing from these policies are proposals about how the increased treated wastewater (assuming even more wastewater plants are built) will actually be used, where and by whom. An additional factor is that the actual designs of new (and old) wastewater treatment plants do not include water reuse plans (CDM, 2007a).

- The monitoring of treated wastewater is within the scope of a few ministries: the MWI's Water Reuse and Environmental Unit; the Ministry of Health's Environmental Health Directorate; and the Ministry of Environment's Water Protection Directorate. The main challenge is that the government agency responsible for monitoring is the same one that issues regulations. This means there is usually little incentive to report non-compliance in the water quality of the treated wastewater.
- The Ministry of Agriculture and the Ministry of Health play a regulatory role in water reuse. The Ministry of Agriculture, through the *Law of Agriculture No.44* (2002), must ensure compliance with the standards and rules it sets on the use of wastewater in irrigation specifically. The Ministry of Health, through the *Public Health Law No.54* (2002), monitors compliance with public health-related standards for water reuse, especially in agriculture so as to ensure that farmers do not grow crops that are not permitted under Jordanian law (CDM, 2007a). The issue is that most governmental entities do not have the power to enforce penalties.
- An important element of Jordan's water reuse policy framework should be a country-wide public information and education campaign about why and how Jordan is using treated wastewater, especially in agriculture. To my knowledge, there is no such national campaign being contemplated at this juncture, which would target both users of treated waste-water and the consumers of products that are irrigated by reclaimed water.
- There is not yet any comprehensive monitoring of fodder crops irrigated with reclaimed water in Jordan (CDM, 2006d). WAJ's Water Reuse and Environmental Unit, through

their Soil and Plant Monitoring Programme, collect data twice a year on the biological and chemical composition in the soil and plants irrigated with reclaimed water from each wastewater treatment plants. However, the data are not analyzed and hence no results-information is conveyed back to the farmers. This is largely because of the absence of qualified personnel to interpret it. Also, WAJ is unwilling to expose data that would reflect unfavorably on the operations of its wastewater treatment plants (CDM, 2006d).

(iv) Intervening factors

As with my case study of the water user cooperatives in the Jordan Valley, there are several intervening factors (in addition to the five facets of institutional arrangement) that appear to play a significant role in influencing the effectiveness of water sector partnerships. In this case study, these are support for a sustainable livelihood, knowledge transfer, and innovative organizational arrangements.

The concept of "sustainable livelihood" was coined by Robert Chambers and Gordon Conway in 1991.[164] They explained the concept as follows, "[a] livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable if it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term" (Chamber and Conway, 1991, p.6). The sustainable livelihood framework has been used by major development agencies (e.g., the UK Department for International Development, CARE, the United Nations Development Programme), and at its core it

[164] An Advisory Panel of the World Commission on Environment and Development first proposed the concept of a sustainable livelihood security in 1987. Chambers and Conway modified the definition slightly in their 1991 paper titled "Sustainable rural livelihoods: practical concepts for the 21st century" (Chambers and Conway, 1991).

encourages promoting a secure livelihood while lowering a community's vulnerability to environmental and/or economic shocks (Ashley and Carney, 1999).

USAID did not explicitly use the term "sustainable livelihoods" in describing the aims of the water reuse pilot project. However, I believe they were alluding to promoting the concept as a way of making the partnership more effective in the project agreement document and the project workplan. They did this by referring to: establishing sustainable irrigation system operations and maintenance procedures; expanding irrigated areas to fully utilize available reused water generated by the wastewater treatment plant; and developing effective linkages between water users and agricultural markets (USAID, 2004b; CDM, 2004b). I think this partnership has helped to establish a number of sustainable livelihood strategies that have (and will likely continue) to strongly support making the partnership work over the long-term. One example lies in the environmental benefits already discussed above. Included are the replacing of precarious rainfed farming with irrigation systems; monitoring water quality of the treated wastewater used for irrigation; and the effort to utilize as much of the treated wastewater as possible for irrigation in order to minimize the amount of water that escapes into *wadis*. These environmental benefits are crucial given that farmers in an arid, water scarce country like Jordan are particularly susceptible to the adverse effects of climate change (e.g., variable rainfall, recurring droughts), and promoting a sustainable livelihood approach will assist their adaptation to the current impacts of climate change.

There are also economic benefits in the partnership that promote a sustainable livelihood. For example, the choice of growing fodder crops makes a lot of economic sense because, as previously mentioned, there is a tremendous deficit of locally available fodder in Jordan. Less than 30% of the national demand for "green fodder" (mainly alfalfa) is met by Jordanian production, and more than 95% of "dry fodder" (e.g., barley, wheat) is imported from Black Sea countries and Saudi Arabia[165] (CDM, 2006d; Hazaimeh, 2008b). The fruit trees have yet to yield any meaningful production. However, they offer promise in terms of their local marketability in Wadi Mousa, should local wholesalers who supply the nearby luxury hotels in Petra be willing to buy their fruits (CDM, 2006b; CDM, 2006d).[166] Wadi Mousa is no exception given there is a high demand for fodder (2,800 tonnes) and no alfalfa production except for the pilot project plots. Realistically, the farmers will concentrate on selling to local buyers (animal producers) because they have forged strong relationships with them, but this does not preclude the farmers from trying to sell to larger enterprises in Jordan that are engaged in raising livestock (CDM, 2006b).

These environmental and economic benefits appear to bode well for providing the farmers with a reliable income. Several farmers spoke to me about their improved annual incomes (section 4.3.2 (iii) above), and the favorable marketing environment that exists for their produce, as key indicators of the success of the partnership (Interviews 24; 34; 50; 60; 83). I would contend that promoting this kind of sustainable livelihood is a form of empowerment for the members of the Red Dam Cooperative, and will motivate the farmers to do what they can to ensure the effectiveness of the partnership. I would also draw a parallel to what happened with the water user cooperatives in the Jordan Valley, who were also empowered to try to make their

[165] The annual demand for both types of fodder has been pegged at 970,000 tonnes for dry and 132,000 tonnes for green fodder (CDM, 2006d).

[166] The potential for the farmers in the cooperative to eventually export fruit production is quite limited because for the European fruit market, only very high quality Jordanian produce that can generate enough revenue margin to cover high air transport costs, will be successful. It is not clear whether the farmers in Wadi Mousa will have sufficient revenue margins for such an endeavor. Furthermore, European Union regulations preclude any produce that might be expected to be contaminated with parasites, pathogenic microorganisms or decomposed foreign substances. The importing European country might view the use of treated wastewater as a risk for microbiological or chemical contamination. Finding export opportunities in the Gulf of Arabia and other regional markets, for Jordanian fruit are a more realistic opportunity. However, Jordanian farmers also face serious competition from Syrian, Egyptian, and Lebanese farmers, who enjoy lower production costs (CDM, 2006d).

partnerships effective. In the Jordan Valley, I would venture that empowerment came about through the transfer of authority and responsibility for water distribution services to the water user cooperatives (section 4.2.3 (iv)).

The awareness and education component of the RIAL project in Wadi Mousa was a crucial factor in influencing the effectiveness Red Dam Cooperative. This was because not only did most, if not all, of the cooperative members have misconceptions about why and how to use treated wastewater for irrigation, many also thought it was *haram* (sacrilegious) to use treated wastewater to grow crops (Interviews 26; 52;CDM, 2006c). There were also a number of vital managerial and technical skills the cooperative members needed to learn in order to effectively operate and manage a cooperative of this kind (CDM, 2007d). In addition to the day-to-day training and advice on both the administrative and agriculture/irrigation issues of managing the cooperative and the farm plot, provided mostly by the CDM, there was also a comprehensive training session on five themes. These themes included: agricultural marketing; organization and management of a cooperative; operation and maintenance of the irrigation systems; public health; and credit mechanisms (CDM, 2007d). Many farmers admitted that they overcame their initial resistance to using treated wastewater for irrigation only when they were actually shown how to handle treated wastewater safely. After the first successful cultivation of fodder crops, it was a case of "seeing is believing" (Interviews 26; 37; 52; 59; 61; 116). As one farmer told me:

> The CDM project site manager helped in training the farmers, he educated us about how to use drip irrigation and filters. And the most important thing about managing the cooperative was to show us how to organize people and tasks. What I mean is that people now understand why and how we have an irrigation schedule - a rotation system - and they understand their responsibility to maintain their on-farm irrigation systems and the farming machines we use. This is not easy. All this gave the people in the cooperative jobs and even tourists now stop by our plots to see and visit this newly green area. (Interview 36)

By the end of 2007, CDM project staff were only providing advice to farmers rather than undertaking work on their behalf, as they had done since the beginning of the project. Farmers were now in a position to prepare the land, seed, apply the necessary fertilizers and pesticides, prune fruit trees, harvest, and maintain their on-farm irrigation systems (CDM, 2007b). A survey of farmers in 2006 showed that they all responded affirmatively when asked if they had adequate knowledge of how to deal with treated wastewater for irrigation (CDM, 2006c).

Innovative organizational arrangements are reflected in this partnership through the proposed revolving fund mentioned in sub-section 4.3.2 (iii). The revolving fund is still not operational because the new managers of the Wadi Mousa pilot project (i.e., the Hashemite Fund for the Development of the Badia) are currently working on issuing a regulation to operationalize this financial instrument (Interview 113). I can only speculate at this point that the revolving fund will potentially be an asset to the cooperative because it will provide initial financing to underwrite diverse activities and create a system of accountability about how the funds are used. The proposal for the fund is fairly detailed, and spells out who will sit on the Higher Committee that will supervise the initiative's activities. It also provides: a list of examples of acceptable projects (e.g., upgrading irrigation networks, purchasing equipment to increase efficiency, establishing livestock farms); explains how to prepare loan applications and how loans are to be repaid; and describes the accounting and auditing procedures (CDM, 2005b). I spoke to a few representatives of other foundations in Jordan that have established similar community-based credit schemes (such as the Near East Foundation, Noor Hussein Foundation, Jordan River Foundation). There are reportedly over 200 projects funded by such initiatives across Jordan (Interview 78; NHF, 2008). It appeared to me that the most obvious difference between these other funding schemes and the revolving fund proposal in Wadi Mousa, is the insistence of both

CDM and the Hashemite Fund on issuing a regulation to shape the revolving fund (Interviews 52; 89; 90). It has been suggested that one reason for wanting a regulatory framework in this case is that in 2005 His Majesty King Abdullah visited the pilot project in Wadi Mousa, and donated US$42,373 to the development of the project. The Hashemite Fund wants a regulation to underpin the revolving fund in order to ensure that these funds are spent in a transparent and accountable manner (Interview 26; 89).

4.4 Historical influences on these two rural partnership

Section 4.2.1 provided a description of how water was managed historically in the Jordan Valley prior to the formation of these recent water user cooperatives. I also offered my assessment of how the specter of severe water shortages, and misuse of the pressurized irrigation system both pushed donors, farmers, and the government to forge a new kind of partnership. This need resulted in the foundation of water user cooperatives, with the objective of mitigating the advent of fulsome rural water crises through increasing the efficiency of irrigated water distribution, and ensuring the sustainability of farming in the region. The key factor that I touched on is the history and role of "trust" between the various factions directly involved in water management issues. I believe that the cases strongly suggest that it is a lack of trust among farmers, and between farmers and the JVA, that is the single biggest impediment to forming water user cooperatives. It was clear during the initial organizational stages that most farmers did not readily welcome a modern pressurized irrigation system. They believed that the lower rate of flow (as was required by design) was insufficient, and they simply preferred and "trusted" the more straightforward open channel that existed previously. The biggest issue was the rampant water theft by farmers in their quest to augment the water supply to their farms. The lack of trust among neighboring farmers who were worried that others would not abide by water schedules, and limit themselves to their entitlement of water, was felt by farmers across the entire Valley (Interviews 5; 32; 45; 48; 66; 70; 75; 76). The lack of trust was especially problematic for the farmers in the Kafrein area in the south of the Valley. It has taken many years to slowly rebuild trust.[167] Trust is of course not something tangible that can easily be measured; however several farmers and the JVA officials believe that the formation of water user cooperatives has promoted increased trust between the two (Interviews 23; 28; 32; 42; 48; 70; 80). One indicator of this increase is the fact that farmers are willing to pay both an initiation fee and an annual fee to be a member in good standing of a cooperative, although becoming a member remains voluntary (Interview 32). Another major source of mistrust is the very negative experience that many farmers had with the notoriously corrupt agricultural cooperatives that were created in the 1970s and 80s. This led to profound resentment among most farmers in the Valley, and initial opposition to the very concept alone of a cooperative (Interviews 5; 23; 63; 70; 80; Ghneim *et al.*, 2005). The GTZ project team must constantly explain to farmers how and why the recent water user cooperatives are different from the agricultural cooperatives i.e., the water user cooperatives' boards are elected farmers; GTZ can act as a third-party and assist in the monitoring of activities and attends meetings; and there is more public scrutiny as a result of the water meters and regular inspections reveal whether any farmers are in violation of the water

[167] Thanks to high water quality and the year-round availability of water, farmers in this area have focused on growing bananas which are extremely water intensive but highly profitable (GTZ, 2002). The lure of profits was so high that farmers tried to increase their share of water illegally by drilling unlicensed wells, diverting water from distribution lines, and fixing hidden joints to distribution pipelines. Farmers admitted that they were hardly ever penalized by the JVA for these illegal acts. However, the drought years between 1997 and 2001 affected even the most prosperous farmers in Kafrein. Irrigation water was in very short supply and many fields were left fallow as a result. The GTZ project team remembers that the farmers were probably only willing to consider trying to establish a water user cooperative to improve water distribution out of desperation. The situation slowly improved: by 2003 buried irrigation pipelines were brought to the surface so they could be routinely inspected for illegal joints; a full rehabilitation of the system has taken place; and in 2006, the cooperative was registered with the JCC (GTZ, 2002). The most recent progress report shows that: water efficiency in the system has increased to 70%; there is a decline in frequency of valve maintenance because the cooperative has been using the valves correctly and not interfering with their operation ; an increasing number of illegal openings to the main pipelines running from the Karameh dam have been exposed and closed by farmers (GTZ, 2007).

rotation schedule, or indeed tampering with the infrastructure (Interview 80). For the Red Dam Cooperative, trust plays an equally important role in fostering an effective partnership. It was in large part the long-standing relationship and trust between the Amareen tribe (who make up the majority of the members of the cooperative) and the *Sharifa* (who currently heads the Hashemite Fund), that persuaded the tribe to consider using treated wastewater for irrigation despite their serious initial reservations (Interviews 26; 34; 52).

One other historical fact mentioned in a number of reports written about the water user cooperatives is that the creation of the JVA has eroded traditional water management practices. These practices relied on water user groups assuming responsibility for ensuring that water rights were adhered to. This fell to the *katib idhara* (water logistician or clerk), who would organize the tribal rotation of water time shares (Ghneim *et al.*, 2005; Regner *et al.*, 2006; GTZ, 2002; GTZ, 2003; Scherl and Assaf, 2003). By the time the JVA was created in 1977, the irrigation system had become highly centralized. Many migrants from across Jordan made their way to the Valley seeking to benefit from the social and economic development that the JVA spearheaded. In the process, the social structure of the farming population evolved into one that favored economic independence of individual families. This led to a weakening of tribal bonds. As the farmers became reliant on the JVA managing any kind of development activity, they no longer saw the economic or social necessity of cooperation. Indeed, farmers began perceiving each other as competitors for scarce water resources distributed by government, - thereby undermining the traditional practices of their tribal structure (Regner *at al.*, 2006; GTZ, 2002; GTZ, 2003; Interview 42; 84).

