INSTITUTIONAL SUPPORT AND STRENGTHENING PROGRAM (ISSP)

INSTITUTIONAL ASSESSMENT REPORT

ANNEXES VOLUME

October 2011

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

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ANNEX 1 - JORDAN WATER BALANCE PROJECTIONS TO 2030[1]

CURRENT WATER SUPPLY AND USE

OVERALL

Jordan currently consumptively uses around 770 MCM of water across all use sectors[2]. Irrigation uses the lion's share of this amount – some 65% – while most of the rest goes to serve urban consumers. About 30% of the amount supplied comes from surface water, mostly from the Yarmouk and Jordan Rivers, while roughly 57% is withdrawn from renewable fresh groundwater aquifers, almost all of which are located in the highlands. However, of the groundwater withdrawn from these aquifers, 34% (166 MCM) comprises over-abstraction, meaning that it is being withdrawn from the aquifers more rapidly than it is being replenished by natural inflow (Table 1, Figure 1).

National Water Supply and Consumptive Use (MCM), by Sector, 2009						
Sources	**Domestic**	**Industrial**	**Irrigation**	**Livestock**	**Total**	**Share**
Surface	93.9	3.1	153.4	7.0	257.4	29.5%
Ground	214.7	33.0	245.8	0.9	494.3	56.8%
Treated	0.0	1.2	101.2	0.0	102.4	11.8%
Brackish	17.0	0.0	0.0	0.0	17.0	2.0%
Total	**325.6**	**37.3**	**500.3**	**7.9**	**871.0**	**100.0%**
less treated reuse	(102.4)	0.0	0.0	0.0	(102.4)	
Total (consumptive)	**223.2**	**37.3**	**500.3**	**7.9**	**768.7**	
Share	29.0%	4.8%	65.1%	1.0%	100.0%	

Table 1. National water supply and consumptive use, 2009

(Source: Ministry of Water and Irrigation, Water Budget 2009)

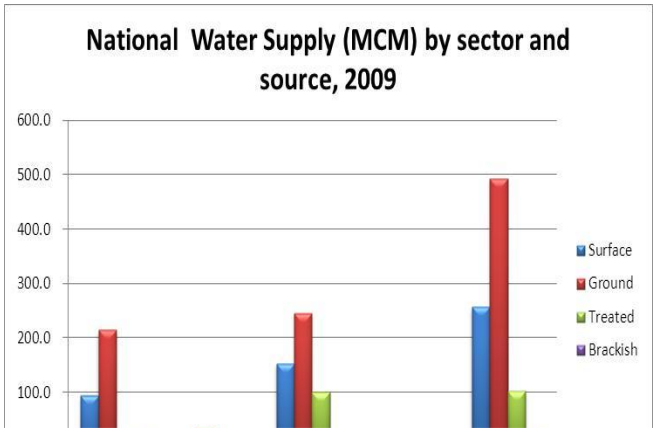
[1] The invaluable assistance of the Ministry of Water and Irrigation in assembling,supplying, and checking data is gratefully acknowledged.

[2] Note that the treated wastewater reused in agriculture has been deducted from the total to avoid double counting. Water delivered to users is thus about 100 MCM larger than the total shown.

This foreshadows two severe consequences. First, because the nation has come to depend on this borrowed water, it will experience a drastic shock when these aquifers are eventually drawn down to their lower limits and the overdrafted water is no longer available. Users depending on this resource will then be forced to seek new sources of supply under great time pressure. This will be particularly dire for urban water systems where such drastic cuts in supply cannot be tolerated. The length of time until this lower aquifer limit is reached is unknown at present, because good hydraulic models of these aquifers are lacking. Developing such models is a critical priority need for the sector and the country.

Second, as the water tables in these over-abstracted aquifers drop, saline water from neighboring aquifers can move into the space vacated by the fresh water, permanently damaging the aquifers and rendering them useless for future storage, even if the over-pumping were to cease. Thus a valuable storage asset will have been removed from the nation's water resource inventory.

Figure 1.Water use by source and sector, 2009



Source: Ministry of Water and Irrigation, Water Budget 2009.

Brackish springs produced 17 MCM in various parts of the country in 2009. All of this quantity was used for drinking water purposes after desalination, and comprised 2.2% of the total water supply. This source should grow in importance, as brackish water is cheaper to desalinate than is seawater.

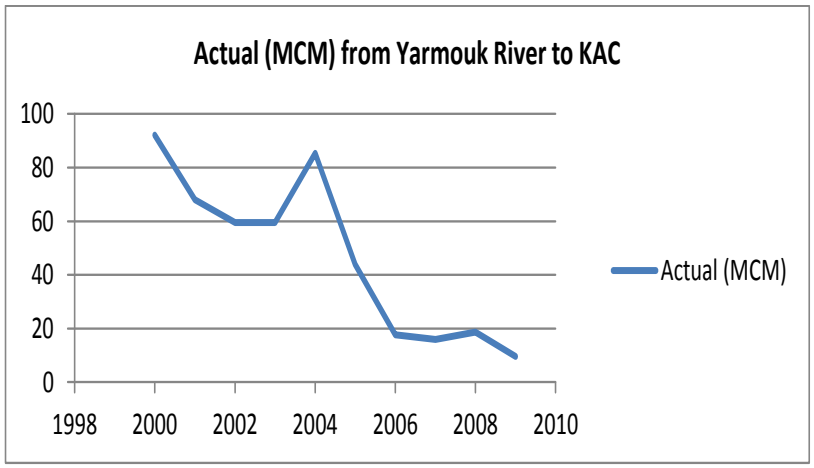
About 3.76 million people (63% of the population) are served by sewerage systems producing about 110 MCM of effluent per year. Most of that treated effluent is reused, primarily in agriculture in the Jordan Valley (JV), where it currently comprises about 40% of the JV agricultural water supply. The amount of treated wastewater is expected to grow with an expanding population and growing municipal and industrial use of water. This water is currently blended with fresh surface water for irrigation use. However, as more and more of the surface water is diverted for use in municipal water systems, the quantity of fresh water available for blending in the JV will shrink. A concern of growing important will thus be the quality of the water being used for growing crops in the Jordan

Valley. This concern will be crucial as growers in the Valley seek to raise the value of their output, particularly insofar as the strategy employed involves exporting fresh produce to Europe under its strict phyto-sanitary regulations and criteria.

SHARED WATER RESOURCES

Jordan shares important water resources with neighboring countries. Surface water comes from the Jordan River or its tributaries, which are shared among five countries. Although no comprehensive basin-wide agreement exists, there are bi-lateral agreements between Jordan and Syria for the Yarmouk River and Jordan and Israel for both the Yarmouk and the main Jordan River. Jordan and Syria also share common groundwater aquifers, but these are unregulated and burgeoning use of these aquifers in Syria, as well as direct surface water diversions, has become a growing source of friction between the two countries. There is also a large fossil groundwater reservoir which is shared by Jordan and Saudi Arabia, which is viewed by Jordan as a medium-term solution to its present water supply problems.

Figure 2. Available water from Yarmouk River at KAC



Source: MWI, Water Budget (2000 - 2009)

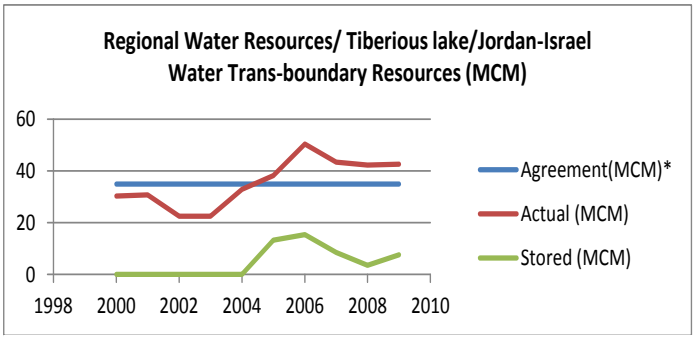
The building of a dam, with a hydropower station, on the Yarmouk River, the main tributary of the Jordan River, was the purpose of the agreement between Jordan and Syria. A first agreement was signed in 1953, but it was not implemented and was updated and replaced by a second agreement in 1987. In the second agreement, Jordan and Syria agreed to build the "Unity Dam" on the Yarmouk River with a height of 100 m and a storage capacity of 225 MCM.

In 2003, the height of the dam was reduced to 87 m and the storage capacity became 110 MCM. The dam was finally inaugurated in 2008. Because of the political conflict in the region, the case of the Yarmouk cannot be considered completely settled. The river is part of the Jordan River basin. It needs therefore to be integrated into an agreement governing the whole drainage basin (FAO, 2008). The agreement does not quantify water

use by the two countries and is silent on the critical question of groundwater withdrawals from shared aquifers. As shown in Figure 2, the quantity of water available in the Yarmouk River at the point of diversion to the King Abdullah Canal (KAC), has declined sharply over the past 10 years -- from 92 MCM in 2000 to 10 MCM in 2009. This most likely reflects increased abstractions of both ground and surface water in Syria, as well as possible climate change-related impacts on volume of rainfall received.

The 1994 Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan contains provisions on shared water resources, strongly linked to a context of political conflict and exercise of power. Annex II of the agreement on "water related matters" covers the Yarmouk and Jordan Rivers and groundwater in Wadi Araba. The Jordan River is shared among five riparian countries: Israel, Jordan, Lebanon, Syria, and the Palestinian Territories. The agreement is between only two of these riparians, Israel and Jordan, not leading however to any joint management of the Jordan River (FAO, 2008). Jordan's share of Jordan River water under that agreement was negotiated downward in 1997 and currently totals 35 MCM per year[3]. In addition Jordan has the right to store winter flood flows from the Yarmouk in Lake Tiberius for later withdrawal. Figure 3 shows that the amounts transferred from Lake Tiberius to the KAC and amounts stored in Lake Tiberius between 2000 until 2009.

Figure 3.Transfers between Israel and Jordan



Source: MWI, Water Budget (2000 - 2009)

***Half of the additional quantity of 50 MCM plus 10 MCM in exchange of the**

The ancient water in the Disi aquifer in the southwestern corner of Jordan and northwestern Saudi Arabia is presently being exploited by both countries. Saudi Arabia is pumping the aquifer at a rate of close to 1 BCM per year, while Jordanian extractions are currently less than a tenth of that. New

[3] This is only about 3% of the historical native flow of the Jordan River into the Dead Sea, the rest being diverted by Israel (primarily), and Syria (see IWMI. 2005. *Research Report 9, Historical transformation of the lower Jordan River Basin (in Jordan): changes in water use and projections (1950-2025).*

well fields and a pipeline to Amman are scheduled to go on-line in 2013, and will allow Jordan to increase its pumping by 100 MCM per year, over an estimated lifetime of 50 years. There is no agreement with Saudi Arabia governing withdrawals from this aquifer and obviously the expected lifetime of the supply will depend to some extent on the rate of extraction in Saudi Arabia as well. While the water is of good quality from a bacteriological standpoint, radium has been detected in samples of the water and this does constitute a human health concern (Source: MWI, DiWaco, 2009, Environment and Social management plan part 2, Disi Project).

PROJECTED FUTURE REQUIREMENTS

Future water requirements can be divided into three categories – municipal supplies, industrial and energy uses, and agricultural uses. Although all are important, municipal supplies are the most critical and receive the highest priority.

FUTURE MUNICIPAL REQUIREMENTS

Jordan's population was 5.980 million in 2009 and is expected by the Department of Statistics to grow to 8.819 million by 2030. This reflects a population growth rate that is expected to decline from 2.22% per year today to 1.47% per year in 2030. The proportion of that population living in urban areas varies widely among governorates – from 35% in Karak to 95% in Zarqa. Government of Jordan policy calls for a targeted supply of 120 liters/capita/day (lpcd) in Amman, 100 lpcd in other urban areas, and 80 lpcd in rural areas. Hence per capita targets will vary among governorates depending on their urban/rural ratios.

These factors have been combined in a model that projects total domestic water requirements through the year 2030 under several different scenarios. The results generated by the model for these different scenarios are shown in Table 2.

As seen, assuming supply at the target levels and planned reductions in non-revenue water (NRW) yields an aggregate water requirement of 441 MCM by 2030, about 1.35 times the actual supply of 326 MCM in 2009 (Scenario 2). However, if planned reductions in NRW are not achieved, the requirement would be substantially higher at 600 MCM, about 1.84times current use (Scenario 3). Clearly future water needs are very sensitive to the level of water losses and illegal diversions, and achieving the planned reductions in NRW is a critically important part of any strategy for meeting estimated water needs. These results are shown graphically in Figure 4. Projections using current delivery values rather than the target values are lower, but show the same dependence on lower levels of NRW.

Table 2. Projected Municipal Water Requirements (million m^3/year

Year	Assuming the following per capita share of water (120 lpcd for Amman, 100 for other urban areas and 80 for rural areas)			Assuming fixed per capita share of water based on 2009 supply figures			National Water Strategy Figures (2008-2022)
	Scenario 1 Water Need Excluding NRW	**Scenario 2** Water Need Including Planned NRW Reduction	**Scenario 3** Water Need Including Fixed NRW Figures (based on 2009 figures)	**Scenario 4** Water Need Excluding NRW	**Scenario 5** Water Need Including Planned NRW Reduction	**Scenario 6** Water Need Including Fixed NRW Figures (based on 2009 figures)	
2010	233.67	397.96	415.92	180.96	306.65	415.92	324.00
2015	259.77	391.73	462.37	201.17	302.20	356.15	392.00
2020	286.79	398.80	510.45	222.10	308.07	393.19	421.00
2022	297.31	403.24	529.18	230.24	311.58	407.61	456.00
2025	307.56	407.24	547.42	242.09	314.75	421.67	-
2030	337.12	441.19	600.05	261.08	341.04	462.20	-

Sources: 1. Department of Statistics, growth rates (2009 to 2030)

2. MWI, Planned NRW (2010-2030)
3. MWI, Annual Water Supply (2009)
4. Water for life, National Water Strategy (2008-2022)