The concept of participatory irrigation management, which GTZ has encouraged water user cooperatives to adopt as a drastic rethinking of this point: "[t]he apparently harmless step from a mere water consumer to a partner is not easy. It requires changing relationships of all kinds. The fellow farmer and former adversary becomes an ally and partner, and the almighty JVA becomes a partner of the farmer, who is no longer a passive beneficiary" (GTZ, 2002, p.25). Although those farmers who are now members of water user cooperatives are most likely convinced that it is in their best interest to move away from the legacy of over-dependence on the JVA and the shunning of cooperation with other farmers, I would hazard an intuitive guess that there are still many farmers[168] who remain wary of joining what is for them a new and essentially untested (in their eyes) kind of partnership.

Despite the above observation, there are other elements of tribal relationships which remain strong - namely, the neo-patrimonial networks based on family, tribe, and proximity to the ruling elite. I discussed these previously at the end of Chapter 3, as well as in the context of the urban water partnerships. Several of my interviewed farmers did confirm that often they rely on their tribal relations to group together with other farmers and use their influence to resolve problems they are having with the JVA (Interviews 5; 12; 43; 45; 74; 80). As one farmer told me "our relationship is tribal. The main relationships are those between tribes, dealing with the JVA and other government entities is new to us, and does not always work for us. We believe that if we have a good relationship with our neighboring tribes then we can solve our problems together. But of course, when having laws and a system of government that is fair and just is also helpful" (Interview 74). This sentiment was echoed among the members of the Red Dam Cooperative (Interviews 26; 34; 35; 52), as one of the members commented, "what binds us is our tribal relationship, not the government" (Interview 34). This infers that although farmers in Jordan are

[168] Recall that, as mentioned at the beginning of this Chapter, 63% of farm units across the Jordan Valley are farmed by members of a water user cooperative. Therefore, more than one-third of all units are still worked by farmers who have not become members of a water user cooperative.

willing to partner with government entities or donor agencies to improve their irrigation practices, the relationship that is paramount to them is the one with their fellow tribes-people.

Patronage networks are not confined to farmers. A more unfavorable aspect of such networks is the way in which government officials, in the JVA for example, use patronage networks and *wasta* to obtain privileges for themselves or family members through personal connections. This has, and will continue, to breed corruption within the JVA (Interviews 43; 74; 80). For some farmers, these informal and often unjust lines of interaction might continue to be a deterrent to joining a water user cooperative because they may be suspicious of building too close a relationship with the JVA. Other farmers however, who have benefited greatly from their personal connections with the JVA staff, may be reluctant to join a cooperative because, in their view, they might dilute the relationship they have established independently, to their own benefit.

4.5 Summary table of key points related to each of the two rural partnerships

Table 24 summarizes the key points discussed in this Chapter for both rural case studies under review. The Table covers four sections: (i) measures used to evaluate the partnerships; (ii) intervening factors that influenced the partnerships; (iii) historical influences on the partnerships; and (iv) the institutional facets that I argue are the main influences on the effectiveness of the partnerships.

In Chapter 1, I hypothesized that in Jordan, partnerships can be effective subject to institutional arrangements allowing for the following: (i) contracts that afford the service provider with sufficient autonomy to be effective and efficient; (ii) governance structures that include end-users in decision-making and implementation; and (iii) polices, legal settings, and information channels that are adequately accountable to constituencies. I also suggested that institutional arrangements constrain or encourage accountability, flexibility, and participation. These, in turn, alter the prospects for effectiveness in the provision of water services, which in these two rural cases is the distribution of irrigation water. I also contended that there are a number of intervening factors that play significant roles in influencing the effectiveness of a partnership in the water sector, and in both rural partnership cases this was indeed true. The intervening factors were empowerment of the members of the cooperative; knowledge transfer, and innovative organizational arrangements.

To what extend did the five facets of an institutional arrangement influence the effectiveness of the water user cooperatives in the Jordan Valley and the Red Dam Cooperative in Wadi Mousa? Contracts in both cases were problematic in the sense that even though there was a project agreement between the donor agencies (GTZ in the Jordan Valley and USAID in Wadi Mousa) which spelled out the terms of the project in full, the contracts that were missing in both cases were ones between the members of the cooperatives and their key government partner. For the water user cooperatives in the Jordan Valley there was no formal agreement between the farmers and the JVA, and in Wadi Mousa there was no official/legal undertaking that bound the farmers and the PRA. Although this made the relationship between farmers and government more flexible, it also diminished accountability. This left the farmers unsure of the government's commitment to establishing cooperatives and undermined encouraging farmers' participation in irrigation management. It also led to the cooperatives becoming very reliant (particularly in Wadi Mousa) on the donor agencies and their consultants for technical and managerial support. The policies related to each partnership were not detrimental to the partnerships. However, they were consistently vague and lacked clear prescriptions as to how to actually implement the plans and procedures called for by the policies, and which entities should be responsible in this respect. Thus, the accountability generated by these policies is/was minimal.

The governance structures in both case studies generated similarly high levels of participation. This had a significant impact on the partnerships. The cooperatives in both the Jordan Valley and Wadi Mousa are registered with the JCC and as a result are legal entities. The *JCC Law No.18* provides detailed instructions as to how cooperatives are to be organized e.g., the president and board (management committee) must be elected; the cooperative must draft its own internal statute, and the like. This arrangement has facilitated transparency. The rules and procedures are formal and available to all. The regular meetings of the board, as well as the meetings between the cooperatives and their partners (this would be the JVA and GTZ for the cooperatives in the Jordan Valley, and CDM and the PRA for the cooperative in Wadi Mousa) allow for constant discussion and thoughtful decision-making. The clarity of roles and responsibilities within the cooperative enhances accountability as well.

There were laws of relevance to both partnership cases. For the water user cooperatives in the Jordan Valley, their objectives and relationship with the JVA is largely guided by the amended the *JVA Law* (2001). It essentially opened the way for a private operator - such as a cooperative - to participate in the JVA's activities. The drawback was the lack of detail and instruction in the law (or in subsequent regulations) as to how this should be applied in practice. Extreme flexibility leaves far too much open to interpretation and reduces accountability because lines of responsibility are not clearly drawn. In Wadi Mousa, there are several laws that pertain to water reuse, and these laws are associated with different ministries. Perhaps the fact that multiple ministries have a role to play in upholding the legal framework around water reuse, has helped clarify who-does-what. This has improved accountability at the expense of some flexibility, however and understandably, there will always be a trade-off between flexibility and accountability.

The information channels in both cases are probably the best example of accountability. The channels entail regular meetings between the cooperatives and their respective governmental counterparts, thereby allowing each group important and predictable fora at which they can hold the other accountable. For example, this has been especially helpful in the Jordan Valley where the JVA is eager to reduce the incidence of violations on the irrigation network. And the cooperatives want the JVA to enforce the strict water rotation schedule and deal promptly with technical problems. Information channels are participatory as well, given that there is now a platform, mainly through the cooperative's board meetings, for farmers to engage constructively with the JVA.

In sum, I believe my hypothesis to be confirmed. The influence of key institutional features on the effectiveness of these two partnerships is substantial. For the governance structure, legal setting and information channels, the influence is largely positive. However, for the contracts and policies, the influence was substantial, but mostly negative because the contracts and policies were not crafted in a way that improved and supported the partnership.

Table 24 - Summary table of main points in Chapter 4 concerning rural partnership case studies

	Water user cooperatives in the Jordan Valley	**Red Dam Cooperative for Agricultural Water Reuse**
Measures of an effective partnership		
Water quality	• In the northern section of Jordan Valley irrigation water quality is good, and for the middle and southern sections irrigation water quality is high in sediments and salinity, as it is a mix of freshwater and treated wastewater. • The cooperatives have little influence on irrigation water quality. Donor-funded projects that target improving irrigation water quality prefer to work with cooperatives.	• Water quality of effluent from Wadi Mousa wastewater treatment plant always superior to Class A, which is most stringent water quality criteria class for reclaimed domestic wastewater. • Electrical conductivity tests, which measure salinity, are consistently within acceptable limits. Heavy metal concentration very low. • CDM and the farmers monitor water quality data compiled by WAJ.
Sustainability of supply	• The pressurized irrigation network, which distributes water to farmers, operates more efficiently when water rotation schedule is adhered to. Cooperatives do this better. • Water theft by farmers has decreased but still happens in some areas. • Cooperatives promote more efficient and reliable water distribution and farmers are less likely to over-irrigate their fields as a result.	• Continuous supply of wastewater into treatment plant because source is household and hotel effluent. • On-farm water efficiency high because farmers trained in drip irrigation. • No cases of water theft by farmers reported.
Affordability and financial arrangement	• Irrigation water tariff is heavily subsidized. • Membership fee to join a cooperative ranges from US\$70.60 – 141.00. These fees are pooled into a fund that a cooperative uses to purchase equipment or construct office space for example.	• Memorandum of Understanding guarantees that WAJ supplies the farmers with treated wastewater for US\$0.01/m^3. • Annual income from selling fodder crops significantly exceeds various expenses. • Farmers sell most of production to small-scale, local animal producers who need fodder.
Efficiency of service	• Fewer reported cases of tampering with the network or taking water out-of-turn, which has led to a more reliable water rotation schedule. • More reliable water distribution means more farmers are irrigating according to crops' respective water demands, versus not only irrigating the crops that will generate the most revenue. Agriculture is therefore intensified, and yields and incomes increase.	• Reliable supply of irrigation water because there will always be a supply of wastewater into the treatment plant and water theft is not an issue. • CDM project staff has carefully designed the crop pattern to ensure high productivity and maximum utilization of treated wastewater.

	• Transfer of responsibility from the JVA to cooperatives ("irrigation management transfer") means that farmer opens and closes FTA which is more efficient. • Approximately 200 out-dated water meters replaced.	
Intervening factors that influence partnerships		
Empowerment: irrigation management transfer for water user cooperatives in Jordan Valley and sustainable livelihoods for Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa	• Two pilot projects set up to test how the transfer of management responsibilities would work. Operational tasks of distributing water will be handed over from the JVA to cooperatives. Source of empowerment for farmers.	• Promotion of sustainable livelihoods for members of cooperative by providing environmental benefits (e.g., utilization of treated wastewater so that it does not drain unproductively into *wadis*), and economic benefits (e.g., growing lucrative fodder crops where demand is high). Source of empowerment for farmers.
Knowledge transfer	• GTZ provides farmers with technical training on understanding and operating the pressurized irrigation network. • GTZ also provides the JVA with technical assistance on rehabilitation of distribution lines.	• CDM have provided day-to-day training and intensive workshops on how to irrigate with treated wastewater and how to manage a cooperative.
Institutional innovation	• GTZ is helping implement irrigation management transfer. • Specialized water user cooperative to act as an umbrella organization representing individual water user cooperatives across the entire Jordan Valley. It will negotiate needs of farmers with senior government officials. The specialized cooperative has legal status but was appointed not elected.	• CDM prepared a proposal on establishing a revolving fund for the Red Dam Cooperative which would provide farmers with access to credit and initial funding of income generating activities.
Historical influence on the partnerships	• Trust is a major issue for farmers. In the Jordan Valley, there is a lot of mistrust because of negative experience with agricultural cooperatives created in the 1970s/80s. Also considerable mistrust among farmers because of rampant water theft by their own peers. For the Red Dam Cooperative, members have benefited from a long-standing, trusting relationship with the head of the Hashemite Fund for the Development of the Badia. • Creation of the JVA eroded traditional water management procedures that relied on water user groups. • Tribal relationships between farmers in Jordan Valley and Wadi Mousa remain very strong, as seen by neo-patrimonial networks. There is also evidence of patronage networks and *wasta* in the JVA, which breeds corruption and makes some farmers suspicious of joining a cooperative and working more closely with the JVA. Apart from the military veterans, most farmers in Red Dam Cooperative are of the same tribe, which facilitates trust and cooperation.	

Five facets of an institutional arrangement that influence partnerships	Positive or negative effects on partnership	Degree of accountability, flexibility, and/or participation	Positive or negative effects on partnership	Degree of accountability, flexibility, and/or participation
Contract	• Overall, negative effect on partnership. • No formal contract or agreement between farmers and the JVA. • No pre-defined set of indicators shared with farmers and the JVA to evaluate success of cooperatives. • Ambiguity created in terms of what each partner can expect of the other.	• Minimal flexibility and accountability.	• Overall mixed effect on partnership. • There are a few important contracts: project agreement; and two Memoranda of Understanding one about providing water to cooperative and one about Hashemite Fund for Development of the Badia taking over project in January 2008. • There is no contract between the cooperative and the PRA, the key implementing partner.	• Medium flexibility and accountability.
Governance structure	• Overall positive effect on partnership. • Cooperatives are legally recognized and registered with JCC. They have a board (or management committee) that is elected. • Regular meetings between board and the JVA. Improved technical cooperation and conflict resolution.	• Maximum participation and accountability.	• Overall mixed effect on partnership. • Cooperative is legally recognized and registered with the JCC. It has an elected board (or management committee). • Cooperative receives more support from Hashemite Fund for Development of Badia than the PRA.	• Medium participation and accountability.
Policies	• Overall, mixed effect on partnership. • A few relevant policies: "Jordan's Water Strategy and Policies" (1997) calls for participatory irrigation	• Minimal accountability. • Maximum flexibility.	• Overall mixed effect on partnership. • Three national-level policies refer to water reuse, but insufficient instructions on how to implement them.	• Minimal accountability. • Maximum flexibility.

	management; 2002 "National Strategy for Agricultural Development"; "JVA 2003-2008 Strategic Plan." • Implementation is weak and unclear.		• Regulatory framework exists, but there are overlapping responsibilities and insufficient resources.	
Legal setting	• Overall, positive effect on partnership. • Cooperatives are legal entities providing them with more leverage in dealing with the JVA and other government bodies. • *JVA Law* (2001) supports water user cooperatives but does not sufficiently clarify the new relationship between farmers and the JVA.	• Medium flexibility. • Minimal accountability.	• Overall, positive effect on partnership. • Cooperative abides by the *JCC Law*. • Several laws in Jordan deal with the various issues related to using treated wastewater for irrigation.	• Minimal flexibility. •Medium accountability.
Information channels	• Overall, positive effect on partnership. • Increased information sharing between cooperatives and the JVA. • Workshops organized on communication skills and quarterly newsletter is prepared by the JVA-GTZ and distributed to farmers,	• Maximum accountability and participation	• Overall positive effect on partnership. • The cooperative benefited from the regular meetings with CDM, the PRA, and the head of the Hashemite Fund for the Development of the Badia. • CDM had an on-site manager based in Wadi Mousa who interacted daily with the cooperative daily.	• Maximum accountability and participation

CHAPTER 5: A cross-case analysis of partnerships in the water sector: explanations and theory building

5.1 Overview

The goals I have set for this Chapter are to consolidate my key findings from each of the four partnership case studies in Jordan's water sector, as presented in Chapters 3 and 4, and to analyze the institutional arrangements and other intervening factors that appear to have influenced the effectiveness of these same "water partnerships." Given that the case studies were divided between urban (the Greater Amman water supply and wastewater service management contract and the NGWA Managing Consultant contract) and rural environments, (the water user cooperatives in the Jordan Valley and the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa), I am also interested in identifying salient differences and similarities between these two distinctive settings.

I hypothesized that in Jordan, and countries in similar circumstances within the region, partnerships could be effective when institutional arrangements allow for: (i) contracts that are flexible and guarantee the service provider with sufficient autonomy; (ii) governance structures that are participatory and include end-users in decision-making and implementation; and (iii) polices, legal rules, and information channels that ensure accountability to constituencies. I also suggested at the outset that it might not be simply institutional arrangements that influence the effectiveness of partnerships in the water sector. In fact, I ventured that certain intervening factors might play a significant role as well. In Chapter 1 I opined that by the end of my analysis, I could expect to be in a position that would allow me to specify the key attributes that go to supporting effective water partnerships. As I explained in preceding chapters, I focused on four indicators as being fundamental to my assessing the effectiveness of each partnership considered in this study. These were: water quality, sustainability of supply, affordability and financial arrangements, and efficiency of service. Table 25 summarizes my approach to measuring overall effectiveness. It also ranks the four partnerships in terms of their respective levels of this same effectiveness.