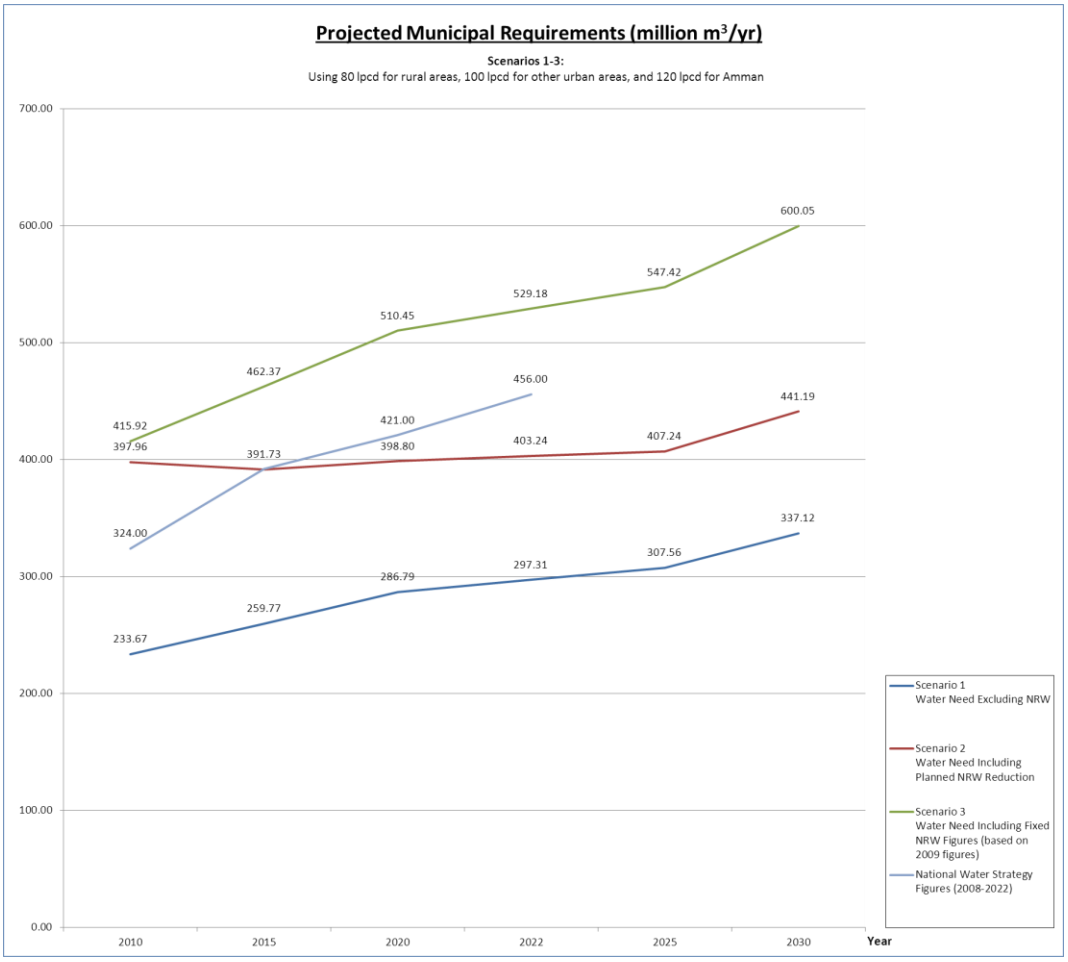


Figure 4. Projected municipal water requirements to 2030

FUTURE INDUSTRIAL REQUIREMENTS

A relatively modest 37 MCM was used by industry in 2009. Because the exact development trajectory which Jordan will follow over the coming 20 years cannot be known with certainty, estimating future requirements is best done using economic growth estimates. Recent world economic growth has averaged 2.4%, while GDP growth in Jordan over the past 10 years has averaged a strong 6.5% per year. However, in addition to the uncertainty about the growth pattern which will unfold, there is uncertainty about the water intensities of alternative growth pathways. Hence two scenarios are modeled here, one where industrial growth expands at a rate of 4% per year and another where it expands at 8% per year. Water use is assumed to track with growth in industrial output. These two scenarios yield industrial water needs of 91 and 201 MCM, respectively, in 2030.

FUTURE AGRICULTURAL REQUIREMENTS

Agricultural water use is currently around 500 MCM. It is assumed that this level will constitute a cap and that water use in agriculture will continue to hold at 500 MCM through 2030, but that the value

of agricultural output it produces would grow, in real terms, as growers shift to higher-value export-oriented crops and improve water use efficiency. It is also assumed that the unsustainable portion of current agricultural use of highland ground water will be eliminated and that treated wastewater will increasingly substitute for freshwater in making up the 500 MCM of water used in agriculture.

COMBINED FUTURE REQUIREMENTS

These projected needs have been combined into a model represented in Table 3. This model employs the assumptions and estimates made above to drive demand growth. In addition, it assumes that a rising fraction (30% increasing to 60%) of municipal use will be reclaimed and used to support the water needs of the agricultural sector. It also assumes that a rising fraction (0% increasing to 40%) of industrial water used will be reclaimed and reused in that sector. This yields a pair of net water use variables for these two sectors which measure their respective needs for water from the natural resource base. Total water needs from the natural resource base are shown graphically in Figure 5.

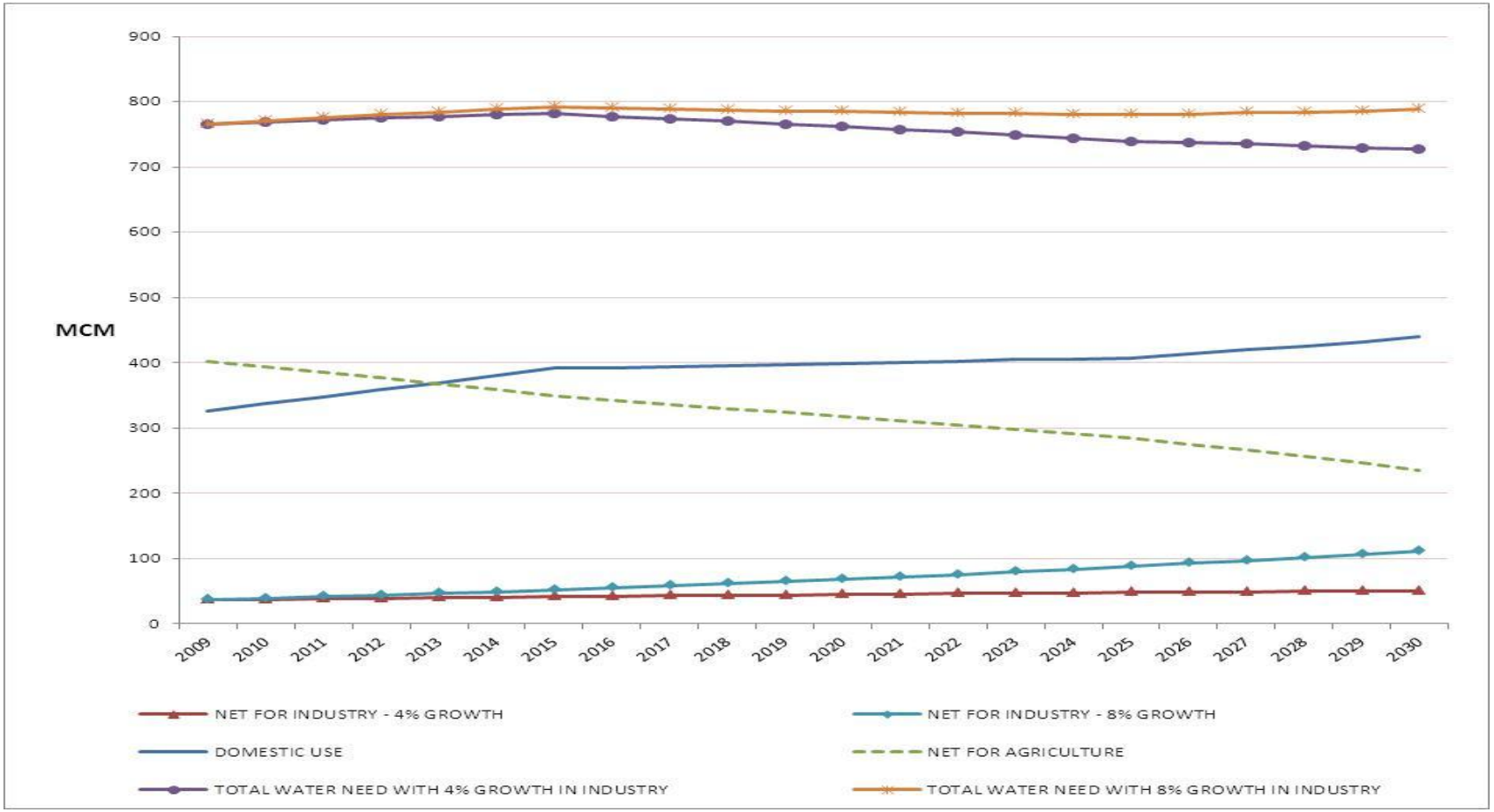
Table 3. Estimated Water Uses in Jordan through 2030

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
YEAR	POPUL. (1,000)	DOMESTIC USE (MCM)	INDUSTRY USE: 4% GROWTH (MCM)	INDUSTRY USE: 8% GROWTH (MCM)	SHARE OF INDUSTRY WATER RE-USED IN INDUSTRY (Percent)	TREATED WATER RE-USED IN INDUSTRY 4% GROWTH (MCM)	TREATED WATER RE-USED IN INDUSTRY 8% GROWTH (MCM)	EXTRA WATER NEEDED FOR INDUSTRY 4% GROWTH (Column 4 minus column 7) (MCM)	EXTRA WATER NEEDED FOR INDUSTRY 8% GROWTH (Column 5 minus column 8) (MCM)	AGRIC USE (MCM)	SHARE OF DOMESTIC WATER RE-USED IN AGRIC (Percent)	TREATED WATER USED IN AGRIC (MCM)	ADDITIONAL WATER NEEDED FOR AGRIC (MCM)	TOTAL WATER NEED AT 4% GROWTH IN INDUSTRY (MCM)	TOTAL WATER NEED AT 8% GROWTH IN INDUSTRY (MCM)
2009	5,980	326	37	37	0%	0	0	37	37	500	30%	98	402	765	765
2010	6,113	337	38	40	2%	1	1	38	39	500	31%	106	394	769	770
2011	6,247	348	40	43	4%	2	2	38	42	500	33%	114	386	772	775
2012	6,382	359	42	47	6%	2	3	39	44	500	34%	123	377	775	780
2013	6,519	370	43	50	8%	3	4	40	47	500	36%	132	368	778	784
2014	6,657	381	45	54	10%	4	5	41	49	500	37%	142	358	780	789
2015	6,796	392	47	59	11%	5	7	41	52	500	39%	151	349	782	793
2016	6,936	393	49	63	13%	6	8	42	55	500	40%	157	343	778	791
2017	7,077	394	51	68	15%	8	10	43	58	500	41%	163	337	774	789
2018	7,219	396	53	74	17%	9	13	44	61	500	43%	170	330	770	788
2019	7,362	397	55	80	19%	10	15	44	65	500	44%	176	324	766	786
2020	7,502	399	57	86	21%	12	18	45	68	500	46%	182	318	762	785
2021	7,641	401	59	93	23%	14	21	46	72	500	47%	189	311	758	784
2022	7,778	403	62	101	25%	15	25	46	76	500	49%	196	304	754	783
2023	7,912	405	64	109	27%	17	29	47	80	500	50%	203	298	749	782
2024	8,046	406	67	117	29%	19	34	48	84	500	51%	209	291	745	781
2025	8,178	407	69	127	30%	21	39	48	88	500	53%	215	285	740	780
2026	8,308	413	72	137	32%	23	44	49	93	500	54%	224	276	738	781
2027	8,438	420	75	148	34%	26	51	49	97	500	56%	234	266	735	783
2028	8,565	426	78	160	36%	28	58	50	102	500	57%	243	257	732	784
2029	8,691	432	81	172	38%	31	66	50	107	500	59%	253	247	729	786
2030	8,819	441	84	186	40%	34	75	51	112	500	60%	265	235	727	788

Notes:

Column	
2	From Jordan Statistics Office projections
3	MWI data
6	Projected to grow from 0% to 40% by 2030.
7	Derived from columns 4 and 6.
8	Derived from columns 5 and 6
12	Projected to grow from current level of 30% to 60% by 2030.
13	Derived from columns 3 and 12
14	Derived from columns 11 and 13

Figure 5. Estimated Water Uses in Jordan Through 203



FUTURE WATER SUPPLY

Total water supply in 2009 was about 871 MCM, including reused wastewater. Of that amount, 166 MCM constitutes over-abstraction. Hence the renewable supply currently used is around 705 MCM. Uncontrolled reductions in the Yarmouk supply to Jordan due to cross-border abstractions presumably are already factored into the 2009 figures, with little room left for further reductions. Three additions to supply are expected in the medium-term future. One is a small increase of 5 MCM in new surface water from the construction of the Kufranja Dam. A more important addition is the 100 MCM of Disi water to be added to the national supply around 2013, all earmarked for urban use. This will bring the available supply to about 810 MCM.

The third major addition is reuse. In 2009, about 30% of the total municipal water supplied was reused, primarily in Jordan Valley agriculture. Applying this ratio to estimated 2030 municipal needs under Scenario 2 above yields a volume of treated wastewater of about 132 MCM. However it is assumed that the share of municipal water reused will increase over time with the construction of additional wastewater treatment plants and a growing aversion to discharging raw sewage into the environment. Assuming that by 2030, 60% of urban water is reused, 265 MCM of treated wastewater will be available from that source, compared with 102 MCM at present.

It is likely also that a portion of the growing volume of industrial water will be treated and reused. Assuming that the share of industrial water reused grows from virtually nil at present to 40% in 2030 would yield an additional 36 to 80 MCM of available treated industrial wastewater in that year, depending on whether a 4% or an 8% growth scenario is used. Assuming a median industrial reuse of about 60 MCM, the total medium-term national water supply would thus be around 1,033 MCM.

Over the longer term, additional supplies are slated to come from desalination projects. Several such projects have been proposed, including the multi-lateral Red Sea-Dead Sea Project and the all-Jordanian Jordan Red Sea Project. The water produced by future desalination projects would be additional to the 1,033 MCM projected above.

CONCLUSION

Under the assumptions employed in the foregoing analysis, Jordan's annual needs for water from the natural environment in 2030 of less than 800 MCM can be comfortably met with the anticipated post-Disi supply of just over 1000 MCM. There are, however, a number of **risks** that come into play and which could cause demand to be greater than anticipated, or supply to be less than expected, as noted below.

- The government will be unable to summon the political will to restrict highland pumping in excess of sustainable annual recharge, leading to aquifer salinization and the loss of some portion, or all, of the available groundwater from this source
- Investment in wastewater treatment capacity, for both municipal and industrial water, and transmission facilities needed to move treated wastewater to desired reuse locations, will not keep pace with expanding use and expected reuse targets in these two sectors
- The economic growth strategy chosen will focus exclusively on water-intensive mining and resource extraction rather than a more balanced and less water-intensive one, leading to more rapid expansion in industrial water needs than anticipated
- Climate change will further diminish annual basin precipitation, leading to less useable surface water discharge in rivers and reduced aquifer recharge

Failure to make and implement decisions that support the strategy outlined will eat into the 200 MCM buffer between anticipated supply and needs through 2030 resulting from the foregoing analysis and may necessitate early recourse to vastly more expensive water supply options.

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ANNEX 3 - ANNOTATED BIBLIOGRAPHY OF KEY MATERIALS

ABDULLA FA AND AW AL-SHAREEF. 2009. ROOF RAINWATER HARVESTING SYSTEMS FOR HOUSEHOLD WATER SUPPLY IN JORDAN. DESALINATION 243: 195-207.

Rainwater catchment systems have been used for domestic and irrigation purposes in Jordan since 850 BC. This study evaluated the status of domestic roof rainwater harvesting in Jordan and the potential for potable water savings by using rainwater in residential areas, where the majority of households use the public water supply network. Water quality and economic feasibility were also investigated. To address scarcity, in recent years rainwater harvesting has increased in Jordan, though under 4% of households use a rainwater harvesting system (RHS) for their main drinking water supply. This varies by region, with Irbid containing over 80% of the country's RHSs. New homes are required to have a water collection storage tank, and the MWI has encouraged using RHSs particularly in the winter when precipitation is greatest.