The two urban partnerships appear to be less effective than the two rural partnerships. In this regard, the NGWA Managing Consultant partnership appears to be the least effective overall, as evidenced by the northern governorates continuing to face recurring water quality problems. Their problems arise largely from leaching (or otherwise malfunctioning) cesspools that contaminate drinking water, which is a serious hazard to public health, as happened during the Mafraq incident in July 2007 (see Chapter 3, sub-section 3.3.1). Also, the efficiency of providing service needs improvement; data on water scheduling and complaints is quite fragmented; and the NGWA has yet to produce water schedules in a format that allows for accurate monitoring of performance. In terms of customer satisfaction, the largest proportion of complaints can be categorized under a "no water" heading i.e., from customers not receiving their respective water allotments.

The Amman management contract is the next least effective partnership overall. I believe this to be mostly attributable to LEMA's restrictive financial arrangement. LEMA had an Operating Investment Fund that comprised a pool of funds able to be drawn upon for capital investment purposes. However, it was completely insufficient to undertake the level of capital investment required to meaningfully improve the network. Also, any spending from the Operating Investment Fund had to adhere to strict World Bank procurement guidelines which rendered the process more complex than it already significantly was. In the much larger Capital Investment

Program fund, which was fully controlled by WAJ, LEMA had little influence regarding the timing or procedure for spending from this investment source. Using my preset indicators, I found the Amman management contract was still more effective than the NGWA Managing Consultant contract. However, this was in large part due to water quality never being a real issue, reliability of water services was better in terms of response time to complaints, and bigger improvement gains were made with respect to reducing NRW. It should nevertheless be stressed that if the NGWA Managing Consultant contract has yielded less impressive results, this was not for lack of effort and initiative on the Managing Consultant team's side, as I discussed in Chapter 3. One must also keep in mind that the NGWA Managing Consultant contract, unlike the Amman management contract, is an on-going contract in its final (third) year (it terminates in April 2009) and further improvements in water services are still likely.

I have concluded that the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa was the second most effective partnership of the four, and the Jordan Valley's water user cooperatives ranks as the most effective. The Jordan Valley case is more successful than the Red Dam Cooperative because even though both partnerships enjoy a reliable supply of irrigation water and make a concerted effort to sustain their limited supply, my impression is that the water user cooperatives in the Jordan Valley have made greater strides in improving their management of irrigation water since the partnership started. Unlike the farmers in the Jordan Valley, most of the farmers in the Red Dam Cooperative were not even farming prior to the partnership, let alone facing perplexing issues such as vulnerability to significant water theft by many farmers, a highly complex pressurized irrigation network, and working alongside a very large often inefficient entity like the JVA.

Table 25 - Summary of the overall effectiveness of each case study

	LEAST EFFECTIVE →			**MOST EFFECTIVE**
Measures of an effective partnership	**NGWA Managing Consultant contract**	**Greater Amman water supply and wastewater service management contract**	**Red Dam Cooperative for Agricultural Water Reuse**	**Water user cooperatives in the Jordan Valley**
Water quality	• Over 98% compliant with Jordanian water quality standards for chemical and bacteriological samples from effluent. • Recurring water quality problems caused by cesspools contaminating drinking water (Mafraq incident in July 2007). • Have started auditing all water sources.	• Over 99% compliant with Jordanian water quality standards for chemical, bacteriological, and algae/nematode samples from effluent. • Increased monitoring of water quality and introduction of databases.	• Water quality of effluent from Wadi Mousa wastewater treatment plant always superior to Class A, which is most stringent water quality criteria class for reclaimed domestic wastewater. • Electrical conductivity tests, which measure salinity, are consistently within acceptable limits. Heavy metal concentration very low. • CDM and the farmers monitor water quality data compiled by WAJ.	• In the northern section of Jordan Valley irrigation water quality is good, and for the middle and southern sections irrigation water quality is high in sediments and salinity, as it is a mix of freshwater and treated wastewater. • The cooperatives have little influence on irrigation water quality. Donor-funded projects that target improving irrigation water quality prefer to work with cooperatives.
Sustainability of supply	• Investigations into fairly high failure rate of wells. • Preparation of NRW Reduction Plan. • Improved well monitoring practices.	• Production of water reached 128.1 MCM in 2006. • LEMA never exceeded maximum allowable production limit from wells.	• Continuous supply of wastewater into treatment plant because source is household and hotel effluent. • On-farm water efficiency high because farmers trained in drip irrigation. • No cases of water theft by farmers reported.	• The pressurized irrigation network, which distributes water to farmers, operates more efficiently when water rotation schedule is adhered to. Cooperatives do this better. • Water theft by farmers has decreased but still happens in some areas. • Cooperatives promote more efficient and reliable water distribution and farmers are less likely to over-irrigate their fields as a result.

Affordability and financial arrangement	• NGWA collected 96% of what it billed in 2008. • Operating cost recovery in 2006 was 83%; 2007 was 85%; and 80% in 2008. • Staff productivity was 7.8 staff per 1000 water connections in 2008, and 22.9 to 1000 for wastewater connections. • Created a Capital Expenditure Committee to approve investment spending. • Introduced a standardized billing system, purchased more accurate C-class meters, and started an automated billing system. • New Call Center at NGWA headquarters in Irbid with 24-hour service and GIS.	• Insufficient capital investment funds under LEMA's control (Operating Investment Fund US$ 32 million). • Debt ratio (debt to billing revenue) decreased from 0.65 to 0.5 in 2006. • LEMA collected 97% of what it billed in 2006. Water sales collection increased from US$25.7 million in 1999, to US$56.9 million in 2006. Operational deficit in 1999 became a profit of US$16.4 million by 2006. • Staff productivity improved from 5.6 to 3.4 staff per thousand water connections in 2006. • Two new computerized customer call centers established (equipped with databases and GIS). • Over 200,000 meters replaced. Also introduced hand-held computers for meter reading and automated billing system.	• Memorandum of Understanding guarantees that WAJ supplies the farmers with treated wastewater for US$0.01/m^3. • Annual income from selling fodder crops significantly exceeds various expenses. • Farmers sell most of production to small-scale, local animal producers who need fodder.	• Irrigation water tariff is heavily subsidized. • Membership fee to join a cooperative ranges from US$70.60 – 141.00. These fees are pooled into a fund that a cooperative uses to purchase equipment or construct office space for example.
Efficiency of service	• About 95% of NGWA's service area receives access to drinking water, and 65% receives wastewater services. • Water and wastewater connections have risen since start of contract, reaching 217,297 and 74,127 respectively in 2008. • NRW was at 43% 2007, and 39% in 2008.	• Almost 99% of Amman's service area receives access to drinking water, and 80% receives wastewater services. • Close to 98% of all water meter connections were read in 2006, compared to 75-80% in 2000. • Reduction of NRW from 54% in 1999 to 41.6% in 2006.	• Reliable supply of irrigation water because there will always be a supply of wastewater into the treatment plant and water theft is not an issue. • CDM project staff has carefully designed the crop pattern to ensure high productivity and maximum utilization of treated wastewater.	• Fewer reported cases of tampering with the network or taking water out-of-turn, which has led to a more reliable water rotation schedule. • More reliable water distribution means more farmers are irrigating according to crops' respective water demands, versus not only irrigating the crops that will generate the most revenue. Agriculture is therefore intensified, and yields and

• Largest proportion of complaints relate to "no water." • Water scheduling: customer can expect between 12 to 24 hours of water once a week. • Average response time to complaints is 6-7 days.	• Compliance to water rationing schedule always exceeded 100% on average i.e., LEMA supplied more hours of water than projected. • Response time to wastewater complaints reduced to under 2.2 hours on average, and less than six hours for drinking water complaints.		incomes increase. • Transfer of responsibility from the JVA to cooperatives ("irrigation management transfer") means that farmer opens and closes FTA which is more efficient. • Approximately 200 out-dated water meters replaced.

At the outset, I anticipated one of three possibilities coming to the fore regarding what influences the effectiveness of partnerships in Jordan's water sector, apart from institutional arrangements. First, Jordan's economic climate (tied to its relative political stability) might shape the opportunity to attract both domestic and foreign investment in the country's water sector, resulting in the economic climate having the most pronounced effect on the success of water partnerships. Second, the government's commitment to both economic development, and its favorable attitude toward PPPs, could surpass the importance of the overall economic climate in determining the success or failure of water partnerships in Jordan. Or third, perhaps the management, or more importantly, the leadership of the specific partnerships is what primarily accounts for their effectiveness.

In terms of the impact of the economic climate, I was interested in the government's ability to maintain a healthy economy, defined for my immediate purposes as keeping inflation, taxation, and interest rates relatively low (Economist, 2008). Since one urban partnership started in 1999 and the other in 2006, I had the opportunity to isolate the effects of Jordan's economic environment that had changed over time. The annual rate of inflation since 1999 has increased dramatically (0.6% in 1999, to a predicted 8.9% for 2008) (CBJ, 2008a). Tax rates have remained generally favorable for and encouraging to investment inflows over this same time period (e.g., capital projects face reduced income and social services taxes by 25-75%, imported fixed assets are 100% exempted from customs duties and taxes, and exemption from customs duties and income tax is granted for the expansion of existing projects (ECB, 2008). As for interest rates, they declined between 1999 and 2003 (8% to 2.5%), although they have been on the rise since 2004, (reaching 7% in 2007) (CBJ, 2008b). Higher interest rates tend to deter private sector investment in capital projects because of the higher cost of borrowing, coupled with the increased appeal of alternative forms of investment (e.g., bonds and other interest bearing financial instruments). The Amman management contract initiated in 1999 benefited from lower interest rates when compared to the NGWA Managing Consultant contract. However, the end result by my measures was the establishment of not particularly effective partnerships in either case. Thus, although the climate for investment varied over the time period during which the two urban partnerships were initiated, the slightly more favorable economic conditions in the earlier case (i.e., the Amman management contract) were not determinative. As discussed previously, both urban partnerships did not fare particularly well in their own rights, and in relative terms, both urban partnerships were less effective than the two rural partnerships as well.

Jordan has had a development-driven government, hospitable to donors and their projects, in its water sector since the 1950s. The two donors that figured prominently in the four case studies have been the U.S. (through USAID), and the Germans (through KfW and GTZ). Since 1952, total U.S. economic aid (across a range of sectors such as water, agriculture, tourism, education, environment and infrastructure) exceeded US$4.4 billion (USAID, 2007a). This amounts to a little over a third of Jordan's GDP (World Bank, 2006a). U.S. support to Jordan's water sector has totaled US$50-80 million a year, the largest amount supplied by any donor country (Van Aken *et al.*, 2007).

The Germans have been working in Jordan's water sector on numerous projects since 1977. They were instrumental in developing the "National Water Master Plan", supporting regional water utilities in reducing water losses, and building a knowledge-capacity among farmers (GTZ, 2008). I see no evidence to suggest that donor government support for water partnerships, to whatever degree it might have varied during the 1990s or in the current decade, explains why some of the forms of partnerships were relatively more effective than others. Jordan has had a development-driven government before and during the life of all four partnerships under consideration.

However, that great intangible of "leadership" in the respective partnerships could explain the variation in the levels of effectiveness. I suggest this because in the case of the two rural studies, the quality of leadership was gauged to be reasonably high. I measured this qualitative factor by the government partner's commitment to the given partnership, and by the ability of the private operator (farmers or the private companies) to take decisive action. In the two urban partnerships analyzed, I found these qualitative leadership measures to be weak, resulting in my determination of their being the least effective partnerships.

In the rural partnerships, the water user cooperatives in the Jordan Valley benefit from being able to elect the president of their respective cooperative and decisions were usually based on a farmer having a proven track record of productive yields, technical knowledge about irrigation, and competence in monitoring water distribution (as discussed in Chapter 4). The cooperatives were also boosted by management changes in the JVA since 2006. These included the introduction of senior decision-making officials that are more supportive of the cooperatives and more committed to fostering transparency within the JVA. This was contrary to the prevailing attitudes of their predecessors who felt invariably threatened by the prospect of transferring management responsibility to the cooperatives (Interviews 47; 80).

As for the Red Dam Cooperative, the main source of good leadership in that partnership is having the *sheikh* as the elected president of the cooperatives. He is the Bedouin tribal leader of one of the Amareen sub-tribes (the Showshe sub-tribe) that has historical tribal rights to the land being farmed. *Sheikhs* are elderly, revered and learned members of a community and assume a leadership role within their community. The particular *sheikh* of Showshe sub-tribe was described by interviewees as open to new concepts and supportive of such reforms as engaging women in the cooperative (Interviews 26; 52). My meeting with the *sheikh* solidified for me the comments and opinions I had gathered from others as to his strong leadership capabilities. And both water user cooperatives in the Jordan Valley and in Wadi Mousa had dedicated staff from GTZ and CDM to support them in the daily management of the cooperatives, technical training, and negotiating with their government counterpart.

The principal issue with leadership in both urban cases is the very high turnover at the ministerial level (i.e., the Minister of Water and Irrigation). Over the past 10 years, there have been no less than eight ministers, three of them in 2007 alone. As a result, the problem has been a lack of consistency in direction of and approach to the urban partnerships (Interviews 98; 53). Certain ministers have reinforced and supported the two urban partnerships. Notable in this regard is the current Minister of Water and Irrigation who was appointed in November 2007. He is a proponent of PSP, is very business-minded, and was very supportive of the series of Cabinet Decisions regarding staffing policy and procurement policy that affected the NGWA Managing Consultant contract (Interviews 91; 98). Other ministers, such as the Minister holding office during the early years of the management contract (2001-2004) had initially supported the PSP concept. However, he (and other successors to varying degrees) became disillusioned by the experience of the management contract in Amman by 2004, and were generally loathe to repeat the experience. As a result, there was no ministerial push in 2004 for PSP renewal in NGWA (Interviews 56; 100).

The NGWA Managing Consultant contract had possibly the weakest leadership. It was also affected by high turnover of its head, the NGWA Managing Director. In the first 1.5 years of the contract, NGWA had three Managing Directors. Leadership at this level was also complicated by the fact that the contract required that there be two Managing Directors: the local Jordanian NGWA Managing Director, and a member of the Managing Consultant team to act as Co-Managing Director. The result was that a power struggle developed between the two, thereby undermining the Managing Consultant's ability to fulfill its management functions and take decisive action when needed (Interviews 98; 99).

My findings support what other researchers and analysts have said about the importance of institutional arrangements (as discussed in Chapter 2). Importantly however, I would challenge one fundamental point in the literature. Specifically, the 2006 United Nations Human Development Report, entitled "Beyond scarcity: Power, poverty and the global water crisis", claims that "[water] scarcity is manufactured through political processes and institutions that disadvantage the poor. When it comes to clean water, the pattern in many countries is that the poor get less, pay more and bear the brunt of the human development costs associated with scarcity" (UN, 2006, p.3). This may be true to some extent in Jordan, if one focuses only on some distinct aspects of urban water partnerships. I also recognize that the fact that irrigation water utilizes almost 75% of Jordan's water supply is not sustainable. However, the sweeping generalization that water scarcity is a "manufactured" circumstance, whether it is in the context of drinking water and wastewater services in urban areas, or irrigation water in rural areas, does not really hold in Jordan. The Kingdom is a Middle East pioneer with respect to experimenting with different types of water partnerships. As I discussed at length in Chapters 3 and 4, partnership models such as the Managing Consultant contract in the northern governorates and the Red Dam Cooperative are the first of their kind in the region. While the institutional arrangements may not be perfect, they symbolize important steps in determining, through trial and error, what ingredients are needed to make water partnerships work ever-more effectively.

5.2 Key findings on institutional arrangements

5.2.1 The institutional factors that matter most for effective partnerships in Jordan's water sector

The following is an analysis of the three institutional factors (i.e., contracts, governance structure, and legal setting) that emerged as most important in determining the effectiveness of all four of the partnerships studied. I also discuss why public policies and information channels were eventually considered of a lesser importance.

(i) Contract flexibility and accountability

The two rural partnership initiatives were more flexible than their urban counterparts, primarily because there was no formal contract per se in the rural cases between the cooperatives and their respective key governmental partners (the PRA and the JVA). The most obvious disadvantage of this fact, particularly for the water user cooperatives in the Jordan Valley, was the ambiguity created in terms of: (i) what each partner might expect of the other; (ii) what activities they needed to coordinate; and (iii) which performance indicators they would agree to use in determining whether key objectives were being achieved. The absence of a formal contract between the cooperatives and their government partners meant there was no signed document to promote a mutual understanding about the precise objectives of the cooperatives. Of all four partnerships, the only one in which flexibility had a positive effect was in the Red Dam Cooperative case. This partnership benefited from a Memorandum of Understanding that circumscribed key features of the partnership, along with the inclusion of a stipulation that the mandate for management be passed on to the Hashemite Fund for the Development of the Badia, once CDM's (i.e., the initially retained consultant) contract terminated in January 2008. This latter element ensured the longevity of the partnership because the farmers in Wadi Mousa were not in a position to take over the management and technical work on their own.

One of the urban partnerships, the Amman management contract, offered flexibility in terms of the ability to review and modify the contract. This resulted from two Memoranda of Understanding which essentially twice-extended the original contract (i.e., once in 2002 for 17 months, and then again for 24 months in 2004) so as to push its conclusion to the end of December 2006. The Memoranda also included some technical changes such as incorporating a measurement of "major non-compliance", rather than the previous "strict non-compliance" with respect to the targets to be achieved (Bankworld, 2006). However, both the Amman management contract and the NGWA Management Consultant contract were relatively inflexible in terms of affording the service provider the degree of autonomy it needed in order to be effective. Evidence of this in the Amman management contract was the severe constraints placed on LEMA's staffing and procurement policies, and the limited control that LEMA had, as an operator, to coordinate the Capital Investment Program. The latter was intended by design to build the backbone for the water system in the Greater Amman service area through restructuring, expansion and rehabilitation. In the NGWA Management Consultant contract, the over-arching impediment to achieving the operating ratio of 105%, or improvements in NGWA more generally, are the constraints imposed by WAJ. These run the gamut from limitations on recruitment, to budgetary rules, to overly complicated procurement rules.

In a positive vein, I would also argue that these two urban contracts fostered accountability to customers and government. The performance standards in both cases were explicit, although as some respondents pointed out they were also unattainable. In the Amman management contract, there were far too many targets (over 60 in total), many of them being unrealistic (e.g., reducing NRW by 25%, and doubling the duration of water supply to customers) given the poor state of the water network. Nevertheless, the contract created accountability because of the host of performance indicators used to calculate LEMA's compensation. In the NGWA Managing Consultant contract, the sole target with a financial impact is that the Managing Consultant has to achieve an operating ratio of 105%, and a balanced cash flow. Given that NGWA's water and wastewater network, as well as its internal structure (billing systems, complaints center, etc.) need substantial improvement, this will be virtually impossible to attain.

The NGWA Managing Consultant contract is unlike the Amman situation in that the Managing Consultant team's fixed fee was not attached to meeting any performance standards (i.e., in NGWA, the Managing Consultant was scheduled to receive a fixed fee for their services over the three-year contract that was not attached to meeting any performance standards). However, I conclude that it is still an accountable contract because its only contractual target with a financial impact is the requirement for the contractor (the Managing Consultant team) to achieve an operating ratio of 105%, and a balanced cash-flow, before WAJ can make NGWA an operating (or public) company by the end of the contract in April 2009. This ultimate goal of transforming NGWA into a utility that will become a public company has been at the forefront of every strategic meeting since the beginning of the contract (Interviews 38; 91). My impression is that it has concentrated the minds of all partners on the changes and improvements in water and wastewater services that need to be undertaken so as to ensure that NGWA can become a public company, after the termination of the Managing Consultant contract in April 2009. This has required partners to hone in on what components of the NGWA's management and operations require most attention. This has led to a more efficient use of limited resources, most notably time and money.

One way to achieve a high degree of both flexibility, coupled with accountability, in these two urban contracts, is to subsequently attach contingent agreements to the original contract (Susskind, 2005). Contingent agreements are additions to a negotiated contract that spell out what should be done under various scenarios, "promises are added to reduce risk in the face of real-life uncertainty about the future" (Susskind, 2005, p.3). Such contingent agreements can be used to manage technical disagreements in a contract and this, I believe, could have improved both urban contracts in this study. For example, the Managing Consultant team could have argued that attaining the 105% operating ratio by the end of the contract was an unreasonable target, especially given the poor state of the water network and the skewed structure of the water tariff, as explained in Chapter 3, sub-section 3.3.3 (i). They should have attempted the negotiation of a lower, yet still improved, operating ratio target following the first year's pragmatic experience with the contract.

(ii) Governance structures and participation

The partnership that generated the highest level of participation (in terms of membership in the cooperatives as well as engagement between farmers and the JVA) was the water user cooperatives in the Jordan Valley, for reasons I will outline below. Both the water user cooperatives in the Jordan Valley and the Red Dam Cooperative in Wadi Mousa are registered with the JCC, and adhere to this Corporation's detailed instructions regarding how cooperatives should be organized and governed (i.e., scheduled elections, minimum number of meetings per annum, committees, etc.). However, I believe the Jordan Valley water user cooperatives benefited from at least two features which contributed to enhancing participation, but were missing with the Red Dam Cooperative. The JVA is a large organization that oversees every aspect of social and economic development in the Valley. It has always played a much more active role with respect to working with farmers since its creation in 1977. In comparison, the PRA is a much younger entity (created in 2001) with a more limited agenda, and its role vis-à-vis farmers involved in the water reuse pilot project remains informal. Also in the Jordan Valley, the farmers' governmental counterpart is required to be the JVA, which in turn owns the water and manages all development in the area. There is no ambiguity as to which body is the most suitable partner for the farmers, as was the case in Wadi Mousa.

Participatory governance is weakest in the Amman management contract. Although LEMA's customers are being consulted via annual surveys and polls at customer service centers, the actual sharing of the information gathered and LEMA's poor responsiveness to feedback were major weaknesses. In part, this is because LEMA's annual reports, prepared by the external Technical Auditors, were not intended for public consumption, although they should have been posted on a website accessible to anyone as is common practice in most countries around the world.

The bigger weakness in participatory governance was LEMA's internal set-up. Unlike the NGWA Managing Consultant contract, LEMA had not developed a business plan of any description. As a result, there was no vision for the company, and therefore no unifying document around which staff might have coalesced in finding a common sense of purpose. In sum, both internal and external governance were weakest in LEMA, and this dampened participatory governance. A further governance flaw was LEMA's inadequate decision-making power in coordinating the Capital Investment Program. After only three years into the contract, WAJ and its PMU realized that it was in their best interest to become more involved with the

Capital Investment Program contractors. To this end, LEMA's Technical Services Director was assigned lead responsibility for the Program, and thereby raising him to the position of Capital Investment Program Director in 2002. This involved having weekly meetings with the PMU and the Capital Investment Program contractors, and decisions were made more swiftly with all three parties at the table. Most importantly, LEMA's Capital Investment Program Director was finally granted additional decision-making authority covering the sequencing of work projects, and the allocation of labor.

A supplementary reason for believing that the NGWA Managing Consultant contract is more participatory than the Amman management contract is that it carries an elaborate governance arrangement for decision-making that involves actors from both outside and within the NGWA. The two main bodies in the governance arrangement are the Management Steering Committee and the Executive Management Board. While they are participatory, their membership is perhaps too broad. The Management Steering Committee for example represents the board of directors for NGWA. The Committee's members include: the Minister of Water and Irrigation; Secretary General of WAJ; Director of the PMU; Ministry of Planning and International Cooperation representative; KfW representative; Managing Director of NGWA; and a Managing Consultant representative. This has frustrated efforts to work efficiently. For example, the Management Steering Committee includes officials at the highest level (e.g., Minister of Water and Irrigation, Secretary General of WAJ, and the Director of the PMU). In this regard, the main problem that arises, according to the Managing Consultant team, is that the Minister and the Secretary General wield disproportionate power, and find themselves intervening in more routine matters and daily responsibilities of the various parties represented on the Committee from which they are expected to remain at arm's length (Interviews 38; 99).

As for the Executive Management Board, it originally included the Managing Consultant and senior local NGWA staff (the Managing Director of NGWA and the four Governorate Directors). It has been subsequently scaled back to include only the Managing Consultant staff and the Managing Director, because local NGWA staff had demonstrated considerable resistance to change. The point is that an effective governance structure requires a balance between quantity and quality. The NGWA Managing Consultant contract might have benefited from streamlining so that all relevant parties would have been represented, but the views and recommendations of each-and-every entity would possibly have not carried equal weight in decision-making.

The main reason overall that the Amman management contract had the weakest participatory governance structure of the four partnerships being considered, is because it was missing something that the other three partnerships exhibited, namely a "collaboration as a negotiated order" (Gray, 1989). A "negotiated order" is a means of renegotiating relationships as needed, "the negotiated theory order downplays the notion of organizations as fixed, rather rigid systems which are highly constrained by strict rules, regulations, goals and hierarchical chains of command. Instead, it emphasizes … the changing web of interactions woven among its members, and it suggests that order is something at which the members of the organization must constantly work" (Day and Day, 1997, p.132 as quoted in Gray, 1989, p.228). The regular meetings of farmers, donors, and government officials in the two rural partnerships, and the meetings between the various bodies that governed NGWA, allowed for a dynamic exchange between all partners. Problems were identified and resolved through on-going interaction.

(iii) Legal setting

In each of the four partnerships there are certain Jordanian laws that have had a substantial impact on effectiveness, as I discussed in detail in Chapters 3 and 4. To reiterate briefly, the most constraining laws that frustrated both LEMA's and the Managing Consultant's efforts to fulfill their contracts objectives were: (i) Jordan's government procurement regime is framed by the Government By-Work Regulation No.71 (1986), and the Supplies Regulation No.32 (1993). Both these are overly bureaucratic and emphasize securing the lowest cost for supplies, which inherently forces a compromise on the quality aspects of nearly any given procurement; (ii) the auditing bodies which were numerous and inconsistent in their assessments; (iii) the *Civil Service Law* (2002) which is very rigid and limiting because it does not allow the likes of a LEMA to operate on a commercial basis; and (iv) the *Water and Sewerage Authority Law* (1973), which does not provide for any applicable penalties when illegal stormwater connections to the network are discovered. The latter made it very difficult for LEMA, and continue to do so for the Managing Consultant team, in terms of attempting to oblige customers to disconnect.

By contrast, both urban partnerships were supported by two legislated acts. The amended *WAJ Law No.18* (1988), Article 28, essentially permitted WAJ to engage in PSP by assigning any part of its activities related to water and wastewater services to another entity in the public or private sector. The *Emiri Law* for its part, states that all the government's accounts receivable (such as its water billing accounts) must be paid, and this must happen even if the customer has accrued debt to deal with on other fronts as well. Perpetrators face consequences if they do not pay (in the NGWA's case, the *Emiri Law* is not being enforced and the Managing Director has decided not to attempt to enforce the provisions of this Act, making it even more difficult to cover NGWA's substantial debt burden).

However, I think the disadvantages of the constraining laws and regulations outweigh the two more favorable laws at-play in both partnerships. This is certainly a major reason why the two urban partnerships were less effective than their rural counterparts. Another adverse effect of the legal setting was, and still is, that there is no consensus on which entity should assume the role of regulator of Jordan's water sector. The implications of all this for LEMA was, and remains, for the Managing Consultant team, that not only is the regulatory framework unclear, but the lines of responsibility between key organizations are also quite nebulous. This can lead to confusion about LEMA's or the Managing Consultant's discretionary power in its daily operation and maintenance activities, as well as confusion as to whom it is legally accountable.

The two rural partnerships benefited to a greater degree from the laws and regulations that pertained to them. In both cases, the cooperatives are legally recognized forms of farmer organization because they have registered with the JCC, and cooperatives are governed by the *JCC Law No.18* (1997) and Regulation No.13 (1998). Farmers also feel that there is a clear advantage to being a legal entity. This gives them added authority and standing as greater leverage when presenting their problems to government partners - i.e., the JVA for the water user cooperatives in the case of the Jordan Valley, or the PRA for the Red Dam Cooperative. What also helps the Red Dam Cooperative is that there are also several Jordanian laws that refer to how treated wastewater should be handled, monitored, and used for agriculture. Specifically, these are the *Law of Agriculture No.44* (2002) and the *Public Health Law No.54* (2002).

The most pertinent law for the water user cooperatives is the amended *JVA Law* (2001). This essentially opened the way for a private operator - such as a cooperative - to participate in the JVA's activities. This is certainly positive for continued engagement between the JVA and the water user cooperatives. However, the drawback is that the law lacks details regarding how this should be applied in practice. The amended law does not mention how farmers, specifically, can take over certain JVA activities with respect to water distribution. Nor does it provide guidance as how to implement irrigation management transfer. This leaves too much room for interpretation by both proponents and opponents of irrigation management transfer.

Overall, the various laws and regulations that have affected the partnerships considered in this study have enhanced accountability to the customers in the urban partnerships, and to the farmers in the cooperatives in the rural partnerships. The laws have provided a fairly comprehensive set of "checks" as to who-does-what, which means the lines of accountability are spelled out. My evaluation would suggest that the two urban partnerships did not fare as well as the rural partnerships with respect to the legal setting. This is primarily because the laws and regulations that govern them have embedded an excessive number of "checks" on what LEMA and the Managing Consultant team can or cannot do. The end effect is that they could not deliver services to their customers as effectively as they might want to.

Information channels and public policies are two other facets of institutional arrangements (in addition to contracts, governance structure, and the legal setting) that I originally hypothesized might have an impact on the effectiveness of the partnerships. In the following section, I explain that while they exert some influence on the effectiveness of all four water partnerships, their influence is not as significant as the other three institutional factors we have under consideration.

A direct benefit of both rural partnerships' governance structures is the frequency of dialogue with government partners. This is especially true in the case of the water user cooperatives in the Jordan Valley, where farmers were convening with the JVA regularly to share information and address issues related to irrigation management for the first time. This would occur during the weekly cooperatives' board meetings, at which the JVA staff frequently attended. Another potentially significant contribution to improving information exchange and communication is the quarterly newsletter '*Sharik*' ("Participate") published jointly by the JVA-GTZ, beginning in July 2006. The Red Dam Cooperative also benefited from monthly and annual meetings between the members of the cooperative. The fact that the meetings were attended by the CDM project site manager, a couple of officials from the PRA, and occasionally the *Sharifa* from the Hashemite Fund for the Development of the Badia, meant that all parties had numerous opportunities to express concerns or share their thinking.

In a way, these information channels allowed for constant communication that helped each partner take stock of what the others were doing to meet their responsibilities. The reason why information channels did not appear to play as important a role as the other institutional factors discussed above (i.e., contract, governance structure, and legal setting) is because most farmers, particularly farmers in the Jordan Valley, placed more weight on having a formal contract with their government partner. This would have cemented their relationships and provided an indicator of the government's commitment to working with and supporting the cooperatives.

What helped LEMA in the Amman management contract, and NGWA in the Managing Consultant contract, improve their information sharing were the companies' interactions with customers in response to complaints. This was supported thanks to modern technology, training of customer service staff, and around-the-clock service in customer call centers. However, customers could have had more opportunity to hold LEMA accountable had the annual reports prepared by the external Technical Auditors been made available to the public.