The study found that potential water yield from RHSs varied extensively among the 12 governorates. The maximum overall potable water savings potential was found to be around 7%, provided that all rooftop surfaces are used and all fallen rainwater is collected. However, quality is also a concern: the 60 cisterns tested for water quality demonstrated that the water met WHO chemical and physical standards, but it did not meet biological standards due to human and animal waste contamination. The authors thus recommend cleaning the cistern area prior to rainy season collection. The cost of RHSs to consumers is relatively high when compared with public water supply, which is subsidized. The authors posit that increasing use of RHSs will lower demand on the public water supply and thus decrease subsidies. The necessity of government incentives and support in this area is emphasized.

ABO-SHEHADA MN, M HINDYIA AND A SAIAH. 2004. PREVALENCE OF CRYPTOSPORIDIUM PARVUM IN PRIVATE DRINKING WATER CISTERNS IN BANI-KENANAH DISTRICT, NORTHERN JORDAN. INTERNATIONAL JOURNAL OF ENVIRONMENTAL HEALTH RESEARCH 14(5): 351-358.

Many rural residents in northern Jordan (especially the Bani Kenanah district) use on site systems for their primary domestic water supply. These systems consist of rooftop runoff collection and subsequent underground cistern storage. As these areas also do not have access to public sanitation networks, seepage pits are typically used for human waste disposal, as well, often releasing biological pathogens into the area surrounding the cistern. Private water collection and storage systems are not regulated for quality control and thus contamination is likely. In recent years, outbreaks of *Cryptosporidium parvum* (C. parvum) – a protozoa that causes gastrointestinal distress in most individuals but can be life threatening in immune-compromised people – have occurred in Jordan. This study investigated the prevalence of C. parvum as well as fecal coliform and E. coli in cisterns in the Bani-Kenanah district.

Almost half of the cisterns were coliform positive, and 17% and 2% were E. coli and C. parvum positive, respectively. The authors discuss the importance of collecting rainwater from a clean surface and maintaining a clean, dry area around the cisterns. They also discuss the relationship between system design and contamination. For example, many of the contaminated cisterns had a bucket stored outside the cisterns. Also, location of cisterns relative to seepage pits is an important consideration, as about ¼ of the E. coli contaminated cisterns were within 15 meters of a seepage pit. The authors conclude that private drinking water systems do currently present a health hazard in the Badi-Kenanah district.

ABU-SHAMS I AND A RABADI. 2003. COMMERCIALIZATION AND PUBLIC-PRIVATE PARTNERSHIP IN JORDAN. WATER RESOURCES DEVELOPMENT 19(2): 159-172.

In 1997, the government of Jordan began a privatization program to shift its economy toward the private sector, which involved, among other objectives, attracting private investments, primarily from outside the country. In 2000, Jordan adopted Law No. 25 on privatization, which defined Jordan's privatization policy and created the Privatization Council and Executive Privatization Commission. Privatization under this law was directed at: 1) attaining local and foreign investments, 2) increasing long-term investments to strengthen the national economy, 3) alleviate the national Treasury's debt by reducing loans and grants awarded by it, and 4) using modern economic techniques, such as emphasizing international competition.

Jordan decided to pursue a public-private partnership for water management in the Amman governorate. In Jordan, water is priced by the Ministry of Water and Irrigation in a "block" fashion, with subsidies concentrated on lower volume uses; higher prices to large volume domestic and industrial users are intended to offset the lower block subsidies. In 1999, Jordan signed a management contract with the French-British-Jordanian company LEMA to manage, operate and maintain water and wastewater facilities in the Amman governorate for four years. Under this contract, Jordan could maintain its subsidy/pricing system. At the time of publication (2003), public-private partnerships were being considered and proposed in several of the remaining 11 governorates. The authors point out that while management contracts such as in the Amman governorate have several benefits, one major drawback is that they do not relieve Jordan of the financial burden of capital investment. Thus, management contracts should be used as transitional, and include provisions for next steps.

AL-JAYYOUSI OR. 2003. SCENARIOS FOR PUBLIC-PRIVATE PARTNERSHIPS IN WATER MANAGEMENT: A CASE STUDY FROM JORDAN. WATER RESOURCES DEVELOPMENT 19(2): 185-201.

Public-private partnerships (PPPs) vary depending on the level of involvement of the private sector and the design of the agreement in terms of responsibilities and regulation. This paper begins by critiquing the four dominant privatization models and making a case for involving the private sector in water management. The author argues that this shift will actually in most instances increase equity rather than favor the affluent. However, it is not the ownership (public versus private) of the utility that differentiates between well- and poorly-run utilities, but rather the model – utilities that are the most efficient and provide the greatest coverage are self-sustaining commercial enterprises that are accountable to citizens.

The author then assesses Jordan's water sector during the beginning of its shift toward increased PPPs and develops several scenarios for water management in the country. The scenarios are based on varying level of government involvement in water management and varying level of financial support, and can be conceptualized as moving through four phases: innovation, growth, improvement and release. According to the analysis, LEMA's involvement in the Amman governorate water management began in the innovation phase and will evolve to the growth phase. During the growth phase, special care should be taken to ensure that private involvement

does not evolve so much that Jordan loses control over its water resources. Keys to successful PPPs are: anticipation of phase shifts, heavy government oversight, and careful regulation.

BEAUMONT P. 2002. WATER POLICIES FOR THE MIDDLE EAST IN THE 21ST CENTURY: THE NEW ECONOMIC REALITIES. WATER RESOURCES DEVELOPMENT 18(2): 315-334.

Information from this paper relevant to Jordan is summarized here. In order to meet urban demands in 2025 Jordan would have to reallocate 113% of its 1990s irrigation usage of water. In addition, Jordan is extracting groundwater at a rate that exceeds recharge in some aquifers and will soon experience additional shortages as a result. Reallocating some water from irrigation will buy some time, but a longer-term solution is needed. This will most likely involve the use of desalinated water in urban centers, probably derived from cooperative projects with Israel. If Jordan incorporates desalinated water into its supply network, it has a good chance of alleviating many of the issues related to its water scarcity.

BEAUMONT P. 2005. WATER INSTITUTIONS IN THE MIDDLE EAST. IN CHENNAT GOPALAKRISHNAN, CECILIA TORTAJADA, ASIT K. BISWAS (EDS.) WATER INSTITUTIONS IN THE MIDDLE EAST: POLICIES, PERFORMANCE AND PROSPECTS, PP. 131-152.

Information from this paper relevant to Jordan is summarized here. Several institutions are involved in water governance in Jordan. The most important is the Ministry of Water and Irrigation. Institutions and associated responsibilities follow:

- Ministry of Water and Irrigation
    - Water policy, strategic planning, water resources development programs, allocation options, water quality monitoring, water data management
- Water Authority of Jordan
    - Municipal and industrial water supply, wastewater management
- Jordan Valley Authority
    - Management of land and water in the Jordan Rift Valley
- Council of Ministers
    - Top level policy initiation, legislation and finance
- Ministry of Agriculture

    - Agricultural water development, authority for both surface and groundwater
- Ministry of Planning
    - Water plan (from MWI) review, funding agencies coordination
- Ministry of Finance
    - Water project budget, loans and international finance logistics
- Ministry of Health
    - Drinking water standards, wastewater facility compliance
- General Corporation for Environmental Protection
    - Coordination of all Jordan's environmental policies
- Water Conservation Association (NGO)
    - Awareness raising, water policy implementation assistance
- Academic institutions (research)
    - Water and Environment Research and Study Centre at the University of Jordan
    - Environmental Research Centre of the Royal Scientific Society
    - Strategic Environment and Water Resources Research Unit at Al Al-Bayt University

DAOUD R, H NABER, MA TARBUSH, R QUOSSOUS, A SALMAN AND E KARABLIEH. 2006. ENVIRONMENTAL ISSUES OF WATER RESOURCES. IN HADDADIN (ED.). WATER RESOURCES IN JORDAN: EVOLVING POLICIES FOR DEVELOPMENT, THE ENVIRONMENT, AND CONFLICT RESOLUTION. WASHINGTON, DC: RESOURCES FOR THE FUTURE.

This chapter (five) draws attention to water resources-related environmental concerns in Jordan. A major land-use concern is that fertile soils and soil-water reservoirs in rain-fed areas are being lost to urbanization. Land-use planning is fragmented: the Ministry of Municipalities is responsible for all municipal planning outside of greater Amman and the Aqaba Special Economic Zone; the Ministry of Agriculture zones agricultural lands, rangelands and forests.

Jordan has recently instituted several national water and environmental policies and laws. In addition, Jordan is signatory to several environmentally-relevant international agreements and conventions. The hope is that these new institutional arrangements will provide mechanisms for reversing or mitigating some of the detrimental environmental effects Jordan is experiencing. Major concerns are aquifer overabstraction, excessive diversion of surface water, agricultural return flows, and effluent from wastewater treatment plants.

DOPPLER W, AZ SALMAN, EK AL-KARABLIEH AND HP WOLFF. 2002. THE IMPACT OF WATER PRICE STRATEGIES ON THE ALLOCATION OF IRRIGATION WATER: THE CASE OF THE JORDAN VALLEY. AGRICULTURAL WATER MANAGEMENT 55: 171-182.

Irrigation water is heavily subsidized in Jordan, with prices significantly lower than those charged for domestic and industrial uses. Prices are set by the Ministry of Water and Irrigation, at a level that allows for partial cost recovery. In 1999, the average volume of surface water available per hectare per year was 6400 cubic meters. Treated wastewater is an additional source and accounted in 1999 for around 20% of Jordan's irrigation water. Mathematical models were used to determine a range of options. Optimizing cropping patterns and water distribution throughout the year may result in economic gains from agricultural production. Water pricing may be more useful for controlling total water quantity demanded rather than water allocation over time.

EL-NASER HK. 2008. MANAGEMENT OF SCARCE WATER RESOURCES: A MIDDLE EASTERN EXPERIENCE. ASHURST, SOUTHHAMPTON, UK AND BILLERICA, MA, USA: WIT PRESS (NOTE: DIGITAL COPY NOT AVAILABLE).

This book by a Jordanian Representative (and former Minister of both the MWI and MA) discusses various policies and strategies for managing water resources in the region, and includes several case studies and examples from Jordan. Topics of relevance include stakeholder participation in local water governance, Jordan's National Water Master Plan (NWMP), private sector participation, wastewater management and services, water harvesting, water tariffs and groundwater use and management.

The Regional Forum on Local Water Governance adopted seven principles in 2007 regarding participation, transparency, coordination and capacity building, which emphasize subsidiarity in water resources decision making. The NWMP is a digital framework (allowing for digital water balancing) for long-term management and strategic planning. Service contracts, management

contracts (including BOT/BOO), concessions, leases and divestitures are described in the context of the region, and the management contract for Amman water and wastewater services is analyzed as an example. A summary of water harvesting facilities and programs is provided for Jordan; check dams and rooftop harvesting are the standard infrastructures. Projections for average tariffs and for improvement in unaccounted for water are provided for Jordan's governorates. Finally, renewable and non-renewable groundwater resources are detailed for Jordan, as well as the various sectoral uses of groundwater; institutional measures are proposed to mitigate overabstraction.

HADADIN N, M QAQISH, E AKAWWI AND A BDOUR. 2010. WATER SHORTAGE IN JORDAN – SUSTAINABLE SOLUTIONS. DESALINATION 250: 197-202.

Due to the water shortage that Jordan is already experiencing, a water rationing system has been put in place, which allows citizens to receive public water supplies just once or twice per week. Water shortage and water quality degradation are synchronistic issues. These result from: 1) low precipitation exacerbated by climate change, 2) rapid population growth coupled with rapid urbanization and industrialization, 3) inadequate wastewater treatment capacity, and 4) high agricultural water consumption. In regard to #4, agricultural water demand accounts for over ¾ of the country's water demand. Jordan's total demand for water is estimated to increase by 25 mcm per year.

Desalination is currently used in Jordan by private industries that run their own plants; however its use for domestic purposes is very limited. There is potential for desalination of brackish groundwater within small communities, but transport is difficult and brine disposal is detrimental to the environment. The seawater in the Red Sea at the Gulf of Aqaba shows the most potential – the authors refer to its supply as "unlimited." However, getting this water to the places that need it most, namely Amman, require raising it 1000 vertical meters and transporting it 350 km.

Options for increasing Jordan's supply: in total, desalinating Red Sea water and transporting it to Amman should cost no more than $1.00 per cubic meter; importing freshwater from Turkey or other countries via a pipeline or bags is technically feasible; reuse of wastewater in agriculture is viable and already being implemented. Options for demand management: agricultural demand can be reduced by increasing technology efficiency; greywater and harvested rainwater can supplement domestic supplies; public education and involvement in water conservation and

future planning is a key to success. The paper concludes by advocating the Red-Dead and Disi-Amman projects.

HADDADIN MJ. 2000. WATER ISSUES IN HASHEMITE JORDAN. ARAB STUDIES QUARTERLY, SPRING 2000.

The water shortage in Jordan has had negative impacts on the environment, the economy and society. Overexploitation of aquifers has resulted in lowered water tables and desiccation of springs. In addition, aquifers and riverbeds have been contaminated with wastewater. Due in part to a rapid spike in population, wastewater treatment facilities often operate well above their capacities, which results in untreated wastewater entering streams. Often, this water is used by farmers to compensate for the water supply deficit in the Jordan Valley. This has caused Jordan to lose credibility in the global market, as there is concern that sub-standard water is contaminating food exports. Also impacting the economy is the cost of water delivery, as more recent approaches, such as desalination and conveyance, require large amounts of energy. Even with outside assistance, Jordan struggled to implement development projects in the 1990's due to lack of capital funds and rapid turnover in the water sector. As water availability for agriculture continues to decline, Jordan's urban areas are expanding faster than anticipated and witnessing an increase in service demands. Options for augmenting Jordan's water supply are detailed, and include: wastewater treatment and reuse, technology transfer, water harvesting, fossil water exploitation, desalination and regional water transfers.

Jordan faces issues related to its institutional arrangements, as well. For one, when the water sector was consolidated, several institutions with various roles and personnel with diverse backgrounds were merged under a single entity. This fostered competition and also decreased efficiency for a time. Regardless, the government recognized the necessity to increase efficiency and thus pursued contracts with private entities. Former Minister Haddadin recommends that these contracts are reviewed and two further steps are taken: 1) award concessions to provide water and wastewater services throughout Jordan, and 2) privatize the utilities themselves, with the government retaining ownership and responsibility of the water resources. He concludes by recommending an autonomous authority for the combined water and agricultural sectors.

HADDADIN MJ, R DAOUD AND H NABER. WATER AND WASTEWATER MANAGEMENT: GOVERNANCE AND POLICY FRAMEWORK. 2006. IN HADDADIN (ED.). WATER RESOURCES IN JORDAN: EVOLVING POLICIES FOR DEVELOPMENT, THE ENVIRONMENT, AND CONFLICT RESOLUTION. WASHINGTON, DC: RESOURCES FOR THE FUTURE.