Information sharing between local NGWA staff and the Managing Consultant team is strained mostly because the Managing Consultant team (responsible for key operations and management decisions under the contract) are based in the headquarters in Irbid. On the other hand, actual Regional Operating Units in charge of day-to-day operations of water and wastewater services are located in their respective sub-regions and they have not been coordinating their activities with the Managing Consultant team.[169] The Managing Consultant team needs to hold the Regional Operating Units accountable despite the logistical challenge of being in a different location. Again these issues are important, but the source of weak information channels might actually reside in the governance structure which does not adequately involve the directors of the ten Regional Operating Units in decision-making.

Jordan's public policies relating to water appear to have had a minor effect on all four partnerships. The only relevant policy impacting the two urban partnerships was "Jordan's Water Strategy and Policies" adopted by the Council of Ministers in 1997. In addition to an overall national Water Strategy, this document covers Groundwater Management Policy, Water Utility Policy, Irrigation Water Policy, and Wastewater Management Policy (MWI, 1998). The Water Utility Policy is the most pertinent for water partnerships because it consists of a section on PSP. This calls for expanding the role of private participants in the water sector through management contracts, concessions, and build-operate-transfer/build-operate-own arrangements. The policy reflects the government's pledge to involve the private interests in water management (e.g., the Water Utility Policy also includes sections on human resources, public awareness, and water resource management).

[169] As I explained in Chapter 3 sub-section 3.3.3, this is mainly because the Regional Operating Units still do not recognize the authority of the Managing Consultant team and participation is further weakened by the language barrier and the physical distance between the Regional Operating Units and their headquarters in Irbid.

The reason why this Water Utility Policy was not viewed by my respondents as critical in shaping the Amman management contract is because the policy itself is somewhat vague. Moreover, it was adopted in 1997. Since then, the partnership landscape in Jordan has evolved (i.e., the Amman management contract, the NGWA Managing Consultant contract and the creation of two public water companies, one in Aqaba and one in Amman). Water utilities have been transformed. If the Ministry of Water and Irrigation updated the policy, it might take stock of these experiences enjoyed to date, reflect the lessons learned, and chart a more detailed a path forward for water utilities and private sector participation.

There are also a few other statements about Jordan's water sector that the government has enunciated over the years, but these have all been more forward-looking rather than focused on policy prescriptions that can be applied by an actual private sector entity, here-and-now. For example, the "National Agenda 2006-2015" is a comprehensive statement that covers all of Jordan's socio-economic and legal sectors (e.g., justice and legislation, financial services and fiscal reform, education, health, etc.). It includes only a brief section on "water", with a few concrete targets to which the public or a private operator can hold the government accountable. It identifies five priority areas as: (i) exploring new sources of water; (ii) curbing NRW from both physical and commercial losses; (iii) addressing disproportionately high subsidies for irrigation water; (iv) improving wastewater treatment plants and increasing wastewater reuse; and (v) encouraging more private sector participation (GoJ, 2006).

There were several other public policy statements that addressed the activities of water user cooperatives, but again these were little more than reference points drafted by high-level government bodies indicating the government's support of cooperatives. For example, "Jordan's Water Strategy and Policies" (MWI, 1998) includes an Irrigation Water Policy. In it, there is a clause that encourages increasing farmer participation in irrigation management, and calls for an eventual transfer of more responsibility from the JVA to the cooperatives. However, no financial support is allocated to the cooperatives. Nor are any targets set to indicate when and how irrigation management should be transferred.

The Red Dam Cooperative is buttressed by three national-level policies that address using treated wastewater. These are: the "National Agenda 2006-2015", which predicts the construction of 17 new wastewater treatment plants in addition to the 19 that already exist); the "2002-2010 MWI Action Plan"; and Jordan's Wastewater Management Policy (MWI, 1998). What is missing from these statements is an indication of how treated wastewater (assuming even more plants are built) will actually be used, where and by whom. The actual designs of new (and old) wastewater treatment plants do not include water reuse plans (CDM, 2007a). Thus for rural partnerships, the actual impact of these policies was diminished by weak implementation because the policies were not sufficiently prescriptive.

The challenge of policy implementation i.e., what happens after a policy is adopted, is well documented in the public policy literature (Browne and Wildavsky, 1984; Grindle, 1980; Lindblom, 1959; Stone, 1997; Majone and Wildavsky, 1979). Many authors suggest that implementation produces both intended and unanticipated outcomes. This is based on the idea that policy evolves during implementation by adapting to changing circumstances. Browne and Wildavsky explain that implementation requires adaptation, and they underscore the need to anticipate potential obstacles and build-in the necessary flexibility to cope with other challenges as they emerge. The urban partnerships could be better informed by a policy that updates the 1998 Water Utility Policy and consolidates what has been learned from the various major PPPs in Jordan to date.[170] The policies related to the operation of water user cooperatives in the Jordan Valley should have incorporated wording to suggest formalizing their relationship with the JVA. Inclusion of specific wording regarding the implementation of the irrigation management transfer would also have been beneficial. In the case of the Red Dam Cooperative, it would have been helpful to have the key national Wastewater Management Policy (MWI, 1998) amended to include a section on how local communities could use treated wastewater for agriculture, and how the government would be supportive of this.

5.3 Other factors that affect partnerships in the water sector

5.3.1 The intervening factors that matter most for effective partnerships in Jordan's water sector

This section analyzes the two intervening factors that I have concluded are the most important across all four partnerships in terms of influencing their effectiveness. I explain why a shift to a commercially-oriented approach is especially important for urban partnerships, and why empowerment is the key to the effectiveness of rural partnerships.

(i) Knowledge transfer

Knowledge transfer is the one factor that had the most positive effect on all four partnerships in this study. By knowledge transfer, I mean the capability and commitment of the partner with more expertise to train, advise, and build the capacity of the other partner. In all four cases, this knowledge transfer was usually achieved through continuous technical and management training, as well as by introducing new technology that would improve the service the partnership is expected to deliver.

[170] The AWC, the micro-PSP initiative in Madaba, and the As-Samra build-operate-transfer wastewater treatment plant project. Having said this, it appears that the recently published "Jordan's Water Strategy 2008-2022" referred to in Chapter 3 section 3.2.3 (ii) is an updated version of the country's national water policy (MWI, 2009).

For example, in the NGWA Managing Consultant contract, knowledge transfer is actually one of the Managing Consultant's responsibilities (as stated in the contract's Service Appendix). Training and development requirements are spelled out in the Human Resources Management Plan (NGWA, 2006d). This plan involved management development programs for directors and managers; specialist training in certain areas; practical training for field staff; and overseas study tours where possible. Training capacity has improved thanks to the NGWA's new internal training facility at its headquarters in Irbid. The Managing Consultant has also asked the Jordan University of Science and Technology to assume some of the training requirements. By 2008, some 53 employee have been trained in leak detection, 12 in GIS, 18 in International Accounting Standards, three in project evaluation, and 10 in commercial awareness monitoring. This is in addition to the daily on-the-job training that NGWA staff receives from the Managing Consultant team (specifically the Severn Trent employees).

Knowledge transfer has probably had a more significant impact on NGWA local staff than was the case with LEMA's local staff. This is because the NGWA Managing Consultant contract requires the Managing Consultant team to share responsibility with NGWA staff for providing water and wastewater services, planning and monitoring service improvements, and proposing performance standards for monitoring progress. The goal is for the Managing Consultant to act as advisors to NGWA, and to take on co-director roles (with local NGWA directors) of the main units in the utility. There is a more pronounced emphasis on the Managing Consultant's responsibility to build the capacity of Jordanian staff through on-the-job training, than that found in the Amman management contract with LEMA.

For rural partnerships, GTZ contributed significant efforts to promote education and awareness of not just how, but why water distribution efficiency should be improved in a pressurized irrigation network (for the water user cooperatives in the Jordan Valley). This continues to be a key ingredient in the success of these cooperatives. GTZ targets the lack of education among many farmers about both the severe water scarcity in Jordan, and the management principles for the pressurized irrigation system. Similarly, CDM, as consultants to the Red Dam Cooperative initiative, demonstrated an ability to explain effectively why treated wastewater is a safe and important source of irrigation water. This was of vital importance to the success of the Red Dam Cooperative initiative. Knowledge transferred from the CDM team (particularly the agriculture experts) to the cooperative was more of a challenge (but still successful). This challenge was largely because there was a great deal of managerial and technical skill the cooperative members needed to develop in order to effectively operate and manage a cooperative of this kind. Unlike the water user cooperatives in the Jordan Valley, the members of the Red Dam Cooperative did not have extensive knowledge of modern agricultural and irrigation practices (the majority of the members are male members of the Amareen tribe who have practiced rain-fed agriculture, but the women and military veterans had virtually no experience with farming). Understandably (and no doubt universally), effective knowledge transfer depends a great deal on the commitment and skill of the group imparting the know-how, meshed with the receptivity and eagerness to learn and apply what is in fact being imparted.

There were also numerous technological improvements in the four partnerships (e.g., establishing LEMA and NGWA's very modern customer call centers, and using drip-irrigation in the Wadi Mousa pilot project).

Knowledge transfer is a crucial intervening factor in all four partnerships. There is a great deal of information about technology and management that needs to be conveyed to local partners (local staff of the water utilities in the urban partnerships and farmers in the rural partnerships).

Unless this happens, it is unlikely that effective and efficient service will continue after the respective partnerships terminate.

(ii) Historical influences

The one historical feature that penetrated all four partnerships, and had an overall negative effect on these same partnerships, is Jordan's traditional system of neo-patrimonial networks based on family, tribe, and "proximity" to the ruling elite. These networks are mostly a result of Jordan having been a semi-rentier state beginning in the 1950s (i.e., depending heavily on foreign aid and remittances from its citizens working in the region's oil-exporting countries). As a result, many transactions and much of the decision-making works along informal lines (i.e., *wasta*, economic rent-seeking, and patronage networks).

Respondents in all four cases lamented this pervasive feature of Jordanian society. In the urban partnerships, interviewees remarked that decisions by locally engaged staff about procurement, or the degrees of customer service they offered, seemed often to be arbitrary. The water utilities' staffing policy never seems to be implemented properly because of the nepotism and corruption that exist. In the rural partnerships, tribal relationships take precedence over any other considerations. At least in the case of the water user cooperatives in the Jordan Valley, there continues to be evidence of patronage networks and *wasta* fully at play in the JVA.

The partnership that is grappling most visibly with past relationships and events is the water user cooperatives in the Jordan Valley. As discussed in the previous Chapter, a major source of mistrust is the very negative experience that many farmers had with the notoriously corrupt agricultural cooperatives created in the 1970s and 80s. This led to profound resentment among most farmers in the Valley who initially opposed even the concept of a cooperative. The GTZ project team must constantly explain to farmers how and why the recent water user cooperatives are fundamentally different from the agricultural cooperatives: (i) the water user cooperatives' boards are elected farmers; (ii) GTZ can act as a third-party and assist in the monitoring of activities and attend meetings; (iii) and there is more public scrutiny as a result of the water meters and regular inspections that reveal whether any farmers are violating the water rotation schedule or tampering with the infrastructure.

One other historical fact mentioned in a number of reports on the water user cooperatives is that the creation of the JVA has eroded traditional water management practices. The practices had relied on water user groups to ensure that water rights were adhered to i.e., the *katib idhara* (water logistician or clerk) would organize the tribal rotation of water time shares (Ghneim *et al.*, 2005; Regner *et al.*, 2006; GTZ, 2002; GTZ, 2003; Scherl and Assaf, 2003). By the time the JVA was created in 1977, the irrigation system had become highly centralized. Many migrants from across Jordan made their way to the Valley seeking to benefit from the social and economic development that the JVA spearheaded. In the process, the social structure of the farming population evolved into one that favored economic independence of individual families. This led to a weakening of tribal bonds. As the farmers became reliant on the JVA to manage any kind of development activity, they no longer saw the economic or social necessity of cooperation. Indeed, farmers began perceiving each other as competitors for scarce water resources distributed by government, and no longer the purview of tribal authority (Regner *at al.,* 2006; GTZ, 2002; GTZ, 2003; Interviews 27; 42). This essentially means that the water user cooperatives today need to "re-learn" how to function effectively.

For the Red Dam Cooperative, trust plays an important role in fostering an effective partnership. It was predominantly the long-standing relationship and trust between the Amareen tribe (who make up the majority of the members of the cooperative) and the *Sharifa,* who currently heads the Hashemite Fund for the Development of the Badia, that persuaded the Amareen tribe to consider using treated wastewater for irrigation, despite their serious initial reservations (Interviews 26; 34; 52).

My impression is that the reason that these various historical influences continue to affect the success of the partnerships, particularly the water user cooperatives in the Jordan Valley, is that many historical concerns remain largely unresolved. For example, both citizens and government acknowledge the adverse effects of *wasta* and patronage networks, but these features have become so engrained that it is very difficult to figure out how to overcome them. And the water user cooperatives in the Jordan Valley need to move-on from their tumultuous experience with the agricultural cooperatives. De Souza Briggs (2003) refers to how Gray (1989) and others believe that "it helps when alliance partners have a meaningful recognition of their inter-dependence … and when respected conveners can help parties overcome barriers such as differing values and work norms, different styles of communication, uneven information, and mistrust – including 'the weight of history'" (Briggs, 2003, p.17).

Another historical relationship that persists (as I discussed in Chapter 4), is the strong bond among tribe members. Several farmers admitted that they often rely on their tribal connections to help them get together with other farmers, so as to use their combined influence to resolve problems with the JVA. Members of the Red Dam Cooperative revealed that what binds the majority of their members is that they are from the same tribe. This suggests that although farmers in Jordan are willing to partner with government entities or donor agencies to improve irrigation practices, the relationship that is paramount to them is the one they hold with their fellow tribespeople.

(iii) Empowerment

I used the word "empowerment" in Chapter 4 to refer to how farmers in both rural partnerships have been able, through their cooperatives, to acquire more responsibility for managing their own irrigation water. This is especially true for the farmers in the Jordan Valley thanks to irrigation management transfer. As a result, they are more confident about their livelihoods and particularly in the case of farmers under the Red Dam initiative where joining the cooperative has given them an additional and stable source of income. The following explains why empowering farmers through these partnerships could potentially be the single most important contributor to the effectiveness of water partnerships, particularly in the rural sector, after ensuring supportive institutional arrangements are in place.

The sources of empowerment are different in the two cases. As explained in Chapter 4 sub-section 4.2.3 (iv), even prior to the start of the GTZ water user cooperative project in the Jordan Valley, the JVA envisioned that its role would, in the future, be significantly transformed. This would occur as farmers eventually took on more irrigation management responsibilities from the JVA through the process of irrigation management transfer.

Irrigation management transfer is not a new concept. It dates back to the 1970s when farmers worldwide were disappointed with the performance of irrigation systems. The strict, top-down nature of these systems was not meeting farmers' needs. The farmers stopped paying for services and this, coupled with deteriorating infrastructure, brought about reform along with the start of irrigation management transfer (Garces-Restrepo *et al.*, 2007). Irrigation management transfer has only just started in the Jordan Valley (since 2008). Two pilot areas were selected to test the prospects of transferring responsibilities and demonstrating what the farmers will actually be doing, which responsibilities they will assume, and what kind of problems they might face along the way.

The rationale for irrigation management transfer in the Jordan Valley is echoed in a description by Vermillion (2006) who analyzed/studied irrigation management transfer from a global perspective: "[t]he irrigation management transfer empowerment model of reform is an attempt to restructure the entrenched government-dominated organizational structures with a new framework that places water users in the role of governing irrigation systems (through management transfer) and places government in the roles of facilitating the formation and capacity building of [water user cooperatives], regulating and providing support services" (p.3).

Given that it is still early days for irrigation management transfer for the water user cooperatives in the Jordan Valley, it is useful to take stock of what some of the main challenges have been to implementing irrigation management transfer in other countries such as China, Mexico, Turkey, Mali and others where irrigation management transfer started in the 1990s or earlier. These challenges include: (i) unwillingness of governments to modify existing laws through parliamentary processes, which means that water user cooperatives are not given sufficiently clear legal responsibilities; (ii) inadequate managerial skills within the water user cooperative making it difficult for them to take on the new management responsibilities; (iii) timely and sufficient financial support for asset (e.g., water network) rehabilitation and technical support before the transfer and technical support from appropriate government entities; (iv) the ability of both farmers and government to allow irrigation management transfer to be a learning opportunity, and continuously monitor and evaluate the progress of the transfer (especially early on) and be flexible about modifying features of the transfer as deemed necessary (World Bank, 2007b; INPIM, 2004; Vermillion, 2006; Garces-Restrepo *et al.*, 2007; DSI, 2004). Irrigation management transfer is seen as the next, natural step to take in improving the efficiency of distributing irrigation water, after the creation of water user cooperatives (Garces-Restrepo *et al.*, 2007; World Bank, 2007b). It is essentially a different kind of partnership between farmers and the government, and is an indication that the water user cooperatives, as a partnership, have fulfilled their role and been effective.

As for the Red Dam Cooperative, their source of empowerment is linked to the way in which this project upholds the concept of sustainable livelihoods. The sustainable livelihood framework has been used by major development agencies (e.g., the UK Department for International Development, CARE, and the United Nations Development Programme). It encourages promoting a secure livelihood while lowering a community's vulnerability to environmental and/or economic shocks by supporting development that builds on the strengths of poor people and improves production through sustainable practices. It focuses on bringing together all the relevant partners (state, civil, or private) in the process (Ashley and Carney; DFID, 1999).

In Chapter 4, sub-section 4.3.3 (iii), I contend that the pilot project in Wadi Mousa with the Red Dam Cooperative espouses both sound environmental and economic sustainability and is tailored to the specific strengths and needs of the cooperative's members. The environmental benefits include: (i) replacing precarious rainfed farming with irrigation; (ii) monitoring the water quality of the treated wastewater used for irrigation; and (iii) using as much of the treated wastewater as possible for irrigation in order to minimize the amount of water that flows into *wadis*.

Economic sustainability stems from the choice of growing fodder crops which makes considerable economic sense because there is a tremendous deficit of fodder locally available in Jordan. Several farmers spoke to me about their improved annual incomes (section 4.3.2 (iii) above), and favorable marketing environment for their produce as key indicators of the success of the partnership (Interviews 24; 34; 50; 60; 83). The one tenet of sustainable livelihoods that I think the Red Dam Cooperative and its current project manager (The Hashemite Fund for the Development of the Badia) will need to be especially conscious of is that the pilot project, and the cooperative itself, must remain dynamic. This means the cooperative will need to understand and learn from change - whether it be a change in fodder prices or unexpectedly lower yields because of an unexpected frost - and grasp the effects of external shocks on livelihoods (DFID, 1999). Being a dynamic cooperative may mean expanding into other income-generating activities (e.g., bee-keeping, dairy cattle, poultry and eggs, etc.), or altering cropping patterns.

I contend that promoting this kind of sustainable livelihood is a form of empowerment for the members of the Red Dam Cooperative, and will motivate farmers to do all they can to ensure the effectiveness of the partnership. I also believe that empowering farmers in this way will make them more of an "equal" partner with their donor agency counterparts (USAID and now the Hashemite Fund for the Development of the Badia) such that farmers will gradually become more financially self-sufficient and less reliant on donors.

(iv) Shift to a more commercially-oriented approach

It is not surprising that one of the chief intervening factors that influenced the effectiveness of the two urban partnerships is the way in which better commercial practices were introduced. This encouraged a corporate mindset among local Jordanian staff. The private operator for the Amman management contract, LEMA, successfully instilled commercial practices into the water utility. In concrete terms, this meant: more transparent business processes; well-planned capital investment program; business spirit among staff that urged them to think creatively and laterally when attempting to solve problems; and a focus on high quality customer service. All these elements contributed to transforming LEMA into a more business-modern water utility.

Both LEMA in Amman and the Managing Consultant team in the northern governorates faced similar barriers in their efforts to instill a more corporate culture in their respective water utilities. Two major barriers were that local WAJ staff in both utilities are engineering-centric and lack a commercially-oriented approach to running their operations. Also, staff in both utilities are not accustomed to adhering to the norms of a corporate culture i.e., preparing and presenting business cases for procurement, digesting lengthy plans and reports, and submitting to intensive training and building a culture of continuous learning in operational, finance, and customer service. The Managing Consultant team in NGWA had more support in overcoming these obstacles because the leaders in the pertinent government entities (e.g., the Minister of Water and Irrigation and senior officials in WAJ's PMU) are proponents of PSP. They have considerable financial and commercial know-how to help bridge the gap between local NGWA staff and the Managing Consultant team.

In addition to the gains that result from adopting more commercially efficient practices, I believe a further important reason why this factor played an important positive role is that the commercial orientation began to eat-away at the deeply rooted engineering legacy. Jordanian water utilities tradition of engineering-focused problem solving (applied indiscriminately to technical, management, as well as administrative problems) was now being boxed within a framework of commercial principles and realism. Examples of what had been the norm included the very little thought that was usually given to the financial implications of procuring an item, and the very little accountability required when it came to expenses, and also, customer service was typically a subordinated function. This *modus operandi* was now changing for the better, although this shift was not as pronounced in rural partnerships, given that cooperatives are not run on the same business model as that of the water utilities.

Finally, while innovative organizational arrangements were a factor in influencing the effectiveness of the partnerships, they seem much less important than the other four factors considered. The concept of innovative organizational arrangements refers to novel ways of organizing people and ideas. For the water user cooperatives in the Jordan Valley, a prime example of an innovative organizational arrangement was the creation of a specialized water user cooperative with legal status (as of December 2007), to act as a federation that represents water user cooperatives the width-and-breadth of the Jordan Valley. The idea was that this specialized water user cooperative would give all the water user cooperatives in the Valley a higher political profile, thereby having them better placed to negotiate their needs with senior government officials.

The farmers in the Red Dam Cooperative will hopefully benefit from a revolving fund which (although not yet operational because it is pending the issuance of a regulation that would operationalize it) will provide seed money to fund diverse activities that the members of the cooperative want to pursue. This is similar to a community-level micro-finance system, and is an important step in reducing the reliance of the cooperative on external funds from donors, thereby increasing its independence.

I think the most significant examples of innovative organizational arrangements are in the NGWA Managing Consultant partnership described in Chapter 3 sub-section 3.2.3 (iii). The actual amalgamation of the four northern governorates' respective utilities into one utility; the appointment of the Managing Consultant to provide management, operational and maintenance support to the Managing Director of NGWA and his staff; running a public utility according to a Business Plan; and introducing micro-PSPs (which is essentially the outsourcing of a specific business activity to a local company), are all "firsts" in Jordan and are key components of transforming NGWA into a more efficient and effective water utility. I believe the NGWA Managing Consultant partnership was more inclined to "pushing the envelope" in reforming NGWA, largely because the government (WAJ specifically) wanted to learn from the Amman management contract experience and implement changes. As a result, the governmental partner was perhaps more amenable to introducing new concepts into the contract. In addition, the Managing Consultant team had the experience and skill necessary to implement these concepts.

In sum, I would argue that institutional organizational arrangements played an important role in influencing the effectiveness of just one of the partnerships, specifically the NGWA Managing Consultant contract. Institutional organizational arrangements appeared to play a role of lesser significance in the rural partnerships because these novel organizational arrangements (i.e., the specialized water user cooperative and the revolving fund) have not yet had a chance to develop (the former was created at the end of 2007 and the latter had not yet started at the time of writing).

Table 26 presents an overview of the seven factors that appear to be the most important in explaining the effectiveness of the four partnerships under study. The first grouping of three (i.e., the contract framework, governance structure and legal setting) are institutional factors. Knowledge transfer and historical influences are two intervening factors that affected the success of all four partnerships. Thirdly, empowerment is uniquely important to rural partnerships, while a shift to commercially-oriented practices is uniquely important to urban partnerships.

Table 26 - Overview of the seven factors that appear to be most important in explaining the effectiveness of the four partnerships studied

	LEAST EFFECTIVE →			MOST EFFECTIVE
Factors that influence the effectiveness of the partnership	**The NGWA Managing Consultant contract**	**Greater Amman water supply and wastewater service management contract**	**Red Dam Cooperative for Agricultural Water Reuse**	**Water user cooperatives in the Jordan Valley**
Contract	• Inflexible because of insufficient autonomy to the Managing Consultant to be effective and efficient (e.g., recruitment, budgeting, procurement, etc.). • Accountable to its customers because of need to focus on its only contractual target with a financial incentive (i.e., the Managing Consultant needed to achieve an operating ratio of 105% and a balanced cash flow).	• Degree of flexibility in terms of the ability to review and modify the contract i.e., two Memoranda of Understanding. • Inflexible in terms of not giving LEMA sufficient autonomy to be effective and efficient (e.g., staffing policy, Capital Investment Program). • Fostered accountability to their customers and government because performance standards were quite onerous, indeed essentially unattainable.	• There are a few important contracts: project agreement; and two Memoranda of Understanding one about providing water to cooperative and one about Hashemite Fund for Development of the Badia taking over project in January 2008. • There is no contract between the cooperative and the PRA, the key implementing partner.	• No formal contract or agreement between farmers and the JVA. • No pre-defined set of indicators shared with farmers and the JVA to evaluate success of cooperatives. • Ambiguity created in terms of what each partner can expect of the other.
Governance structure	• Preparation of a Business Plan and associated plans. • Elaborate governance arrangement (Executive Management Board, Management Steering Committee, and Operations Management Board).	• LEMA had inadequate decision-making power in coordinating the Capital Investment Program. • No business plans prepared.	• Cooperative is legally recognized and registered with the JCC. It has an elected board (or management committee). • Cooperative receives more support from Hashemite Fund for Development of Badia than the PRA.	• Cooperatives are legally recognized and registered with JCC. They have a board (or management committee) that is elected. • Regular meetings between board and the JVA. Improved technical cooperation and conflict resolution.
Legal setting	• Four laws that hinder partnerships in the water sector and two that help them. • Unclear who is regulator in water sector.	• Same issues as with the NGWA Managing Consultant contract.	• Cooperative abides by the *JCC Law*. • Several laws in Jordan deal with the various issues related to using treated wastewater for irrigation.	• Cooperatives are legal entities providing them with more leverage in dealing with the JVA and other government bodies.

	• Private water tanker-trucks not sufficiently regulated.			• *JVA Law* (2001) supports water user cooperatives but does not sufficiently clarify the new relationship between farmers and the JVA .
Knowledge transfer	• The Managing Consultant has introduced training in specific fields (GIS, accounting etc), management training, and practical training for field staff. • New training facility built in headquarters.	• Major technological improvements in the customer call centers. • By 2007, staff had completed over 100,000 hours of training in total.	• CDM have provided day-to-day training and intensive workshops on how to irrigate with treated wastewater and how to manage a cooperative.	• GTZ provides farmers with training on understanding and operating the pressurized irrigation network. • GTZ also provides the JVA with technical assistance on rehabilitation of distribution lines .
Historical influences	• Jordan is a semi-rentier state (dependent on foreign aid and remittances). • State benefits have created neo-patrimonial networks based on family, tribes, and proximity to elite. • These patronage networks engage in societal rent-seeking to get things done which undermines formal institutions and encourages nepotism and corruption.	• Same issues as in the NGWA Managing Consultant contract.	• Apart from the military veterans, most farmers in the Red Dam Cooperative are of the same tribe, which facilitates trust and cooperation.	• Trust is a major issue for farmers. In the Jordan Valley, there is considerable mistrust by farmers of cooperatives because of their negative experience with agricultural cooperatives created in the 1970s/80s. • Creation of the JVA eroded traditional water management that relied on water user groups. • Evidence of patronage networks and *wasta* in the JVA. This breeds corruption and makes some farmers suspicious of joining a cooperative and working more closely with the JVA.

Empowerment			• Partnership supports sustainable livelihoods for members of cooperative by providing environmental benefits and economic benefits. • Source of motivation and independence for farmers.	• Two pilot projects set up to test how a transfer of management responsibilities would work. • Operational tasks of distributing water will be handed over from the JVA to cooperatives.
Shift to commercially-oriented approach	• The Managing Consultant produced Commercial Management Plan to orient staff to better commercial practices. • Focus on quality customer service. • The Managing Consultant staff encouraged moving away from legacy of engineering-centric approaches to problem solving.	• LEMA staff encouraged better commercial practices and business spirit among local staff. • Introduced a greater focus on quality customer service. • LEMA staff encouraged moving away from legacy of engineering-centric approaches to problem solving.		

5.4 Towards improved partnerships in the water sector

The model illustrated in Figure 8 below highlights the factors that appear to have the most influence on the effectives of water partnerships in Jordan. Various institutional arrangements are clearly important: contracts, governance structure, and the legal setting. Contracts with clearly defined targets are crucial to ensuring accountability to customers (i.e., those individuals receiving the water services). However, sufficient flexibility must be built into each contract to allow for a review of targets that, upon reflection or practical experience gained, might not be realistically attainable. Contracts must also allow the service provider adequate autonomy to operate effectively. Governance structures that encourage consistent and inclusive participation of partners in decision-making and information sharing have a very positive effect on partnerships. Relevant laws and regulations can enhance accountability to customers in urban partnerships, and to farmers in cooperatives in rural partnerships.

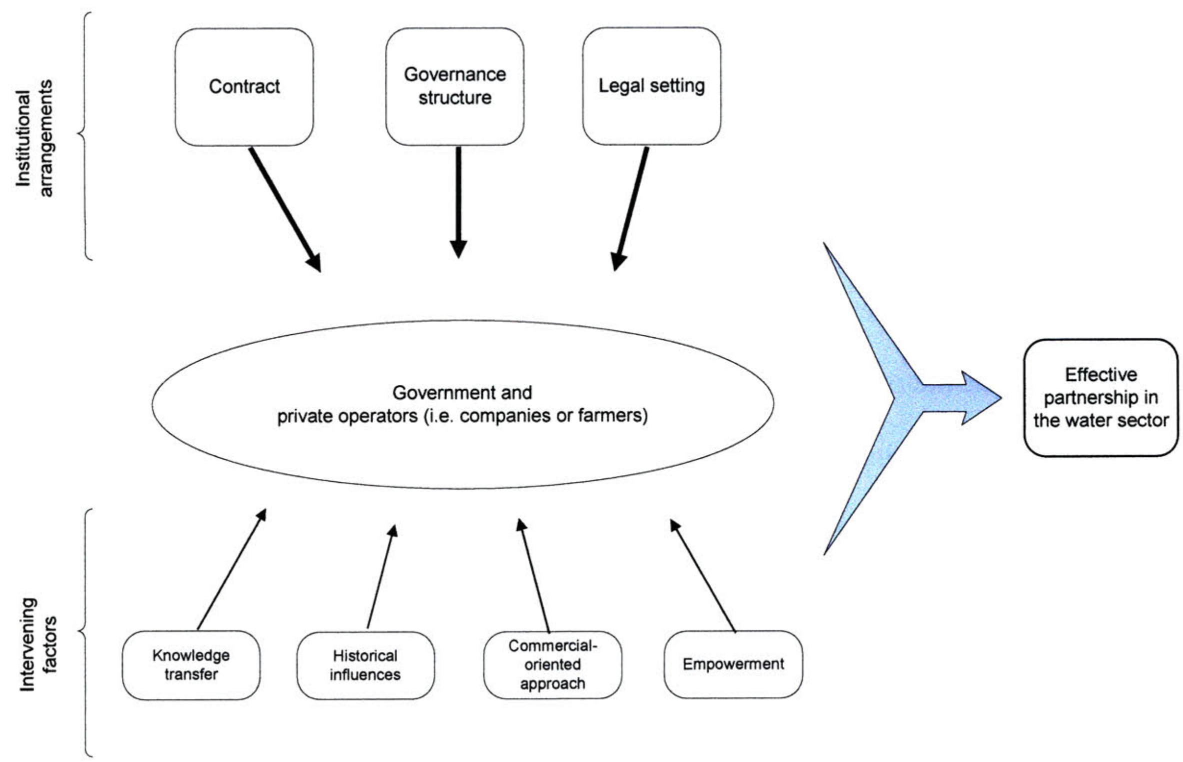
As I reasoned at the end of Chapters 3 and 4, my initial expectations were confirmed: institutional arrangements did have a significant impact on partnership effectiveness. However, this does not mean that these same factors will always affect every water partnership in the same way, or to the same degree. In three of my four case studies, contracts had a negative effect because of the way they were structured. In one case (the Red Dam Cooperative) no apparent negative consequences were identified.