This chapter (eight) addresses issues of water governance, private sector participation in utilities management, water sector subsidies, stakeholder participation and water users' associations. The Ministry of Water and Irrigation is the central administrative body responsible for water resources management, and shares responsibility with the Ministry of Health and Ministry of the Environment. New policies emphasize increased private sector and citizen participation in water management; several public-private partnerships are established, and since 2003 water users' associations and farmers committees have been in the works.

Cost recovery poses a major challenge for Jordan, exacerbated by the precedent set by historically low tariffs and an unwillingness of users to pay for water today, as prices have increased. Energy costs must be incorporated in water services costs. Jordan has been gradually lifting its subsidies, and the water sector is coming closer and closer to recovering costs.

Water sector reforms focus on the following: establishing Water Authority of Jordan (WAJ) owned companies to provide commercial water services, implementing water loss reduction programs, increasing water tariffs by 15% in 2005, reducing employees of the WAJ by 1% annually, and achieving nearly 150% recovery of operation and maintenance costs in 2006. However, cost recovery is well out of the government of Jordan's control, as Jordan relies almost entirely on oil imports for energy production.

HADDADIN MJ, SJ SUNNA' AND HA AL RASHID. 2006. DEVELOPMENT OF WATER RESOURCES AND IRRIGATION. IN HADDADIN (ED.). WATER RESOURCES IN JORDAN: EVOLVING POLICIES FOR DEVELOPMENT, THE ENVIRONMENT, AND CONFLICT RESOLUTION. WASHINGTON, DC: RESOURCES FOR THE FUTURE.

This chapter (four) is on the history of water resources development and in particular focuses on the inter-sectoral competition for surface water allocations and the consequences of unregulated groundwater irrigation. Even though large quantities of water had been earmarked for irrigation, municipal needs in urban centers, such as Amman, Madaba and Zarqa, began to take precedence as demand increased. Industry began competing for water in the mid-1980s, and environmental needs have also competed for scarce supplies in recent years.

Irrigation from groundwater resources has only recently been met with adversity, as several aquifers in Jordan's Highlands have been heavily exploited, some to the point of depletion. By the late 1980s, irrigation area outside of the Jordan Valley had surpassed that in the valley, due to groundwater irrigation.

HALALSHEH M, S DALAHMEH, M SAYED, W SULEIMAN, M SHAREEF, M MANSOUR AND M SAFI. 2008. GREY WATER CHARACTERISTICS AND TREATMENT OPTIONS FOR RURAL AREAS IN JORDAN. BIORESOURCE TECHNOLOGY 99: 6635-6641.

Because household use of untreated greywater for on-site fruit tree irrigation is widely practiced in Jordan, this study investigated the quality of such water, to determine if it was in line with Jordanian Standard 893/2002. Household greywater in the Mafraq governorate was used for the analysis. Organic loads and ammonium concentrations were very high, some approaching levels found in combined and concentrated sewage in Jordan. The authors attribute this to the low per capita water consumption in the region. Due to the low income level in the region, only low-cost treatment options were recommended, including: 1) septic tank followed by intermittent sand filter, 2) septic tank followed by wetland, and 3) UASB-hybrid reactor. The third option was found to be the best for the characteristics of the greywater. Resulting sludge must be disposed of regularly, according to JS 893, but can easily be placed in household cesspools.

HALL D, K BAYLISS AND E LOBINA. 2002. WATER IN MIDDLE EAST AND NORTH AFRICA: TRENDS IN INVESTMENT AND PRIVATIZATION. PUBLIC SERVICES INTERNATIONAL REPORT.

This paper discusses the operations of multinational companies in the water sector as well as recent developments where privatization has been implemented or planned. Jordan is profiled in section 4.5. Projects covered are: Amman water, Ramtha wastewater treatment plant, Al-Samra wastewater treatment plant, Disi water conveyance project, and Amman water supply rehabilitation scheme. Amman water utility began in 1999, Ramtha wastewater treatment plant in 2001 and Al-Samra wastewater treatment plant in 2002. Disi and Amman water supply rehabilitiation scheme were forthcoming at the time of this publication. The paper lists all multinational company projects from 2002 prior in the region.

HRAYSHAT ES. 2009. PROSPECTS OF HYDROPOWER UTILIZATION FOR ELECTRICITY GENERATION IN JORDAN. ENERGY SOURCES, PART B 4: 77-83.

Due to the limited amount of surface water resources, hydropower generation in Jordan is currently a small contributor to the national energy balance. In 2005, it contributed less than 1%.

However, Jordan recognizes that reducing its dependence on foreign energy would greatly benefit its economy. At the same time, Jordan already has plans to move large quantities of water from the Red Sea to the Dead Sea, and the difference in elevation would create a large hydraulic head. This study applied a simulation model to the Red-Dead conveyance to determine the potential for renewable energy production from this source. Assuming peak-power operation and a hydroelectric system with a capacity of 495 megawatts, the 400-meter drop could produce 1.3 kilowatts per year, equivalent to 15% of Jordan's 2006 electricity consumption.

MOHSEN MS. 2007. WATER STRATEGIES AND POTENTIAL OF DESALINATION IN JORDAN. DESALINATION 203: 27-46.

This paper discusses desalination feasibility in Jordan, technically and economically, then outlines institutional changes and strategies for future water management. Desalination is seen as the only viable long-term solution to Jordan's water scarcity problems. Small-scale desalination of brackish water can be powered by solar ponds, as the salinity is quite low relative to seawater. Larger desalination plants require more energy, but overall cost of operation has come down substantially. Even so, Jordan cannot afford such projects on its own, so international investments would be necessary. Constructing a desalination plant between Aqaba and the Dead Sea could produce up to 850 mcm of freshwater. There is also great opportunity for brackish water desalination in various regions in Jordan.

Jordan has made a recent move toward privatization of the water sector, which will allow it to develop as needed without placing an overwhelming burden on the economy. Comprehensive water policies were recently adopted for irrigation, utility, ground and waste water management that include privatization schemes as well as conservation strategies. Several development plans are in the works, and Jordan released a plan for 58 projects to be completed by 2010, with priority going to water storage, wastewater treatment, distribution systems and augmentation of municipal supplies. USAID has funded institutional strengthening programs since the late 1990s, which have focused on information management, policy development, privatization and subsidy/tariff reallocations. Jordan recognizes the need for capacity building in the water sector, in particular if desalination and other innovative strategies are going to be successful ventures.

MOLLE F, JP VENOT AND Y HASSAN. 2008. IRRIGATION IN THE JORDAN VALLEY: ARE WATER PRICING POLICIES OVERLY OPTIMISTIC? AGRICULTURAL WATER MANAGEMENT 95: 427-438.

Irrigation water pricing policy, instituted through the Groundwater Control By-law No. 85 (2002 and amended 2004) and influenced by the Agricultural Sector Structural Adjustment Loan, was meant to reduce diversions in the Jordan Valley and withdrawals in the Highlands to sustainable levels. This paper examines the potential for success of such policy in Jordan. Though irrigation in the highlands is mentioned and briefly discussed (over the last 30 years, 14,000 hectares have been developed, irrigated by groundwater), the focus is on irrigation in the northern and middle directorates of the Valley, where JVA has allocation authority.

Surface water irrigation in the Jordan Valley covers approximately 23,000 hectares. Irrigation to the northern and middle directorates of the valley is supplied through pumping stations pulling directly from the King Abdullah Canal. Allocations were reduced beginning during the drought period of 1997-1999, and have remained lower since, aside from the southern directorate where treated wastewater is abundant. Savings in agricultural allocations have been reallocated to domestic uses in Amman. Prices have increased consistently from the 1960's to 1990's. Without having a major impact on revenues, complete operation and maintenance cost recovery is possible. However, in Jordan, due to a combination of factors – e.g. technical problems, lack of storage capacity, etc. – cost recovery does not usually equate with water savings. Higher water prices may prompt producers of water thirsty crops, such as citrus and banana, to change crops or adopt new technology. The following should be considered as either alternatives to water pricing, or strategies used in conjunction with pricing: revising monthly quotas into a single annual quota, instituting mechanisms for water trading among users, increasing temporal flexibility of supply at the farm level, bulk water allocation through water users' associations, raising prices of higher-tier users to provide disincentive for growing bananas, and providing incentives to farmers for increasing efficiency or choosing crops that require less water.

NACHBAUR JW. 2004. THE JORDAN RIVER BASIN IN JORDAN: IMPACTS OF SUPPORT FOR IRRIGATION AND RURAL DEVELOPMENT. DRAFT REPORT TO THE INTERNATIONAL WATER MANAGEMENT INSTITUTE.

This paper begins by giving an overview of subsidies in water and energy in Jordan, including specific crops that receive priority subsidies, such as bananas, and seasonally adjusted tariffs that are designed to protect Jordanian farmers from being outcompeted by crop imports. Prior to

development of the Jordan Valley, most crops were produced on small plots and irrigated with rainwater. Development goals for the Valley included encouraging settlement, boosting the national economy, and increasing food self-sufficiency, among other goals. Since the 1950's, water development projects – dams, canals, and irrigation networks – in the Jordan Valley have cost over U.S. $700 million. In the Highlands, investments have been primarily private. Revenue is higher in the Valley than in the Highlands.

Positive impacts of development support in the Valley include increased crop production, a greater standard of living, reduced migration to Amman, and an increased capacity to deal with political changes (migration, war). References are listed on page 17 where information on social implications of this support can be found. Negative impacts include environmental degradation and the growth of powerful interest groups that demand continued agricultural support. The final section of the paper presents two future scenarios: one incorporates treated wastewater into irrigation in the Valley, and the other significantly reduces irrigation in the Highlands.

Potter RB and K Darmame. 2010. Contemporary social variations in household water use, management strategies and awareness under conditions of 'water stress': the case of greater Amman, Jordan. Habitat International 34: 115-124.

Social equity implications of non-continuous water supply are investigated in this paper. Since 1987, Amman has rationed water, supplying households once per week. The private company LEMA took over municipal water management in Amman in 1999, and in January 2007 the system was "deprivatized" when the Water Authority of Jordan-owned local company Meyahona took over. Water tariffs are determined by meters, and water to the poor is subsidized through the block system which charges marginal rates for use of up to 20 cubic meters per quarter. Socio-economically, Amman is very divided. This study investigated access in various income-level areas in Amman.

Connectivity to the public water supply was relatively equal, with almost all households being connected. However, since water is only delivered once per week, true access depends on one's ability to store the water effectively. High-income households were able to store on average around five times as much water as low-income households. In addition, private cisterns were common in high-income households but much less so in low-income households. High-income

households also used twice as much water per quarter, on average, and even though low-income households paid less overall for water, the relative proportion of income spent on water was much higher for low-income households. Though cost is an issue, quality was of the greatest concern, and nearly all respondents reported a history of water-derived illnesses – as a result, most people avoid drinking water from public mains. Both income groups have developed strategies to deal with the intermittent supply. In regard to public versus private management, over half of the total respondents felt services had improved since Meyahona took over city water management.

RACHED E AND DB BROOKS. 2010. WATER GOVERNANCE IN THE MIDDLE EAST AND NORTH AFRICA: AN UNFINISHED AGENDA. INTERNATIONAL JOURNAL OF WATER RESOURCES DEVELOPMENT 26(2): 141-155.

This article addresses the region as a whole. The few direct references to Jordan are summarized here. Jordan demonstrates evidence of decentralized water governance: it recently created river basin agencies and water users' associations. The country's rate of "sustainable access to improved sanitation" is above 90%. Several IWRM goals are advancing in Jordan, including open publication of emerging water policies, water demand management, water quality control and increased horizontal coordination among various ministries involved in water management. Jordan subsidizes municipal water, but imposes tariffs on the higher quantity users. NGOs are beginning to play a role in Jordan's water governance.

SALMAN A, E KARABLIEH, HP WOLFF, FM FISHER AND MJ HADDADIN. 2006. THE ECONOMICS OF WATER IN JORDAN. FROM HADDADIN (ED.). WATER RESOURCES IN JORDAN: EVOLVING POLICIES FOR DEVELOPMENT, THE ENVIRONMENT, AND CONFLICT RESOLUTION. WASHINGTON, DC: RESOURCES FOR THE FUTURE.

This chapter (six) analyzes water economics from Jordan's perspective. The authors first argue against complete privatization of water resources, on the basis that it would compromise environmental health and social equity and the price of water would continue to increase in a competitive market from a decreasing supply. Public-private partnerships may offer a promising solution to improve performance while maintaining state involvement in policy and regulation.

Water is subsidized across all major sectors – municipal, industrial and irrigation. In 1995, the World Bank provided Jordan with the Agricultural Sector Adjustment Loan to manage demand, deregulate markets, restructure institutions and improve planning and investment in the agricultural sector. Increasing tariffs on irrigation water did not lead to decreased agricultural

water use, as anticipated – this was because the government instituted an allocation quantity policy and a pricing policy simultaneously.

The chapter concludes with a discussion of the Water Allocation System (WAS) created by the Water Economics Project, which can aid in water resources decision making in Jordan.

SAMUELS R, A RIMMER AND P ALPERT. 2009. EFFECT OF EXTREME RAINFALL EVENTS ON THE WATER RESOURCES OF THE JORDAN RIVER. JOURNAL OF HYDROLOGY 375: 513-523.

Climate change is expected to increase drought events as well as increase the number of extreme rainfall events. This study investigated the impact of both drought and extreme rainfall events on stream flow in the Jordan River. The drought scenario predicted a 20-25% reduction in stream flow, but as the relationship between rainfall and stream flow is not typically linear, the authors anticipate this estimate is higher than will realistically occur. The extreme rainfall scenario predicted an increase in flooding events, but will not significantly impact cumulative annual stream flow, due to the karstic geology of the Jordan River, where around 80% of the flow originates from groundwater. The greatest flood potential is in the Hula Valley, Israel.

SAMUELS R, A RIMMER, A HARTMANN, S KRICHAK AND P ALPERT. 2010. CLIMATE CHANGE IMPACTS ON JORDAN RIVER FLOW: DOWNSCALING APPLICATION FROM A REGIONAL CLIMATE MODEL. JOURNAL OF HYDROMETEOROLOGY 11: 860-879.

This study investigated changes in precipitation, evaporation and recharge in the near future (2010-2035) and far future (2035-2060) for the upper catchments (Dan, Banyas and Hasbani tributaries) of the Jordan River. Precipitation is expected to change very little in the near future, but decrease by approximately 10% (average annual) in the far future. This coupled with increased evaporation (around 5%), will alter base flow regimes and may ultimately decrease daily mean surface flow by up to 17%. However, surface flows account for only around 20% of the basin's total water flows. More significant is the change in base flows, which will result in increased flow variability and increased risk to extreme events. Further "climate informed risk assessments" are recommended.

SCOTT CA, H EL-NASER, RE HAGEN AND A HIJAZI. 2003. FACING WATER SCARCITY IN JORDAN: REUSE, DEMAND REDUCTION, ENERGY, AND TRANSBOUNDARY APPROACHES TO ASSURE FUTURE WATER SUPPLIES. WATER INTERNATIONAL 28(2): 209-216.