The model provided in Figure 8 indicates the importance of two key intervening variables that also shaped the effectiveness of all four partnerships. First, knowledge transfer had a positive effect because there is a great deal of information about technology and management that needs to be conveyed to local partners, so that service levels can be maintained and improved after a

PPP terminates. Second, the historical relationships and events discussed in sub-section 5.3.1 tended to have a largely negative effect on the partnerships, mainly because the historical/cultural/societal issues remain largely unresolved in Jordanian society.

The intervening factor that is unique to rural partnerships is the importance of empowerment of farmers. When given more responsibility for managing irrigation water in a way that helps maintain lifestyles, farmers are motivated to do what they can to continue the success of their cooperative. The intervening factor that is unique to urban partnerships is the way in which the private sector partners injected better commercial practices and encouraged a more corporate mindset among local Jordanian staff. In addition to the efficiency gains that resulted from adopting a higher level of commercial practices, this factor is important in making the partnerships more effective because it began to ebb away the legacy of a solely engineering-focused problem solving mentality within the executive offices of the Jordanian water utilities.

Figure 8 - A model of the factors that appear to have the most influence on the effectives of water partnerships in Jordan



In sum, these findings underline the importance of institutional arrangements in influencing the success of PPPs in the water sector, and they also point to the kind of reforms and direction that Jordan, and countries in the region similar to Jordan, may want to focus on if they choose to pursue more PPPs in this sector. In Chapter 6, I suggest various policy recommendations based on the findings in this study.

CHAPTER 6: Policy recommendations and implications

6.1 Overview

I began this study by posing the following research question: how have institutional arrangements - rules, norms and strategies - contributed to the effectiveness of partnerships in Jordan's water sector? I defined the water sector broadly to include drinking water supply and wastewater services, as well as irrigation water.

At the end of Chapter 5, I concluded that the institutional factors having most influence on the effectiveness of water partnerships in Jordan appear to be contracts, governance structure, and the legal setting. I also demonstrated that there are secondary (or what I term intervening) factors that contribute to the success of such partnerships. These are knowledge transfer, historical relationships, the empowerment of farmers in rural partnerships, and a push for more commercially oriented practices in the case of urban partnerships. As I explain in Chapter 1, given its scarce water resources, Jordan must devise institutional arrangements that balance competing interests, while ensuring participation and accountability. The idea is for Jordan, and other countries in the region, to improve their water management framework by adopting institutional modifications that will place them on the path toward more sustainable management of their relatively scarce water resources.

The aim of this Chapter is to tease out prescriptive policy recommendations that follow from these conclusions. I also suggest a number of avenues for additional future research that might flow from this study.

6.2 Policy Recommendations

(i) Focus on institutional arrangement

My findings support other researchers who have suggested that institutional arrangements are of high importance because they influence the quality of governance, which in turn is central to the operating effectiveness of water systems. There are three facets of institutional arrangements that my research suggests are the most important in Jordan's water sector, and could also be important in other countries dealing with similar urban and rural water systems management challenges. These are: (i) contracts that need to set clearly defined targets to ensure accountability to water service customers, coupled with sufficient flexibility to ensure adequate consumer autonomy; (ii) governance structures that foster extensive participation in decision-making and information sharing; and (iii) laws and regulations that ensure responsiveness to the needs of customers in urban partnerships and farmers in rural cooperatives.

(ii) Experiment with different types of PPP models

Outlined in Chapter 1, Jordan has experimented with numerous partnership models (including a management contract, a Managing Consultant contract, micro-PSP, and public water companies). One major challenge has been finding the right organizational and legal structure to encompass these arrangements (i.e., contracts, policies, laws, governance structures, and channels of information and communication). With water scarcity intensifying, population levels rising, and public utilities operating largely inefficiently, there is a need to keep "pushing the envelope" in terms of implementing and testing creative structures and adaptive solutions in order to build as effective a framework as possible within which to manage the country's demanding and growing water needs.

I believe that the Jordanian government's openness to experimentation with various PPP models offers an important lesson to other countries in the region. Over the past decade, government, farmers, donors, and private water corporations have learned a great deal about which kinds of partnerships work under various circumstances. As one international water consultant who has worked extensively in Jordan suggested, it might also be advantageous to not only experiment with different PPP models, but to set "trial periods" during which private operators can test the viability of contract objectives and make a more realistic assessment of what works. He offered this in the context of urban partnerships that deal with drinking water and wastewater services (Interview 57).

(iii) Encourage micro-PSP activities

In Chapter 2, I discussed the positive experience that Jordan has had with micro-PSP in the water sector. I believe other countries in the region that want to increase the efficiency of their water utilities should explore micro-PSP. This is especially true for those countries willing to create public water companies.

Micro-PSP involves outsourcing selected business activities (e.g., meter reading, billing and revenue collection, leakage repair service, customer surveys, etc.). The anticipated result of commercialization of these functions is that, once in place, bureaucratic delays and inability to provide efficient service are in most cases avoided. The concept is to contract for a specific set of business activities to local companies, which should in turn speed up project implementation.

Micro-PSP is not being suggested as an alternative approach to traditional PSP projects. Rather, it is a complementary and preparatory step leading to more extensive PSP, of water and wastewater systems operations (OMS, 2003b). With the creation of more public water companies in Jordan (such as AWC and Miyahuna, and possibly NGWA as projected for sometime in 2009), micro-PSP contract negotiations should be additionally facilitated because they will not require letting through Jordan's cumbersome Central Tender Directorate. The added benefit to public water companies is that if they sign a performance-based micro-PSP contract with a private provider (such as a local engineering company), that private company will essentially share some of the risk involved in improving the specific business function it would then be charged with. Usually, a private company's compensation is based on both a fixed fee for providing the service, and a performance-based incentive (Interview 82; OMS, 2003b).

(iv) Consider important issues related to public water companies

In Chapter 2, I explained that the creation of new "water companies" appears to be the trajectory that the Government of Jordan wants to take. The "2002-2010 Water Action Plan" prepared by the MWI spelled out Jordan's long term strategic goals for both municipal and agricultural water sectors. Moreover, it was the first document that called for WAJ to "allow for the establishment of public owned companies run on a commercial basis" (MWI, 2002a, p.2). An even more important policy threshold was reached in 2003, when the MWI endorsed water sector "corporatization", as explained in their policy review entitled "The Concept of Commercial Companies in the Water Sector" (MWI, 2003). AWC and Miyahuna in Amman are and remain the two public water companies operating in Jordan, as of 2009.

I believe there are several important lessons to be learnt from the Miyahuna experience to date. One concerns bulk water agreements, which is something that neither the Amman management nor the NGWA Managing Consultant contracts dealt with. A bulk water agreement was deemed a necessary criterion in establishing Miyahuna because WAJ is responsible for allocating available water between users. This is done informally based on rainfall and supply and demand in each region of Jordan (Segura, 2006b).

The informality of the allocation allows WAJ not have to commit to supplying an annual quantity of raw water at a fixed tariff. This means that the supply and financial risks are borne by users. A further consequence of informal allocations is that the accountability of a public water company as a bulk water supplier is diminished. Operations and investments in the public water company are also more of a challenge. Therefore, the suggestion to the Jordanian government in 2006,[171] prior to the creation of Miyahuna, was to "develop more formal water delivery arrangements since WAJ is best placed to manage the bulk water supply risk" (Segura, 2006b, p. 50). Miyahuna's bulk water agreement stipulates that WAJ will supply Miyahuna with 65.8 MCM of water, and the JVA[172] is responsible for supplying Miyahuna with 71.2 MCM. The result sees the two government entities, WAJ and the JVA, sharing in the responsibility almost equally (Miyahuna/WAJ, 2007b; 2007c). I deem the need to clarify and formal a bulk water supply agreement prior to setting up a public water company to be an essential step, so as to ensure both efficiency in delivery and water supply accountability to users.

There are two other noteworthy issues that are important to bear in mind when creating a public water company. First, these companies must prepare a business plan, which in the Miyahuna case was done. Such plans need to outline goals, procedures, and strategies that can be shared with all employees. I discussed the importance of business plans in Chapter 3 (NGWA Managing Consultant contract) and how they have helped guide the NGWA's progress to date.

[171] These suggestions were in a report that analyzed various organizational models, and recommend one for providing water and wastewater services to Amman, following the expiration of the management contract. The report was funded by the USAID office in Jordan (Segura 2006a; 2006b).
[172] The JVA is responsible for allocating water to both agriculture and drinking usages in Jordan (Miyahuna/WAJ, 2007c).

Second, public water companies must be more pro-active in launching public education campaigns related to water conservation and the merits of water demand management (e.g., a strategy that stresses making better use of limited water, improving plumbing standards, and/or restricting car washing).

Besides the specific NRW goals and plans discussed in Chapter 3, which are a crucial component to water conservation, neither LEMA nor NGWA pursued broader public education or awareness campaigns. However, Miyahuna did start such an initiative in 2007, and has invested US$353,107 in their campaign (Interview 85).

(v) Address issues related to historical relationships or events

Throughout the previous three chapters (Chapters 3 to 5), I purposefully discussed in considerable detail the manner by which various historical influences shaped (both positively and negatively) the Amman management contract partnership. And in the case of the other three on-going partnerships, how "history" continues to mark the effectiveness of the partnerships. The reason that these various historical influences continue to be important, particularly for water user cooperatives in the Jordan Valley, is that many historical concerns remain largely unresolved. For example, both citizens and government acknowledge the adverse effects of *wasta* and patronage networks. However, since these features are so ingrained in the culture of the region, it is very difficult to volunteer how one might devise a strategic approach that, over the foreseeable future, would hopefully rid the business environment of their presence.

As well, water user cooperatives in the Jordan Valley need to move on from their previous tumultuous and highly negative past experience with agricultural cooperatives. Thus, I believe one imperative for partnerships in the water sector in Jordan, and in most countries in the region where similar cultural-historical relationships might exist, is to tackle the adverse effects of certain historical events through open discussion them openly among all the partners involved. This, of course, will not ensure that the aftermath of historical events or relationships will be overcome immediately, but the initiation of a hopefully constructive dialogue remains a necessary and fundamental first step.

(vi) Clarify objectives of each partnership

Ensuring that the objectives of each partnership are clearly defined is key. This applies in the cases of urban partnerships, where the focus is providing drinking water and wastewater services, and rural partnerships which are centered on the delivery of irrigation water. Urban partnerships in the water sector, such as the two urban case studies presented (i.e., the Amman management contract, and the NGWA Managing Consultant contract), are usually (if not always) governed by a detailed, legal contract. This usually leaves little room for interpretation and thereby effectively squelches any meaningful room for flexibility that might allow for adapting readily when shifting circumstances or opportunities present.

By contrast, as I explained in Chapter 4, the rural-based water user cooperatives did not have formal contracts with their governmental counterparts. That is, unlike the two urban cases, there are no single documents that listed the services that were expected to be delivered, no performance standards were set-out to be met, or no staffing policy that required adherence. There is no legal or otherwise binding definition of what a "water user cooperative" is in the Jordanian context. These two issues have led to confusion and ambiguity about the purpose of water user cooperatives.

My recommendation is for governments to seriously consider signing formal contracts with water user cooperatives in order to ensure a mutual understanding and agreement from the outset, about the precise objectives of each cooperative. The water user cooperatives in the Jordan Valley have adopted the right approach by restricting themselves to activities that relate to water distribution. They have not expanded into a wider range of business activities i.e., marketing produce, buying supplies, etc.

The GTZ project team has refrained from encouraging farmers to take on related business activities. I agree with the view that there are considerable organizational and economic benefits to be enjoyed by business cooperatives. This structure would be more effective if farmers with similar crops, agricultural needs, and economic interests join forces (Interviews 70; 84; 86). However, the water user cooperatives on the other hand are geographically defined in terms of the irrigable area supplied by a pumping station. As such, their focus should be on water distribution. Farmers need common tasks or challenges they are able to rally around. Coalescing to resolve a question of choice/direction, or an issue whose resolution requires a considered compromise for the greater good, or agreeing to an objective whose attainment requires the dedicated focus of the group as a whole, are all illustrative of supportive, indeed cooperative work, that lends itself to the continued building of ever-greater positives amongst the farmers involved (e.g., self-worth, achievement, empowerment, trust, self-reliance, etc.). For water user cooperatives, such an initial and overriding rallying point that should galvanize their joint efforts is clear: improving the efficiency and equity of given water distribution systems.

(vii) Reduce redundancies in the roles played by government entities

In Chapter 4, I discussed the regulatory framework surrounding the use of treated wastewater in Jordan. It includes overlaps in terms of which government entities are responsible for what specific areas of responsibility. This can lead to redundancies and inefficiencies. For example, the monitoring of treated wastewater is within the scope of several ministries: the Ministry of Water and Irrigation's Water Reuse and Environmental Unit, the Ministry of Health's Environmental Health Directorate, and the Ministry of Environment's Water Protection Directorate. The main challenge is ensuring that the government agency responsible for monitoring is the same one that issues given regulations that control the factors being monitored for in that same water. In circumstances where this match-up does not occur, there is usually little incentive to report non-compliance in the water quality of the treated wastewater in question (CDM, 2007a).

Another example is that WAJ's Water Reuse and Environmental Unit, through their Soil and Plant Monitoring Programme, collects data twice yearly on the biological and chemical composition of the soil and plants irrigated with reclaimed water from each wastewater treatment plants. However, the data are not shared with the farmers because of the absence of qualified personnel to interpret the significance and meaning of the results. Also, WAJ is unwilling to expose data that might reflect unfavorably on the operations of its wastewater treatment plants (CDM, 2006d).

One recommendation is to clearly separate the tasks of operating wastewater facilities from that of monitoring treated wastewater. Until now (2009) WAJ is responsible for both, resulting in an inherent and perhaps obvious conflict of interest. WAJ should focus on operating wastewater facilities, and as one report suggests, concentrate on educating the public about how to effectively use treated wastewater in industry, agriculture, and landscaping (CDM, 2006d).

Making sure that treated wastewater complies with standards should be the task of only two ministries. One is the Ministry of Agriculture through the *Law of Agriculture No.44* (2002). This statute seeks to ensure compliance with government standards, and the rules those standards set on the use of wastewater in irrigation specifically. The other is the Ministry of Health through *Public Health Law No.54* (2002). This Ministry monitors compliance with public health-related standards for water reuse, especially in agriculture, to ensure that farmers do not grow crops that are not permitted to be grown using treated wastewater under Jordanian law.

(viii) Prioritize knowledge transfer

Knowledge transfer (defined here as a commitment by the partner with more expertise to train, advise, and build the capacity of other partners) is the one factor that had the most positive effect on all four partnerships, as discussed in Chapters 3 to 5. In all cases, knowledge transfer was achieved by continuous technical and management training, as well as by the introduction of new technologies that improved the services the partnerships delivered. There is a great deal of information about technology and management that needs to be conveyed to local partners. Building an ever-greater knowledge and information base should always be a central goal of any partnership in the water sector. Unless this happens, it is unlikely that effective and efficient service will continue after the partnership concludes or evolves into a new/different form of management entity.