This paper examines four IWRM approaches to water management that are and could be applied to address Jordan's water scarcity problem.

1. Water reuse – primarily treated wastewater in irrigation. Treated effluent is much higher in total dissolved solids and biological contaminants in Jordan than in water abundant areas. This raises concerns for health implications of using treated wastewater for irrigating food crops and warrants attention toward improvements. Recently, the Water Authority of Jordan imposed a tariff on Amman water users to cover wastewater collection and treatment.

2. Demand reduction – primarily reducing abstraction of groundwater and agricultural water use. While more efficient farming equipment and practices are means of achieving a reduced demand, more controversial is the sectoral reallocation of water, as this brings in social equity and economic concerns. This would also be met with resistance from those currently benefiting from subsidies and unregulated groundwater usage.

3. Energy-water co-management. Up to ¼ of Jordan's energy budget goes to supplying water, and plans to move additional supplies to Amman will require further energy. In the Highlands, high capacity pumps are required to pump water from the deep aquifers for irrigation. Full cost pricing of both water and energy could result in savings in both.

4. Transboundary management of the Jordan River basin. A multilateral agreement would allow Jordan to take full advantage of shared water resources. In order for allocation agreements to be successful, the region must initiate data exchange and technology transfer, and standardize testing methods.

SOWERS J, A VENGOSH AND E WEINTHAL. 2011. CLIMATE CHANGE, WATER RESOURCES, AND THE POLITICS OF ADAPTATION IN THE MIDDLE EAST AND NORTH AFRICA. CLIMATE CHANGE 104: 599-627.

This article examines adaptive governance – developing institutional and political capabilities – to ensure adequate water supplies and quality in light of impacts of climate change on water

resources. Key elements include diversifying water management strategies and ensuring equitable access. Examples do not focus on Jordan, aside from a few key points, summarized here. Institutional weaknesses in Jordan have allowed for illegal well drilling, which has resulted in over 1000 overexploited illegal wells. One adaptation strategy Jordan has initiated is a national drought mitigation strategy, which is supported by the FAO. In general, governments in the region continue to focus on supply and technical solutions rather than dealing directly with social equity issues and water quality. There is still limited room for public involvement and political change has been slow. However, regional and international organizations have recently sponsored climate awareness campaigns and workshops, to raise the salience of the issue among policymakers and the public alike.

SULEIMAN R, L VAN WELL AND JE GUSTAFSSON. 2008. GOVERNANCE OF THE AMMAN WATER UTILITY. DEVELOPMENT IN PRACTICE 18(1): 53-65.

This paper provides background on the evolution of tariffs and the private sector in Jordan water management, and examines the impact privatization of the Amman water utility has had on service performance, namely whether or not good governance was evident during private management from 1999-2002. Prior to LEMA, a new tariff system was put in place in 1997, which is described as a cross-subsidy tariff system, intended to both recover more costs and also leave access affordable to the poor. A major issue arising from this new system was the excessive rate charged to commercial users who, as a result, began buying from tankers (who typically pump water illegally) rather than the public network. When LEMA took over, tariffs did not increase, aside from a new wastewater charge. LEMA was responsible for operation, maintenance, fee collection and improved service delivery. Important elements in the contract included unaccounted for water (UFW), accounts due, and regularity of supply.

Principles of good governance by Rogers and Hall (2003) were used to assess water governance during LEMA's involvement. *Inclusiveness* was limited; though outside organizations such as the World Bank played an important role, inside NGOs, associations, etc. did not. *Efficiency* measured through improvements in UFW was not improved. There were tensions between LEMA and the PMU, which resulted in a lack of *coherency*. Lack of *transparency*, for example over the decision to privatize, resulted in low public involvement. *Accountability* was viewed as low by stakeholders, with only minor improvements in regularity of water supply. Finally, *equity* issues

were apparent, including the fact that 13% of consumers consume less than 10 cubic meters per quarter, but are required to pay for the full 20 cubic meters per quarter; additionally penalties were not always distributed equally.

VAN AKEN M, R COURCIER, JP VENOT AND F MOLLE. 2007. HISTORICAL TRAJECTORY OF A RIVER BASIN IN THE MIDDLE EAST: THE LOWER JORDAN RIVER BASIN (IN JORDAN), PART B. INTERNATIONAL WATER MANAGEMENT INSTITUTE (IWMI) AND FRENCH REGIONAL MISSION FOR WATER AND AGRICULTURE (MREA), AMMAN. PRELIMINARY REPORT.

This section of the report focuses on Jordan's current water management of the lower Jordan River basin, including both the Valley and the Highlands. The focus is on technical and social aspects, including opportunities for and barriers to successful strategy implementation.

Farms in the valley are irrigated with water mainly stemming from the Yarmouk River, today primarily via the King Abdullah Canal. The Jordan Valley Authority (JVA) is in charge of overall management, with operation and maintenance tasks locally managed within each of the three directorates. Irrigation networks, supply/demand tools, water allocation (current water quota system), lack of technical solution acceptance by farmers, lack of capacity of JVA personnel, water pricing and cost recovery are discussed. Additionally, the shift in cultural cognition is addressed – altering long-standing traditions is not easily accepted by society, which affects how readily farmers adopt new technologies, practices and policies. In particular this applies to changes in allocation regimes and the incorporation of wastewater into irrigation water supply.

Highland farms are irrigated primarily with groundwater, though some farms divert water from side wadis and/or rely on rainfall. The high density of wells and abstraction in the Yarmouk and Amman-Zarqa basins has led to over-exploitation of most wells in these regions. Water abstraction licenses, tariffs, metering, the failure of Groundwater By-law No. 85 to adequately regulate sustainable pumping, problems with implementation, and difficulties in determining depletion rates in aquifers are discussed. Additionally addressed are social issues, including Bedouin tradition, pastoral economy, and the new role of agriculture that has only recently been incorporated in the Highlands.

This report also covers several other topics of relevance, including privatization of water resources, local management systems, water balance in the lower Jordan River basin, water use efficiency, groundwater recharge, emerging problems and challenges, and policy options.

VENOT JP. 2003. RECLAMATION'S HISTORY OF THE JORDAN RIVER BASIN IN JORDAN, A FOCUS ON AGRICULTURE: PAST TRENDS, ACTUAL FARMING SYSTEMS AND FUTURE PROSPECTIVE, VOLUMES 1, 3 AND 5. GREY PAPER. REPORT FOR THE INTERNATIONAL WATER MANAGEMENT INSTITUTE (IWMI) "COMPREHENSIVE ASSESSMENT" PROGRAM.

Volume 1 outlines Jordan's available water resources and details the main concerns the country has faced historically and faces today. Previous strategies to address these issues are discussed as well as new management strategies for the future. Options emphasized include integrated management at the basin level, increased participation, increased regulation of groundwater withdrawals, shifting crop types, and investments in development projects.

Volume 3 discusses the impact that the Groundwater Control By-law No. 85 of 2000 had on various farms and farmers. The two responses are: 1) the desired response, which is a reduction in groundwater pumping or surface irrigation, or 2) intensification of farming systems, on the premise that saving wages will counterbalance loss of revenue resulting from increased water charges.

Volume 5 contains the bibliography and annexes.

ANNEX 4 - LIST OF MEETINGS CONSULTATIONS AND WORKSHOPS

Institutional Support and Strengthening Program (ISSP) - Jordan/ Consultation Meetings				
Meeting/Consultation	**Location**	**Date (2011)**	**Participants**	**Staff**
Ministry of Water and Irrigation (MWI)	MWI	18-Jan-11	Eng. Mohammad Al-Momani, Assistant Secretary General for Technical Affairs – (MWI)	a,b,c
MWI- Performance Management Unit (PMU)	PMU	20-Jan-11	Basem Telfah, Performance Management Unit (PMU) Director/WMI	a,b,c
Millennium Challenge Account- Jordan (MCA-J)	MAC-J	23-Jan-11	Tamer Al-Assa'd, Projects Coordinator, (MCA)	a,b,c
Royal Water Committee (RWC)-Jordan's Water Strategy	Marriott Hotel, Amman	23-Jan-11	Dr. Elias Salameh, Royal Water Committee member	a,b,c
Ministry of Planning and International Cooperation (MoPIC)	MoPIC	24-Jan-11	Dr. Saleh Al-Kharabsheh, Secretary General (SG) of Ministry of Planning and International Cooperation (MoPIC)	a,b,c
Ministry of Water and Irrigation (MWI)	MWI	24-Jan-11	The Minister of MWI, Eng. Mohammad Al-Najjar Eng. Muneer Owis, SG of (WAJ) Eng. Maysoon Al-Zou'bi, SG of (MWI) Eng. Sa'ad Abu Hammoor, SG of (JVA) Bassam Saleh, Assistant SG Zeyad Haddadin, Assistant SG Emad Momani, Assistant SG Bassem Haddadin, Assistant SG	a,b,c,d

Institutional Support and Strengthening Program (ISSP) - Jordan/ Consultation Meetings				
Meeting/Consultation	**Location**	**Date (2011)**	**Participants**	**Staff**
			Khaled Bani Hani, Assistant SG Dr. Aiman Bani Hani, COTR, USAID	
Ministry of Agriculture (MoA)	MoA	24-Jan-11	Mohammad Al-Fawaeer, Assistant SG Dr. Mahmood Friehat, Assistant SG for Water & Irrigation Soliman Sawaleha, Director	a,b,c
Water Strategy Consultant (CEC)	CEC-Amman	24-Jan-11	Izzat Sajdi, Managing Director, (CEC) water strategy consultant.	a,b,c
Ministry of Finance (MoF)	MoF	25-Jan-11	Dr. Izzeddin M. Kanakrieh, SG of Ministry of Finance	a,b,c
Water Authority of Jordan (WAJ)	WAJ	26-Jan-11	Eng. Munir Oweis, SG of WAJ Asst. SG for Technical Affairs Bassam Saleh, MWI/WAJ Dissi Project Manager Zeyad Haddadin, Assistant SG for finance and Tendering Dr. Emad Momani, Asst.SG for Human Resources Diana Kawwa, Senior Adviser to SG of WAJ Basem Telfah, PMU Director Dr. Aiman Bani Hani, COTR, USAID	a,b,c,d
MWI- Jordan Vally Authority (JVA)	JVA	27-Jan-11	Eng. Yousef Hasan, (MWI) Representative in the Red-Dead Study Management Unit-Former Asst. SG for Planning, JVA	b
Ministry of Municipal Affairs (MoMA)	MoMA	31-Jan-11	Ahmed Al Ghazo, SG of Ministry of Municipal Affairs (MoMA) Dr. Aiman Bani Hani, COTR, USAID	a,b
Executive Privatization Commission (EPC)	EPC-Amman	31-Jan-11	Abdel-Rahman M. El-Khatib, EPC Chairman Dina A. Dabbas, SG of EPC	a,b
European Union (EU)	EU-Amman	01-Feb-11	Danuta El Ghuff, Water Program Manager of EU	a,b
KfW Development Bank	KfW-Amman	01-Feb-11	Bettina Tewinkel, Director of KfW	a,b

Institutional Support and Strengthening Program (ISSP) - Jordan/ Consultation Meetings				
Meeting/Consultation	**Location**	**Date (2011)**	**Participants**	**Staff**
Ministry of Water and Irrigation (MWI)	MWI	01-Feb-11	Ali Subah, Water Resources Management Director Irene Sander, GiZ Technical Advisor Performance Improvement	a,b
Greater Amman Municipality (GAM)	GAM	02-Feb-11	Bashar Haddadine, Special Projects Director	a,b
General Budget Directorate (GBD)	GBD	03-Feb-11	Dr. Ismail Zaghloul, General Budget Director Dr. Mohannad Al-Hazaimeh, Assistant Director General of Budget	a,b
Natural Resources Authority (NRA)	NRA	03-Feb-11	Dr. Maher Hijazin,General Director Eng. Darwish Jaser, Assistant Director	a,b
Ministry of Environment (MoE)	MoE	06-Feb-11	Faris Junaidi, Secretary General of Ministry of Environment	a,b
Arab Countries Water Utilities Association (ACWUA)	ACWUA-Amman	07-Feb-11	Eng. Khaldon Khashman, Secretary General of ACWUA	a,b
Agriculture and Water Committee-Jordan Parliament	Jordan Parliament	07-Feb-11	Wasfi Al-Rawashdeh, Member of JordanParliament/Head of Agriculture and Water Committee-Jordan Parliament	a,b
Ministry of Water and Irrigation (MWI) Jordan Vally Authority (JVA)	JVA	17-Feb-11	Eng. Qais Owis, Director of JV North, (JVA) Eng. Zyad Ababneh, WUA Manager, JVA	b,e,f
Jordan Vally Authority (JVA)	JVA	20-Feb-11	Eng. Sa'ad Abu Hammoor, SG of JVA	b,e,f
Ministry of Water and Irrigation (MWI)	MWI	07-Mar-11	Ali Subah, Water Resources Management Director, Asst SG	b,e
Project Management Unit (PMU)	PMU	08-Mar-11	Basem Telfah, PMU Director	b,e
Water Authority of Jordan (WAJ)	WAJ	05-Apr-11	Basem Haddadin, Acting Assistant SG	b
Water Authority of Jordan (WAJ)	WAJ	05-Apr-11	Bassam Saleh, Asst. SG	b
Ministry of Water and Irrigation (MWI)	MWI	13-Apr-11	Ali Subeh, Asst. SG	b
Water Authority of Jordan (WAJ)	WAJ	13-Apr-11	Ahmad Olimat, Water Reuse Director	b

Institutional Support and Strengthening Program (ISSP) - Jordan/ Consultation Meetings				
Meeting/Consultation	**Location**	**Date (2011)**	**Participants**	**Staff**
Water Evaluation and Planning WEAP	MWI	13-Apr-11	Hadeel Smadi, WEAP Coordinator	b
Ministry of Water and Irrigation (MWI)	MWI	27-Apr-11	Ali Subeh, Assistant SG, (MWI) Ibrahim Obada, Focal Point	b
KfW Development Bank	MWI	03-May-11	Nabeel Zu'bi, KfW Project Director	b
Ministry of Water and Irrigation (MWI) Jordan Vally Authority (JVA)	JVA	03-May-11	Eng. Yousef Hasan, (MWI) Representative in the Red-Dead Study Management Unit- Former Assistant SG for Planning- JVA	b
Ministry of Water and Irrigation (MWI)	MWI	04-May-11	Eng. Zakareah Hassan, MWI Annual Report Unit Head	b
GiZ	MWI	30-May-11	Nour Habjoka, Technical Advisor, German-Jordan Programme Management of Water Resources	b,f
Ministry of Water and Irrigation (MWI)	MWI	02-Jun-11	SG of MWI Eng. Maysoon Al-Zou'bi Ali Subeh, Asst.SG. Mohammad Momani, Senior Advisor	b,d,e,f, g,h,i
Ministry of Water and Irrigation (MWI) Project Management Unit (PMU)	PMU	02-Jun-11	Shaden Nori, PMU unit. MWI Focal Point, Ibrahim Obada	b
Ministry of Water and Irrigation (MWI)	MWI	02-Jun-11	Ali Subeh, Asst. SG. Ibrahim Obada, (MWI) Focal Point	b
Jordan Vally Authority (JVA)	JVA-JV control room	29-Jun-11	Eng. Qais Oweis, Director of JV North	b,h
Ministry of Water and Irrigation (MWI) Jordan Vally Authority (JVA)	JVA-Jordan River site	18-Jul-11	MWI Focal Point, Ibrahim Obada	b,j
Ministry of Water and Irrigation (MWI)	MWI, ISSP	Weekly	MWI Focal Point, Ibrahim Obada	b

Institutional Support and Strengthening Program (ISSP) - Jordan/ Workshops					
Workshop	**Location**	**Date**	**Participants**	**Number of Attendees**	**Staff**
Institutional Assessment Workshop	Marriott Hotel, Amman	02-Mar-11	MWI, WAJ, JVA, Aqaba water company, Miyahuna, USAID, PMU, ECODIT , Jordan Government Ministries, Royal Scientific Society, University of Jordan, GBD, GIZ, PAP, GAM, DAI, ACWA.	50	a,b,d,e ,f,h,I,j, k,l,m,n
Water Valuation Workshop	Marriott Hotel, Amman	03-Mar-11	MWI, WAJ, JVA, Aqaba water company, Miyahuna, USAID, PMU, ECODIT, Jordan Government Ministries, Royal Scientific Society, University of Jordan, GBD, GIZ, PAP, GAM, DAI, ACWA.	42	a,b,d,e ,f,h,I,j, k,l,m,n
Institutional Assessment Consultation Workshop	Marriott Hotel, Amman	20-Apr-11	MWI, WAJ, JVA, Aqaba water company, Miyahuna, USAID, PMU, ECODIT, Jordan Government Ministries, Royal Scientific Society, University of Jordan, EU, JICA, SIDA, ADF, GBD, GIZ, PAP, GAM, DAI, ACWA.	54	b,d,e,f, g,h,I,k ,l,m,n, o,p

Institutional Support and Strengthening Program (ISSP) - Jordan/ Workshops					
Workshop	**Location**	**Date**	**Participants**	**Number of Attendees**	**Staff**
Institutional Assessment Results Workshop	Marriott Hotel, Amman	19-Jun-11	MWI, WAJ, JVA, Aqaba water company, Miyahuna, USAID, PMU, ECODIT, Jordan Government Ministries, Royal Scientific Society, University of Jordan, CDM, ECO Consult, Executive Privatization Commission, French Embassy, GJU, IDARA Water Demand Management Project, International Finance Corp. (World Bank Group), MCA-Jordan, MCC, McKinsey & Company, Operation and Mainatenance Training Project, Yarmouk Water Company, ADF, GiZ, GAM.	93	b,d,e,f, g,h,I, m,n,o, p,q,r

Staff:	
a. Axel Alexander Kahl	j. Glen Anderson
b. Akram Rabadi	k. Emad Karablieh
c. Russel Misheloff	l. Ehab Qura'an
d. Ra'ed Daoud	m. Nabila Salman
e. Mark Sevendsen	n. May Bseiso
f. Dan Bromely	o. Maram Aridah
g. Barbara Rossmiller	p. Jessica Troell
h. Roger Patrick	q. Alan Brown
i. Koussai Quteishat	r. Ibrahim Alqam

ANNEX 5 - OVERVIEW OF PAST REFORM STUDIES

An essential part of our diagnostic assessment has been to consult earlier analyses of Jordan's water sector. Four documents hold special salience for our work: (1) Jordan's Water Strategy and Policies, adopted by the Council of Ministers, April 26, 1997; (2) The National Water Master Plan; (3) The National Agenda, 2006-2015; and (4) Water for Life: Jordan's Water Strategy, 2008-2022.

In the 1997 document, Jordan's Water Strategy and Policies, we find a strong commitment to: (1) reducing groundwater extraction to renewable rates; (2) an ongoing monitoring effort to control groundwater withdrawals; (3) careful planning and judicious withdrawals from fossil aquifers; (4) the quest for the highest possible efficiency in the conveyance, distribution, and use of water; (5) an integrated and temporally dynamic approach to the management of demand and supply; (6) use of the most advanced technology to enhance resource management capabilities; and (7) keeping operation and maintenance costs as low as possible.

At this early date, the leaders of the Kingdom and its government promised to undertake periodic reviews of the existing institutional arrangements and legislation in order to assess the adequacy of the status quo in light of changing settings and circumstances. Moreover there was a commitment to the diligent enforcement of laws pertaining to water, and to the enhancement of participation by stakeholders—including legislative language to make sure those laws are followed. There was a commitment to increased co-operation and co-ordination among public and private entities involved in water development and management.

The Kingdom and its government advocated frequent monitoring and scoring of the performance of the water and wastewater systems, and promised to employ the principles of resource economics to bring that about.

There was a rather modest commitment to cost recovery for operation and maintenance expenses for utilities. It was said that "Capital cost recovery shall be carefully approached"—suggesting the political difficulties associated with this commitment. It is reported that the role of water tariffs shall be considered as a tool to attract private investment in water projects. In addition, we see that "cost recovery shall be linked to the average per capita share of the GDP and its level. It shall also be connected to the cost of living and the family basket of consumption. However, profitable undertakings in industry, tourism, commerce and agriculture shall be made to pay the "fair water cost."

On the topic of groundwater, it is acknowledged that the government was complicit in promoting irrigated agriculture in the arid southeast beginning in 1984. To make sure things got done, the government contracted with agricultural firms who began to exploit fossil freshwater. Now that same aquifer is central in plans to augment urban water supply to Amman and the North (the Disi aquifer). The agriculture promoted by the government over two decades ago is now a threat to urban water supplies.

At the time this report was adopted by the Council of Ministers, the government declared that priority uses would include municipal and industrial uses, educational institutes, and tourism. It was also declared that priority would be given to the sustainability of existing irrigated agriculture here large capital investments had been made.[4] In particular, trees irrigated from groundwater would continue to receive an amount that would assure their sustainability-giving special attention to the use of modern irrigation methods. The report,

The Challenge of Grounwater overdraft in the highlands

There are various estimates concerning the extent of groundwater overdraft in the Highlands. Despite this range of estimates, it is clear that groundwater pumping in the Highlands must be reduced.

There are approximately 3,696 irrigation wells in the Highlands, of which 2,297 are licensed, and 899 are considered "illegal." Assuming that both categories of wells produce similar annual water flows suggests that the typical Highland well withdraws 80,357 m3 of water annually (297 MCM divided by 3,696 wells).

Recent research explores the feasibility of purchasing water use rights from farmers in the Mafraq-Azraq basin in Jordan. A total supply of 29million m3 could be periodically purchased from farmers at an annual price of approximately JD 0.23/m3 (1 JD ≈ 0.70 U.S. dollars), or a total cost of about JD 6.8 million per year.

[4] This approach serves to limit possible compensation claims from farmers in jeopardy of losing their access to groundwater.

anticipating concern in some parts of the country, was clear that the expropriation of legal water abstractions, or of water claims established on springs rising from groundwater reservoirs, would not be carried out in the absence of a clear higher priority need, and without fair compensation for current irrigators.

At this time it was also recognized that agriculture should have a priority in those instances where water from reservoirs is too inferior to be used for municipal and industrial purposes. Priority was also accorded where supplementary irrigation from the groundwater reservoir is possible. At this early date, it was promised that a contingency plan would be developed (and updated) to reallocate water from privately operated wells for use in the municipal networks.

The report suggests that there will be a vigorous campaign focused on illegal drilling of tube wells—drilling will be stopped, rigs confiscated and legal action taken against violators. As part of the National Water Master Plan, groundwater basin management plans would be developed for each aquifer. Water meters were to be installed on wells and be subject to quarterly readings. Only high-priority purposes would be able to obtain licenses to drill, and the prohibition of licensing of agricultural wells would be maintained. In a promising development, the report announced that fees would be assessed to control over-pumping of groundwater.

There is a commitment in this report to "institutional restructuring" in which proper legislation and effective law enforcement would form the basis of a new policy climate. It was pointed out that a "significant reorganization of water agencies would be a necessary component of bringing about efficiency and managerial agility. From that point forward, the Ministry of Water and Irrigation (MWI) would play a central role in planning, development of the water sector, formulation of a coherent policy framework, and regulation of the sector[5] This new policy framework was to have three general principles:

[5] In hindsight, it was a mistake to place responsibilities for planning and development of water resources in the same agency that is responsible for regulating water withdrawals and use.

1. The Ministry of Water and Irrigation (MWI) would retain responsibility for sector governance. This would entail policy formulation, decision making, data collection, geo-referenced data systems, monitoring, and overall national planning;

2. The Water Authority of Jordan (WAJ) would separate its bulk water supply and retail functions, shifting water delivery to the private sector. WAJ would monitor retail supply contracts, and would become a smaller organization. For those bulk supplies that are not privatized, WAJ would remain the purveyor of bulk supplies that are not privatized, and it would provide support to smaller retail distribution units not operated by the private sector;

3. The Jordan Valley Authority (JVA) has seen its programs in social infrastructure diminish in the recent past and there was a call for the reassessment of its functions and programs. The report wanted the JVA to launch a new program focus on tourism, industry, manufacturing, and advanced technologies. Law No. 19 of 1988 would remain a mandate to the JVA. The private sector was expected to become more active in development, and in activities concerned with operation and maintenance. It was said that the responsibilities of the JVA would be enhanced by the emergence of a new Jordan Rift Valley (JRV) initiative.

The Ministry of Water and Irrigation was directed to set municipal water and wastewater fees at levels that would cover the cost of operation and maintenance by the first quarter of 1998. The Ministry was also directed to launch a program to recover all or part of the capital costs of water infrastructure. Until cost recovery is complete, and the national savings reach levels capable of domestic financing of development projects, project financing will depend on concessionary loans, private borrowing and/or BOO and BOT arrangements. While the new fee structure would be an essential instrument in cost recovery, full recovery seems impossible without newly profitable industry, tourism, commercial businesses, and agriculture.

It was stated that the Ministry should set differential prices based on water quality, end users, and the social and economic impact of prices on various economic sectors and regions. The Ministry was also directed to review and modify water tariffs based on the costs of supply, operations, and relevant economic data.

The report acknowledges an overly lax program to monitor and control excessive groundwater withdrawals. There was recognition that persistent over-pumping was bringing about increased pumping costs, as well as accelerated levels of salinity. It was claimed that the Ministry is implementing a program that would be effective in gradually reducing groundwater withdrawals to the level of sustainability.

At the time of the report, the Ministry was providing wastewater collection and treatment services to fourteen major populated areas. The Ministry was also said to be reorganizing in order to become more effective in monitoring and enforcing wastewater regulations. The Ministry was directed to establish a unit responsible for the planning, design, construction and management of sewerage system projects—and for the reuse of treated effluent.

The report acknowledges that there is a growing problem with degraded water quality from industry, agriculture, runoff, inadequate wastewater treatment facilities, excessive pumping, seepage from landfills and septic tanks, and the improper disposal of dangerous chemicals. Of course population pressure, compounded by refugees and displaced persons, has further strained the Khirbet-As-Samra treatment plant. This has led to the serious degradation of the King Talal reservoir.

As mentioned above, existing irrigated agriculture would be allowed to continue. If reallocation is required, the government claimed that it would provide for replacement supplies. The sustainability of agriculture was to be compromised only if it (agriculture) threatened the sustainability of groundwater resources. Of course pollution of aquifers—or their depletion—are two reasons why agriculture might be compromised. In that regard, the government declared a commitment to protect against pollution that degrades soils or endangers animal health. This suggests that the government recognized the need for close collaboration with the Ministry of Agriculture. During the wet season, surplus surface water would be made available to farmers in order to leach soils. New drainage networks would be installed where natural drainage is inadequate.

At this time it was urged that the government should get out of the business of distributing irrigation water at the farm level. The report called for pilot programs in Participatory Irrigation

Management (PIM) in which farmers would assume the responsibility of managing water delivery to their farms.

Since 1983, development of water resources outside the Jordan Valley has been the responsibility of the Water Authority of Jordan (WAJ)—the successor of the Natural Resources Authority. The report urged that water prices be set to cover the cost of operation and maintenance and, with conditions, should also serve to recover part of the capital cost of irrigation projects. It was suggested that there be a one-time charge "against irrigation rights" to help recover capital costs. This fee would be assessed as a rate per unit area of the irrigated farm. The objective here was to cover at least half of the development costs of irrigation networks. There was early recognition that the planting of crops with high water requirements should be discouraged. Moreover, perennial crops were to be controlled by a permitting requirement, at least until a proper balance between supply and use was restored.

Wastewater was recognized as an essential component of renewable water resources and it was to become an integral part of the national water budget. Industries were to be encouraged to recycle part of their wastewater and to treat the remainder to meet specific standards. Priority was to be given to treated effluent for irrigation. Blending of treated wastewater with fresh water was encouraged where possible. Crops would be selected with consideration for the blended irrigation water, soil type and chemistry, and the economics of the reuse operations. Accumulation of heavy metals and salinity would be monitored and mitigated where necessary. It was noted that treated effluent should be priced in order to cover the operation and maintenance costs of delivery.

The next significant policy document is The National Agenda: 2006-2015 issued in early 2000. This document acknowledged that the water sector is of strategic importance as water scarcity can significantly impede socio-economic growth. In addition to the scarcity of renewable water resources and depletion of underground water, there was yet another acknowledgment that the water sector suffers from distribution inefficiencies, inadequate tariffs, limited wastewater treatment capabilities, and restricted private sector involvement.

Proposed initiatives pertinent to our institutional assessment included: (1) improvements in the efficiency of water distribution networks to decrease operational costs and non-revenue water;

(2) restructuring tariffs and gradual reductions in subsidies; (3) the development (and upgrading) of wastewater treatment facilities by using state-of-the art technology and re-use of treated water for agriculture and industry; and (4) greater involvement of the private sector in developing the water sector and creating an investment-friendly environment. The National Water Master Plan reinforced the importance of these reforms.

Finally, in the most recent report, Water for Life: Jordan's Water Strategy, 2008-2022, the government of Jordan committed itself to: (1) providing adequate, safe and secure drinking water supply; (2) promoting a greater understanding and more effective management of groundwater and surface water; (3) healthy aquatic ecosystems; (4) sustainable use of water resources; (5) fair, affordable and cost-reflective water charges; and (6) the timely adaptation to increased population growth and economic development across the water sector and water users.

Most significantly for our assessment, this report admitted that the prevailing motivation for water "management" in the Kingdom had been dominated by the flawed imperative to supply water rather than the more logical approach that focuses on justified water needs. As a result, groundwater levels have dramatically declined, and the imbalance between supplies and claimed "needs" has grown to unsustainable levels. Moreover, the quality of the nation's water has declined significantly.

The Water for Life report calls for: (1) efficient and effective institutional reform; (2) more efficient use of water resources; (3) dramatic reduction in the exploitation of groundwater; (4) more attention to the problems brought on by irrigated agriculture in the highlands; and (5) appropriate water tariffs and water-conserving incentives.