Another point regarding knowledge transfer concerns the collection of reliable baseline data on water resources. Donor agencies or private sector companies can assist developing countries with this task, which can in turn be costly. Germany's international development arm, GTZ, has been working in Jordan on all aspects of water management and technology for 30 years, since the 1970s. The one undertaking it focused on gathering baseline data for was its Operation

Management Support project. The data base laid in that instance was instrumental in determining the scope of the goals of the two urban partnerships that eventually evolved and that are, of course, the subject of this study.

6.3 Avenues for future research

(i) Exploration of community provision of water services as another PPP model

The role of communities in supplying water, particularly in urban areas, has been a long-standing area of research in international development. Community provision is an alternative to PSP contracts in urban centers around the world. A recent study by Bakker (2008) suggests that "[t]he resurgence of 'community' water supply alternatives to privatization in public debate has been useful in disrupting the (false) public/private binary to which much of the privatization debate is subject. Historical experience shows that the terms 'public' and 'private' only incompletely capture the diversity of the existing range of resource management systems" (Bakker, 2008, p.246).

In my inquiry, the four case studies examined showcase the different roles that the state, corporations, and community can play in the provision of water services in Jordan. I believe it would be valuable to pursue research that further parses these roles. I am not suggesting a normative line of inquiry that presumes that communities can solve all issues related to water services. Rather, I recommend examining and contrasting community-managed initiatives as one model of water management. This line of study could explore the role of communities (if any) in providing water services in large urban centers such as Cairo or Beirut, as well as rural areas in Morocco or Yemen, for example.

(ii) Examination of the role of philanthropic organizations in water partnerships

My analysis of the Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa, highlighted the role of the Hashemite Fund for the Development of the Badia in advising and providing guidance to the cooperative. In January 2008, the Fund assumed responsibility of managing the water reuse pilot project in Wadi Mousa from CDM, the original partnering consultants between 2004 and 2007. The Fund is a philanthropic organization, but it has ties to the Jordanian monarchy. The head of the Fund is a member of the Jordanian royal family - a *Sharifa* - whose ancestors are from the *Badia,* and she indeed remains very knowledgeable about the *Badia* region.

Further research on the role of how and why monarchies (or organizations linked to the monarchy) have become involved in water resource management issues, and more specifically whether the monarchy complements or complicates the work that the government is involved within the water sector, would be valuable. This could lead to a regional comparative study as there are numerous monarchies in the Middle East and North Africa, although major challenges with respect to reasonable access to appropriate Royal Family members, and expectations for interlocutor-comment and input that might be little more than platitudinal self-serving generalities, would clearly remain.

(iii) Study the potential of micro-PSP in the region

As I have mentioned throughout this study (including just above in section 6.2), micro-PSP is garnering more interest and support in Jordan's water sector. It would be useful to determine whether other countries in the region have experimented with the micro-PSP model and, if so, why? If such a study revealed that micro-PSP has not yet taken hold in other countries, perhaps the next step should be a reasonably comprehensive feasibility study to determine how the micro-PSP concept could be applied in countries that either already have public water companies or are in the process of creating them.

(iv) Comparing PPPs in the water sector with PPPs in transportation or energy

Another area of future research would involve a comparative study of PPPs in another sector that involves major infrastructure investment and has important social and environmental implications. This research could horizontally investigate across three sectors (i.e., water, energy, and transportation) within a chosen country, or at multiple sectors in multiple countries. The question, as in this study, should be how institutional arrangements have contributed to the effectiveness of partnerships in the sectors under investigation?

By considering multiple institutional factors simultaneously, and unraveling how and why these factors have a significant impact on urban and rural partnerships, we could reframe the debate that is needed to take place. We should be trying to understand how and why institutional factors (particularly contracts, governance structure, and legal frameworks), as well as related factors such as knowledge transfer and historical relationships, influence the success of infrastructure partnerships

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Appendix A: Interview guide

Below is the interview guide for the two urban partnership and the two rural partnerships. The interview guide was tailored according to whether the interviewee was answering questions about an urban or a rural partnership.

Part A: Questions about the effectiveness of each partnership

1. What can you tell me about the quality of the drinking water that LEMA/NGWA provides to residents in the service area? What about the quality of the irrigation water that the JVA supplies to farmers in the Jordan Valley? Is there annual data on water quality? Is there data about the following indicators of water quality:
   - Salinity of the water (or total dissolved solids).
   - Total suspended solids.
   - Pathogens: Is there any data about the presence of e.coli for example? Or any other pathogens they measure.
   - Trace metals: Is there is a significant quantity of industrial discharge that affects the surface water or groundwater that LEMA/NGWA is distributing to residents? What about the irrigation water being supplied to farmers?
   - Public Health related to water quality: What is the incidence of water borne diseases in the region (e.g., related to crypto, malaria, cholera)?

2. How would you describe the sustainability of the supply of water that LEMA/NGWA is using to supply both drinking water and wastewater services to the service area?
   Reliability. Were there any concerns about having sufficient water to provide both drinking water and wastewater services to the service area? If so, what kind of concerns? What is the frequency with which the suppliers meet the full demands of users or at least 90 % of demands?

   Modification of questions about reliability for the two rural partnerships:
   How would you describe the sustainability of the supply of water that the JVA is using to supply irrigation water to the farmers?
   Reliability. Were there any concerns about having sufficient water?

   Supply of water. What is the source of the supply of water ? What is the ratio of the annual amount taken from the water supply source to the annual renewal amount of water?

   Resource conditions. Were there any water conservation policies put in place by either the government or LEMA/NGWA? How much water has been saved each year of the contract through various conservation measures (i.e., fixing leaks, detecting stealing of water, quantifying non-revenue water)? Has LEMA/NGWA or the government factored in climate change as a cause for water supply variability in Jordan - if so, how?

3. What are your views on the affordability of the services that LEMA/NGWA is providing to residents in the service area?
   - Do the poor who are connected to the system pay their bills? If not, do you know why?
   - Would unconnected households be able to pay if they were connected? Are there a high proportion of poor households in the service area?

- What is the price of a unit of water?
- What percentage of those residents being serviced by LEMA/NGWA can afford these prices?
- Are there meters? What percentage of the users is metered?
- How much money has been collected annually? How has this changed?
- What percentage of users fails to pay their fees? How has this changed?
- Does the pricing recover the true capital and operating costs of the system?

Scope/efficiency of service. Are there a high proportion of unconnected households? Is there a high proportion of lost water (or non-revenue water)? Are there a high proportion of end-users who have unreliable/unpredictable service of water supply or wastewater? What percentages of residences are served on a regular basis by adequate water supply (quality and pressure)? How has this percentage changed?

Modification of questions about affordability for the two rural partnerships:
Are there any financial issues that the water user cooperatives need to think about, for example, membership fee, increased cost of unit of water? If so, what are these financial issues and how have then been dealt with?

- What is the price of a unit of water?
- Are there meters at each farm? How is money collected from each farmer? How is this different with a farmer who is part of a water user cooperative, as opposed to a farmer who is not?
- Are farmers who are members of a water user cooperatives experiencing any cost savings, in terms of using less water to irrigate their land, compared to before they joined the water user cooperative?
- Does the pricing recover the true capital and operating costs of the system?

Scope/efficiency of water user cooperatives across the Jordan Valley. What percentage of farmers in the Jordan Valley are members of a water user cooperative? Is there a high proportion of lost water (from leaking pipes, or damaged pipes) within any of the water user cooperatives? Are there any farmers who have unreliable/unpredictable supply of irrigation water? What percentages of farmers in a water user cooperative receive on a regular basis adequate water supply (quality and pressure)? How has this percentage changed?

Subsidies. Are there currently subsidies for water provision? Are these block tariffs, if not, then what kind of tariffs are they?

Part B: Question about how institutional arrangements influenced the effectives of each partnership

1. What kind of contract or agreement existed between the entities in the partnership?
    - Are there provisions in the contract about the longevity of the partnership? Who initiated the partnership? Does the contract or project document provide leeway for revision of objectives or other parameters?
    - What is the nature of the relationship between the partners? Is it clear who reports to whom?

Modification of questions about the contract for the two rural partnerships:

- Is there any wording in the contract or agreement about how long the water user cooperatives would last? Who initiated the partnership? Does the contract or agreement provide any way for revisions to be made about the nature of the water user cooperatives (e.g., objectives, fees, rules)?
- What is the nature of the relationship between the members of the water user cooperatives? Is it clear who reports to whom?
- Is there a contract or agreement of some kind between the water user cooperatives and the government? If so, in what form is this agreement? What does it consist of? When did it start?

2. Are there any national laws that pertain to partnerships in the water sector or water management in general? Have these been helpful to the partnership?
   - Has the partnership led to the creation or proposition of new laws?
   - Are there any legal implications (or any penalties) in the partnership for any wrongdoing and are they enforced?
   - Are there laws in place to govern the operation of public utilities or water user cooperatives? If yes, are these laws enforced?
   - Is there a regulatory body for water in Jordan? Is this body independent of the political system and immune to changes in politics?

3. How would you describe the decision-making (or governance) structure of this partnership:
   - Does the partnership put in place committees, a board, or other decision-making bodies? If so, who are the members and how are they chosen?
   - Are customers in the urban partnerships or farmers in the rural partnerships involved in any decisions that could influence any aspect of the water service?
   - Is the decision-making structure in this partnership static or can it be revised? Can (or has) the governance structure respond to situations characterized by change, risk, or variability?
   - Is there a conflict resolution mechanism for the partnership? If so, does the more modern conflict resolution mechanism allow for traditional arrangements to still be applied?

4. Is there communication between service user and service provider? Is there information provided to the service users about water billing, about how water tariffs set, and this kind of thing? Is there a channel for the entities in the partnership to voice their complaints or discuss matters in general about the partnership?

5. Do you think there are any policies regarding the water sector that are relevant to the partnership? If so, which policies and were any of these policies created as a response to partnership's activities? Are there any policies in place, like for example, subsidies for consumers of domestic water supply service?

6. Do you have any ideas of how water was managed historically in Jordan? Do you have any thoughts about how what it is about history that does or does not constrain these kinds of new partnerships in the water sector?

Appendix B: List of interviewees

Greater Amman water supply and wastewater service management contract:

Chief Executive Officer of Miyahuna
Chief of Party for Segura IP3 Partners LLC (International water sector consultant)
Co-Director of Customer Services at LEMA
Both Co-Directors of Customer Services at LEMA
Both Co-Directors of Operations at LEMA
Co-Director of Water Production and Quality
Co-ordination Manager for the Amman water and wastewater services management contract at the Water Authority of Jordan
Director of Capital Investment in Water Authority of Jordan (Programme Management Unit)
Director of Finance at LEMA
Director of Groundwater Basins Directorate at the Water Authority of Jordan
Director of the IUCN West Asia Middle East office in Amman
Director of Wastewater Services at LEMA
Director Regional/Branch Office of Dorsch Consult - Consulting Engineers
External technical auditor financed by USAID for LEMA
Head of Amman Water and Sewerage Authority in 1982 and Secretary General of WAJ 1984-1987
Head of Customer Call Center at LEMA
Lahmeyer International Consulting Engineers. A German consultant to the Water Authority of Jordan.
President and chairman of the Board of the Jordan Valley Authority from 1982 to 1987 and Minister of Water and Irrigation in Jordan from 1997 to 1998.
Professor at Al-Zaytoonah Private University. Head of Natural Resource Authority 1965-1980. Head of AWSA 1980-1983.
Professor of Hydrogeology in the Department of Geology and Environment at the University of Jordan
Senior Consultant at Bearing Point in Jordan
Senior Engineer at Zai Water Treatment Plant
Senior Financial Analyst in the Sustainable Development Department - Middle East and North Africa Region at the World Bank.
Senior USAID/Jordan official
Technical Services Director at LEMA
Wells and Pumping Stations Manager at LEMA

The Northern Governorates Water Administration Managing Consultant contract:

Business Manager at Engicon
Co-Director of Operations Northern Governorates Water Administration
Co-Managing Director of Northern Governorates Water Administration
Director of Commercial Services & Finance at NGWA
Director of Governorate Support, Ministry of Water and Irrigation, WAJ, Programme Management Unit
Director of Information Communication Technology at NGWA
GTZ Program Manager for the Operations Management Support for the Middle Governorates Water Program
GTZ Program Manager for the Operations Management Support in Jordan
Consultant for the Northern Governorates Water Administration
Programme Manager KfW Bankengruppe - Middle East Department. Competence Center Water Supply, Wastewater, Solid Waste.
Technical Advisor KfW Bankengruppe - Middle East Department. Competence Center Water Supply, Wastewater, Solid Waste.
Water Sector Consultant

Water user cooperatives in the Jordan Valley:

Agricultural Engineer at the French Mission Regionale Eau et Agriculture
Agricultural Engineer in the Jordan Valley Authority
Agricultural Expert at French Mission Regionale Eau et Agriculture
Director of Build-Operate-Transfer projects at the Water Authority of Jordan
Doctoral student at Reading University (School of Human and Environmental Science)

Engineer with the Jordan Valley Authority Southern Ghors Directorate
German Technical Cooperation (GTZ) Project Leader for Water Resource Management in Irrigated Agriculture project
Head of Control Systems and Water Management Division in the Jordan Valley
Head of French Mission Regionale Eau et Agriculture (from about 1998-2006 (June 2006))
Head of water user cooperative PS91, Karameh, Jordan Valley
Head of water user cooperative PS95, Karameh, Jordan Valley
Jordan Valley Authority Director of Karameh Directorate in the Jordan Valley
Jordan Valley Authority Director of Northern and Middle Directorates in the Jordan Valley
Jordan Valley Authority Director of the Northern Directorate in the Jordan Valley
Jordan Valley Authority Director of the Southern Ghors Directorate in the Jordan Valley
Members of the Safi water user cooperative, Southern Ghors, Jordan Valley, Jordan
Member of water user cooperative PS41 in Northern Directorate in Jordan Valley
Member of water user cooperative PS55 in the North section of the Jordan Valley
Member of water user cooperative PS91 in Karameh, Jordan Valley
President of water user cooperative in Hisban in the Karameh Directorate of the Jordan Valley
President of water user cooperative PS33 in the Northern section of the Jordan Valley
President of water user cooperative PS55 in the North section of the Jordan Valley
Regional Program Manager for Improvement of Irrigation Water Management in Lebanon and Jordan (IRWA) initiative
Secretary of water user cooperative PS50 in the Middle section of the Jordan Valley
Two farmers who are not members of water user cooperative PS55 in Northern Directorate in Jordan Valley
Five Water user cooperative Advisor. German Technical Cooperation (GTZ) project staff

Red Dam Cooperative for Agricultural Water Reuse in Wadi Mousa:

Agriculture Engineer at the Hashemite Fund for the Development of the Badia
Agriculture Engineer at the Petra Regional Authority
CDM Consultant for Reuse for Industry, Agriculture and Landscaping project. Task Leader for Agriculture and Landscape.
CDM Consultant for Reuse for Industry, Agriculture and Landscaping project. Capacity Building component.
CDM Consultant for Reuse for Industry, Agriculture and Landscaping project. Site Manager.
CDM Consultant for Reuse for Industry, Agriculture and Landscaping project Business Plans
Director General of the Petra Regional Authority
Director of Near East Foundation in Amman
Engineer in Customer Services division at LEMA.
Female members of the Red Dam Coooperative for Agricultural Water Reuse in Wadi Mousa
Head of the Jordanian Hashemite Fund for the Development of the Badia
Head of the Red Dam Coooperative for Agricultural Water Reuse in Wadi Mousa
Member of the Red Dam Coooperative for Agricultural Water Reuse in Wadi Mousa
Twelve Members of the Red Dam Coooperative for Agricultural Water Reuse in Wadi Mousa
Principal at the CDM Jordan office
USAID/Jordan Mission Environment Officer

Appendix C: Factors that influence the effectiveness of the four partnership in this study