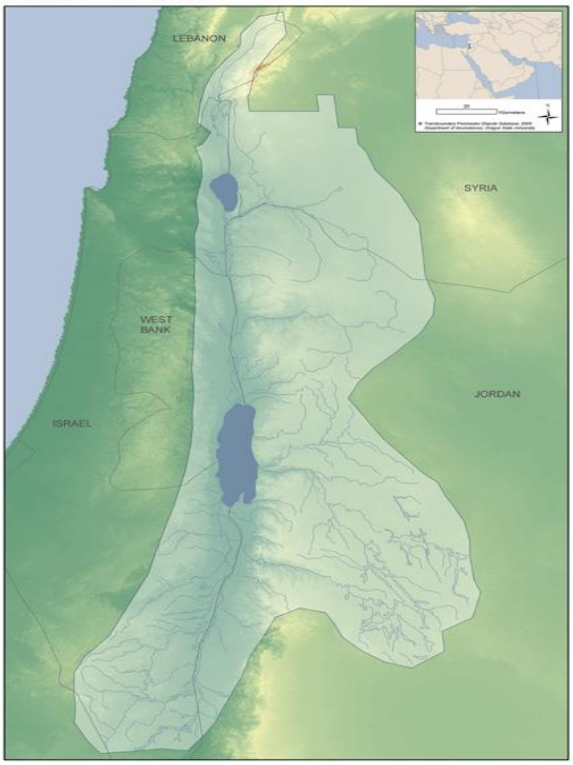
The overriding purpose of the ISSP, therefore, is to help the Government of Jordan convey to its citizens the long-run danger of a water supply policy. It is now time to begin an era of a water stewardship policy.

ANNEX 6 - TRANSBOUNDARY WATER IN JORDAN

INTRODUCTION

The major water resources Jordan shares with its neighbors are the Jordan River, the Yarmouk River (a tributary of the Jordan) and the Disi Aquifer. Jordan lies within the drainage basins of all three of these water bodies. Jordan is also located adjacent to the Dead Sea (the terminus of the Jordan River) and Red Sea, and more recently has been party to negotiations over these water bodies as well. In addition, Jordan has a brief history of negotiating over waters that lie outside its geographic domain – namely the Euphrates, Ceyhan and Seyhan Rivers.

The Jordan River basin



THE JORDAN RIVER BASIN

The Jordan River flows between five riparians – Jordan, Israel, Lebanon, Palestine and Syria. In part, it serves, along with the Dead Sea, as the border between Israel and Jordan, while other stretches form the border between Jordan and the West Bank. Both Jordan and Israel rely on the river and/or its tributaries as their primary water supply. The Yarmouk River is the Jordan River's main tributary. It is not only a major source of water feeding the Jordan River (and thus integral to agreements among Israel, the Palestinian Authority, Jordan and Syria), but also the most

important shared water resource between Jordan and Syria. The Yarmouk or the Hijaz Railroad running in its gorge, whichever is closer to Jordan, forms the border between the two countries.

There is a long and rich history of disputes, negotiations and agreements that have shaped the current management of waters in the Jordan River basin. Table 1 lists the history of governing agreements that Jordan is party to in the basin. This includes ratified treaties and non-ratified agreements.

Table 1. Governing treaties and agreements of the Jordan and Yarmouk Rivers (involving Jordan), adapted from Oregon State University's Transboundary Freshwater Dispute Database, 2011 and Haddadin, 2006.

Date	Agreement Title and/or Description	Ratified Treaty?	Water Body/Basin	Countries
1997	Agreement to implement provision in the Water Annex to the Peace Treaty that provides for the construction of a diversion dam across the Yarmouk at Adasiyya. The dam was completed in 2000.	Yes	Yarmouk	Jordan, Israel
1994, October 26	Treaty of peace between the State of Israel and the Hashemite Kingdom of Jordan.	Yes	Jordan, Yarmouk, Araba/ Arava	Jordan, Israel
1987, September 3	New Yarmouk Agreement between Jordan and Syria, replacing 1953 treaty.	Yes	Yarmouk	Jordan, Syria
1955	Unified Plan for the Development of the Jordan Valley.	No	Jordan, Yarmouk	Israel and, collectively: Jordan, Syria, and Lebanon, with Egypt taking lead.
1953, June 4	Agreement between the Republic of Syria and the Hashemite Kingdom of Jordan concerning the utilization of the Yarmouk waters.	Yes	Yarmouk	Jordan, Syria

HISTORY

The Pre-negotiation Era 1920-1953

As early as the 1920's, when most of the region came under British and French control, the water shortage in the basin was already apparent. Stress on the already limited supply increased heavily with the influx of Jewish immigrants, beginning in 1882. Another surge began in 1922 when Palestine and Jordan came under the mandate of Great Britain.The mandatory power was requested to implement the 1917 Balfour Declaration (Haddadin, 2001b). To address this concern, Great Britain began assessing the Jordan River's potential and subsequently proposed a series of development schemes, including diverting the Yarmouk into Lake Tiberias (Sea of Galilee), constructing dams for hydroelectric power, and building irrigation canals along the river's banks (Haddadin, 2001b). Water resources development began in the 1930's and attempts at formal development and allocation agreements among the riparians in the early 1950's. During the years between, several events transpired that impacted current management of the Jordan and Yarmouk Rivers. Details of this period are described in Annex 1.

By the time that Jordan gained its independence from Great Britain in 1946, it was clear that the limited supplies in the basin would make any unilateral development plans difficult. Regardless, both Jordan and Israel proceeded unilaterally for some time. Jordan hired British consultants, who prepared in March of 1951 the "MacDonald Plan," which proposed canals for both sides of the Jordan River and storage of Yarmouk and Jordan waters in Lake Tiberias (Haddadin, 2001b). The basic principle of the MacDonald Plan, the priority of in-basin use, was adhered to in subsequent Arab plans (Haddadin, 2001b). Israel took a different approach, proposing an out-of-basin transfer from the northern Jordan River to the coastal plains and Negev Desert (Haddadin, 2001b). In 1953 Israel released its "All Israel Plan," which along with the diversion, included the draining of Huleh Lake and adjacent swamps. Concurrently, the Arab states, Syria and Lebanon, were discussing organized exploitation of two northern sources of the Jordan—the Hasbani and the Banias Rivers.

Meanwhile, Miles Bunger, an American attached to the Technical Cooperation Agency in Amman, suggested in 1952 the construction of a dam on the Yarmouk River at Maqarin to help

regulate the flow of the river for irrigation uses and tap its hydroelectric potential. The following year, Jordan and the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) signed an agreement to implement Bunger's plan, including a dam at Maqarin with a storage capacity of 480 million cubic meters (MCM) and a diversion dam at Adasiyya. Syria and Jordan agreed that Syria would receive 70% of the hydropower generated, in exchange for it paying 5% of the cost of development, and Jordan would receive the flow from the Maqarin Dam, estimated at 10 cubic meters per second (cm/s) and 30% of the generated power. However, because of Israeli protests the UNRWA and Great Britain withdrew their financial support to the project, and the United States President dispatched his personal envoy to the region with a draft plan to share the waters of the Jordan basin among the riparian parties.

The Johnston Negotiations 1953-1955

In 1953 the United States took on an active political role in the Middle East and decided to attempt to diffuse tensions between the Arab states and Israel. In October of 1953 after the U.S. Presidential envoy, Ambassador Eric Johnston began his shuttle diplomacy, through negotiations, to market a plan to share the Jordan basin waters. The negotiations attempted to mediate the dispute over water rights among all the Jordan River riparians. Johnston's initial proposals were based on a desk study carried out by the Boston-based consulting firm, Chas T. Main, for the Tennessee Valley Authority (TVA). The latter was asked by the UNRWA to develop the basin's water resources such that development works undertaken by a given riparian party would not negate the benefits sought by another riparian party in the basin's development. The UNRWA hoped that a development plan for the Jordan Valley would help settle Palestinian refugees for whom it was responsible. The Main Plan addressed the TVA task with a regional approach, purposely ignoring political boundaries in their study.

The U.S Presidential envoy, Ambassador Eric Johnston, made his first trip to the region in March 1953. He met with Arab leaders including the emerging leader of Egypt Jamal Abdul Nasser. The Egyptian leader, then Prime Minister, decided to have the League of Arab States look into the Plan that Johnston carried and was mailed before hand to the Arab parties.

In December of 1953, The Arab League Council, upon Egypt's recommendation, formed the Arab Technical Committee to negotiate with Ambassador Johnston. It was chaired by Egypt's

Dr. Mohammad Ahmad Saleem with representatives from Syria (Dr. Subhi Mazloum) and Lebanon (Mr. Ibrahim Abdul Aal). Jordan was not represented at first because of its negative rating by the Arab League due to its "annexation" of the West Bank of Palestine. However, in April of 1954 representatives from Jordan were added. The Arab Technical Committee formulated the "Arab Plan." Its principal difference from the Main Plan was in the water allocated to each state. Israel was to receive 182 MCM per year, Jordan 698 MCM per year, Syria 132 MCM per year, and Lebanon 35 MCM per year in addition to keeping all of the Litani, as originally proposed. The Arab Plan reaffirmed in-basin use. It also rejected storage in Lake Tiberias, which lies wholly in Israel, proposing instead a 450 MCM capacity dam on the Yarmouk at Maqarin.

Johnston worked until October of 1955 to reconcile U.S., Arab, and Israeli proposals in a Unified Plan amenable to all of the states involved. His dealings were bolstered by a U.S. offer to fund two-thirds of the development costs. His plan addressed the objections of both sides, and accomplished no small degree of compromise, mostly at Jordan's expense. Though they had not met face to face for these negotiations, all states agreed on the need for a regional approach. Israel gave up on integration of the Litani and the Arabs agreed to the freedom of each state to use its share the way it saw fit, i.e., withdrawing their objection to Israel's intention to implement an out-of-basin transfer. The Arabs objected, but finally agreed, to international supervision of withdrawals and of deciding on storage in Lake Tiberias or any other economic location. Allocations under the Unified Plan, later known as the "Johnston Plan," included 450 MCM per year to Israel, 720 MCM per year to Jordan, 132 MCM per year to Syria and 35 MCM per year to Lebanon. Although Syria and Lebanon's shares were absolute flows, the shares of Jordan and Israel depended on the residual flow in the Yarmouk and the Upper Jordan, respectively. Such shares would be impacted negatively by droughts and positively by wet years.

In response to the first draft that Johnston carried to the region, the "Main Plan," Israel presented the "Cotton Plan," in which it allocated itself 1290 MCM per year, including 400 MCM per year from the Litani. The Cotton Plan allocated Jordan 575 MCM per year, Syria 30 MCM per year, and Lebanon 450 MCM per year. In contrast to the Main Plan, the Cotton Plan called for out-of-basin transfers to the coastal plain and the Negev, included the Litani River and recommended Lake Tiberias as the main storage facility, thereby diluting its salinity.

In his negotiations with Israel, Johnston succeeded in considering the Litani River a national Lebanese river not to be counted in the sharing process of the Jordan basin. The Unified Plan conceded, "it is recognized that each of these countries may have different ideas about the specific areas within their boundaries to which these waters might be directed." The plan failed to gain approval by the Arab League Council who asked for more time to study alternatives. The U.S. State Department distributed the plan in January of 1956 to the concerned parties and made it the cornerstone of its policy for supporting development projects in the Jordan Valley region (Haddadin 2001 b).

Despite the forward momentum, the Arab League Council formally asked for more time to decide on the Plan because they wanted to study alternatives to it. The Unified Plan was accepted by the Arab Technical Committee but was not ratified by the Arab League Council.

Table 2. Allocations included in the various plans drafted during the Johnston negotiations. Quantities listed are the sum of all allocations for the Jordan River, Yarmouk River, side wadis and groundwater. The Cotton Plan also includes the Litani River. (*)Indicates that the flow rate shown will vary with climatic conditions.

	Main Plan	**Cotton Plan**	**Arab Plan**	**Johnston (Unified) Plan**
Jordan	720 MCM *	575 MCM	698 MCM	720 MCM*
Israel	475 MCM *	1290 MCM	182 MCM	450 MCM *
Syria	132 MCM	30 MCM	132 MCM	132 MCM
Lebanon	35 MCM + Litani	450 MCM	35 MCM + Litani	35 MCM + Litani

In October of 1955, after four shuttle trips between the Arab parties and Israel, Johnston presented "The Unified Development of the Water Resources of the Jordan Valley Region" (the "Unified Plan") to the Arab League Council and to Israel. Its major features included small dams on the Hasbani, Dan, and Banias; a 126 meter high dam at Maqarin; additional storage (in the order of 90 MCM) at Lake Tiberias; and a gravity flow main canal on the East Jordan Valley from which a branch would cross the Jordan River half way down via a siphon and feed another gravity flow canal on the West Bank. Final allocations were as follows:

From the Upper Jordan River and its upper tributaries:

- 35MCM per year to Lebanon from the Hasbani tributary.

- 42 MCM per year to Syria (22 MCM from the Banyas and 20 MCM from the upper Jordan)
- 100 MCM per year to Jordan (West Bank) from Lake Tiberias to be delivered to the eastern main canal.
- Remaining flow to Israel (estimated average 450 MCM per year)

From the Yarmouk River:

- 90 MCM per year to Syria
- 25 MCM per year to Israel
- Remaining flow to Jordan (estimated average 377 MCM per year)

From Side Wadis:

- 175 MCM per year for East Jordan from eastern wadis
- 52 MCM per year for the West Bank of Jordan from western wadis

From groundwater:

- 8 MCM per year for East Jordan
- 8 MCM per year for West Bank of Jordan

Although the agreement was never ratified, both sides generally adhered to the technical details and allocations, even while proceeding with unilateral development. Agreement was encouraged by the United States, which promised funding for future water development projects provided the Johnston Plan's allocations were adhered to. In fact, the grants that the U.S. advanced to Jordan for the construction of the East Ghor Canal and to Israel for the construction of the Tiberias-Beit Shean pipeline were conditioned on each side complying with its share under the Johnston Plan. Violation was committed by Syria beginning in 1967, which has negatively

impacted Jordan and Israel's shares in the Yarmouk. Since 1979, Israeli and Jordanian water technicians have met several times a year under the auspices of the United Nations Truce Supervision Organization, as often as every two weeks during the critical summer months, at so-called "Picnic Table Talks" at the Adasiyya intake on the Yarmouk bank to discuss the diminished flow rates and respective allocations.

The Yarmouk Mediations 1957-early 1990's

The idea of a dam on the Yarmouk was raised again in 1957, in a Soviet-Syrian Aid Agreement, and in 1964 at the First Arab Summit in Cairo, as part of the All-Arab Diversion Project that proposed, among other measures, to build a dam in the Lower Yarmouk at Mukheiba. Construction of a storage dam at Mukheiba was actually begun in 1966 only to be stalled by the Israeli occupation of the Golan Heights in 1967. The right abutment of the Mukheiba Dam (also called the Khalid Ibn al Walid dam) was on the foothills of the occupied Golan Heights. The idea of regulating the Yarmouk flow was again resurrected in Jordan's Five Year Plan in 1975, and Jordanian water officials tapped the potential help of the U.S. to obtain Israeli approval to build a diversion structure associated with the dam downstream. While the Israelis were receptive at the outset, their position hardened later on.

This stalemate might have continued except for strong U.S. involvement in 1978, when President Carter pledged a $9 million loan towards the Maqarin project design and site exploration. Congress agreed to provide an additional $150 million on the condition that *all* of the riparians agree. Philip Habib was thus sent to the region to help mediate an agreement. Habib was able to gain consensus on the concept of the dam, on separating the Yarmouk from West Bank allocations, and on the difficult question of summer flow allocations – 25 MCM would flow to Israel per year as per the Unified Plan versus 40 MCM as per Israel's insistence. Israel claimed that the 25 MCM stipulated in the Unified Plan was only its summer, not annual, allocation. However, negotiations were hung up on winter flow allocations, as Israel stood firm on receiving 15 MCM and Jordan insisted upon an annual Israeli share of 25 MCM. With this issue yet unsettled, Habib's mission was aborted when the Iraq-Iran war caused a rift between Jordan and Syria, the two primary upstream riparian parties on the Yarmouk, and whose territories the dam would straddle.

Upon recovery of their good bilateral relations in 1987, Syria and Jordan reaffirmed mutual commitment to a dam at Maqarin. Syria insisted, and Jordan agreed under duress, on the replacement of the 1953 bilateral treaty over the Yarmouk with a new one by which its water allocations were boosted in violation of the Johnston's allocations (see Annex 4). This agreement also awarded groundwater springs above 250 meters to Syria, and springs below 250 meters to Jordan (Haddadin personal communications, 2011). With the updated treaty, the dam at Maqarin was renamed al Wehda Dam. Although Jordan and Syria had signed a new agreement, Israel's approval of the construction of a diversion weir on the Yarmouk at Adasiyya, yet not granted, remained crucial to the feasibility of the Maqarin Dam project.

Jordan in 1989 approached the U.S. State Department for help in resolving the diversion dam issue with Israel. Ambassador Richard Armitage was dispatched to the region in September 1989 to resume indirect mediation between Jordan and Israel where Philip Habib had left off a decade earlier. The points raised during the following year were as follows: both sides agreed that 25 MCM per year would be made available to Israel during the summer months, but disagreed as to whether any additional water would be specifically earmarked for Israel during the winter

months. The overall viability of a dam was also open to question. Both sides questioned what effects ongoing development by Syria at the headwaters of the Yarmouk would have on the dam's viability. Since the U.S. State Department had no role to play with Syria, their input was missing from the mediation upstream but were continually updated by Jordan. Jordan took the issue up bilaterally with Syria. Israel eventually wanted a formal agreement with Jordan, a step that would have been politically impossible for the Jordanians at the time.

By fall of 1990, agreement seemed to be taking shape. Israel agreed to the concept of the dam and discussions on a formal document; winter flow allocations would continue during construction, which was estimated to last more than five years. However, two issues held up an agreement. First, the lack of Syrian input left questions of the future of the river unresolved, a point noted by both sides during the mediations. Second, the outbreak of the Gulf War in 1991 overwhelmed other regional issues, finally preempting talks on the Yarmouk. In the absence of an agreement, both Syria and Israel had been able to exceed their allocations from the Johnston accords, the former because of a series of small storage dams and extensive utilization of the groundwater aquifer that fed the base flow of the Yarmouk, and the latter because of its downstream riparian position and absence of a diversion structure. Syria drew water from a series of small impoundment dams (believed today to be over 40 in number) upstream from both Jordan and Israel, which it had begun constructing in 1967, while Israel took advantage of the lack of a diversion facility to increase its withdrawals from the river.

Multilateral Water Talks 1990's

Leading up to 1991, the Jordan Basin experienced a drought – for three consecutive years, rainfall in the basin was well below average, and water supplies could not fulfill the allocation quantities in the Johnston Plan. This resulted in a dramatic tightening in the water management practices of the riparians, primarily Israel and Jordan, including rationing, cut-backs to agriculture by as much as thirty percent and restructuring of water pricing and allocations. Although these steps placed short-term hardships on those affected, they also showed that, after years of normal rainfall, there was still some flexibility in the system. Most water decision-makers

agree that these steps, particularly regarding demand management practices and allocations to agriculture, were long overdue.

Around the same time, a series of regional geo-political events paved the way for further negotiations. The end of the Gulf War in 1991 prompted President Bush to focus attention to the unstable Middle East. He dispatched Secretary of State James Baker to the region to attempt to make arrangements to commence a Middle East Peace Process and arrive at a permanent peace in the Middle East. Baker succeeded in designing a Process with two conferences. The first was a bilateral conference in which Israel would directly negotiate separately with a Jordanian-Palestinian joint delegation. Syria, Lebanon, and The second was a multilateral conference in which interested countries of the world would participate along with the core parties. The Process was kicked off in Madrid on October 30, 1991, after which the bilateral conference commenced and held its rounds in Washington, D.C. The multilateral conference started in Moscow on January 26, 1992 and held its subsequent rounds in various capitals of the world.

The multilateral track focused collaboration efforts on five regionally relevant subjects, using working groups as the forum. One of the five groups was the Multilateral Working Group on Water Resources (MWGWR). The idea was that the working groups would come up with projects that would reinforce peace arrived at through negotiations in the bilateral conference. The core parties of these groups were Israel, the Palestinians and Jordan. Lebanon and Syria, although participants in the bilateral conference, opted not to join the multilateral conference as they both viewed it leading to normalization with Israel before peace is arrived at.

Given the role of the MWGWR in this context, the objectives were more on the order of fact-finding and workshops, rather than tackling the difficult political issues of water rights and allocations, which as mentioned were left to the bilateral conferences. The MWGWR met eight times after the initial meeting in Moscow. The subsequent meetings, referred to as the "Water Talks" took place in Vienna (May, 1992), Washington D.C. (September, 1992), Geneva (April, 1993), Beijing (October, 1993), Muscat (April, 1994), Athens (November 1994), Amman (June, 1995), and Hammamet (May, 1996). The pace of success of each round vacillated but overall increased. The Vienna round in May 1992 was characterized as "contentious," with initial

posturing by the Palestinians and the Israelis. The Palestinians, then part of a joint delegation with Jordan, first raised the issue of water rights, claiming that no progress could be made on any other issue until past and current grievances were addressed. In sharp contrast, the Israeli position was that the question of water rights was a bilateral issue, and that the multilateral working group should instead focus on joint management and development of new resources. Since decisions were made by consensus, little progress was made on either of these issues. Nevertheless, plans were made for continuation of the talks – an achievement in and of itself.

The third round in Washington, D.C. in September 1992 made somewhat more progress. Consensus was reached on a general emphasis for the watersheds that the U.S. State Department, gavel holder of the water talks, had proposed in the Vienna meeting, focusing on four subjects: enhancement of water data, water management practices, enhancement of water supply, and concepts for regional cooperation and management. Progress was also made on the definition of the relationship between the multilateral and bilateral tracks. By this third meeting, it became clear that regional water-sharing agreements, or any political agreements surrounding water resources, would not be dealt with in the multilaterals, but that the role of these talks was to deal with non-political issues of mutual concern, thereby strengthening the bilateral track. Actually, by March 1992, Jordan agreed in the bilateral negotiations to negotiate water rights with Israel. The goal in the Multilateral Working Group on Water Resources thus became to plan for a future region at peace, and to leave the pace of implementation to the bilaterals. This distinction between "planning" and "implementation" became crucial, with progress only being made as the boundary between the two was continuously pushed and blurred by the mediators.

The fourth round in Geneva in April 1993 proved particularly contentious, threatening at points to grind the process to a halt. Initially, the meeting was to be somewhat innocuous. Proposals were made for a series of intersessional activities surrounding the four subjects agreed to at the previous meeting. These activities, including study tours and water-related courses, would help capacity building within while fostering better personal and professional relations. In June of 1993 the U.S. and European Union, which held the gavel for the Regional Economic Development Working Group, jointly put forth a proposal to conduct a regional training needs assessment in the region's water sector, which the MWGWR agreed on. This initiated the development of a Priority Regional Training Action Plan, which included a series of courses to

be offered to managers and professionals from the region over two years, to begin in June 1994. Additionally, by July of 1993 the study tours, including a tour of the Colorado River basin, commenced.

On September 15, 1993 the Declaration of Principles on Interim Self-Government Arrangements (from the Oslo Accords) was signed between the Palestinians and Israelis at the White House, which defined Palestinian autonomy. Although the declaration was generally seen as a positive development by most parties, some minor consternation was raised by the Jordanians about the Israeli-Palestinian agreement to investigate a possible conduit from the Mediterranean Sea to the Dead Sea. The Israelis pointed out in private conversations with the Jordanians that *all* possible projects should be investigated, and only then could rational decisions on implementation be made. While a bilateral agreement, the Declaration of Principles helped streamline a logistically awkward aspect of the multilaterals, as the Palestine Liberation Organization (PLO) became openly the negotiations partner and the Palestinian delegations separated from the Jordanian's.

By the fifth round of water talks in Beijing in October 1993, somewhat of a routine seemed to be setting in, whereby reports were presented on each of the four topics agreed to at the second meeting in Vienna and a new series of intersessional activities was announced. By this round, several agreements were reached. Of notable relevance to Jordan were the following:

- Regional data banks should be established.
- Japan would conduct feasibility studies on facilities for the desalination of brackish water in Jordan.
- The U.S., Canada and Austria would explore and lead seminars on water conservation and water demand management options for the region.
- The World Bank would carry out surveys of water conservation in the West Bank, Gaza, and Jordan.
- The U.N. would organize a seminar on various models for regional cooperation and management.

- A German proposal to study the water supply and demand development among interested core parties in the region would be drafted.

In addition, at this meeting Jordan proposed that the working group draft a "water charter" for the Middle East, to define the principles of regional cooperation and determine mechanisms for water conflict resolution, but the proposal was not adopted.

The sixth round of talks was held in Muscat, Oman in April 1994, the first of the water talks to be held in the region and in an Arab country, and the first of any working group to be held in the Gulf. Tensions mounted immediately before the talks as it became clear that the Palestinians would use the occasion as a platform to announce the appointment of a Palestinian National Water Authority. While such an authority was called for in the Declaration of Principles, possible responses to both the unilateral nature and to the appropriateness of the working group as the proper vehicle for the announcement were unclear. Only a flurry of activity prior to the talks guaranteed that the announcement would be welcomed by all parties. This ultimately set the stage for a particularly productive meeting. In two days, the working group endorsed several proposals, including:

- An Omani proposal to establish a desalination research and technology center in Muscat, which would support regional cooperation in desalination research among all interested parties. This marked the first Arab proposal to reach consensus in the working group.

- An Israeli proposal to rehabilitate and make more efficient water systems in small-sized communities in the region. This was the first Israeli proposal to be accepted by any working group.

- A U.S. proposal to develop wastewater treatment and re-use facilities for small communities at several sites in the region. The proposal was jointly sponsored by the water and environment working groups.

- The Regional Water Data Banks Project, a joint venture with the U.S. Geological Survey to create a data sharing system in the Middle East. This project would initially focus on bringing the Palestinian database up to the speed of Jordan and Israel's, so that

consistent data would be available to inform and recommend local and regional decision-making.

- Implementation of the U.S./E.U. regional training program, which included the series of courses proposed in June of 1993. In the end, 20 courses – ranging in duration from two weeks to two years – were given to 275 participants from the region.

Overall, the greatest success of the Water Talks was the ongoing multilateral communication, despite fluctuations in bilateral negotiations.

Jordan-Israel Peace Talks and Treaty 1993-1994

At this time progress was also made on bilateral negotiations between Jordan and Israel. In September of 1993, the two states signed a common agenda for negotiations. The sub-agenda for negotiations over water, energy and the environment was concluded on June 7, 1994. It included several items relevant to the Jordan River basin: 1) negotiation of mutual recognition of the rightful water shares of the two sides in Jordan River and Yarmouk River waters with mutually acceptable quality; 2) restoration of water quality in the Jordan River below Lake Tiberias to reasonably usable standards; 3) protection of water quality; and, 4) exploitation of groundwater resources in Wadi Araba. During these bilateral talks, in August 1993 Israel allowed Jordan to divert 4 MCM of water from Israel's share in the Yarmouk to help alleviate a winter drought-related water shortage.

In October 1994, the two sides signed the Treaty of Peace Between the State of Israel and the Hashemite Kingdom of Jordan. In November of 1994, about two weeks after the treaty was signed and at the WRGWR meeting in Athens, Greece, the parties approved the Implementation Plan of the Regional Water Data Banks Project, which was initiated a few months later.

In the treaty, the parties agreed to recognize each other's rightful allocations from the Jordan River, Yarmouk River and the Araba/Arava aquifer (see Annex 3 for details). For the Yarmouk River, the treaty allocates Israel a summer (12 MCM) and winter (13 MCM) quantity, with Jordan receiving the remainder of the flow. For the Jordan River, Jordan conceded to Israel to pump 20 MCM of water during the winter months. In return, Israel is to transfer 20 MCM of water during the summer to Jordan (Treaty of Peace, 1994). Jordan is also entitled to 10 MCM of desalinated

water and an additional 50 MCM of water to be provided in the future (Berland, 2000). Additionally, it was agreed that for a period of twenty-five years Israel could continue to pump water from wells it had previously developed in Al Ghamr, an area now belonging to Jordan (Haddadin personal communications, 2011). Finally, a Joint Water Committee was established, comprised of three members from each country, to monitor water use, enforce regulations and develop new cooperation activities.

Post-1994 Era

Following the peace treaty, the diversion weir at Adassiya was built and Israel got its Yarmouk share from that diversion point. The water sharing became regulated and Israel's share became confined to the flows stipulated in the Treaty. However, Syria increased its activities and the Yarmouk flow receded at Jordan's expense. Over the next several years, the strength of the treaty was tested numerous times. The first issue related to a provision in the peace treaty that called for the two countries to cooperate to find an additional 50 MCM of water for Jordan. Though Israel proposed a desalination project in which costs would be shared by Jordan, Jordan refused on the grounds that the treaty included nothing about cost sharing (Berland, 2000). Though the treaty specified that a plan must be in place within one year, the issue was yet unresolved after a year and a half. Finally, at a summit meeting on May 7, 1997 in Aqaba – attended by King Hussein, Prince El Hassan, the Prime Minister Majali, Minister Anani and Minister Haddadin on the Jordan side, and Prime Minister Netanyahu, Minister Ariel Sharon, and their aids on the Israeli side – the issue was resolved. At this meeting and documented in a letter written by Minister Sharon to Crown Prince El Hassan, Israel agreed to transfer half of the additional quantity to Jordan (25 MCM per year) for three years after which a desalination plant would be erected to supply Jordan with the entire amount of 50 MCM per year (Haddadin personal communications, 2011). The additional water started to flow from Lake Tiberias on May 26, 1997. The desalination plant, however, was never constructed, due to a series of events. From Jordan's side, the entire cabinet, including Haddadin, resigned and in 1999 King Hussein passed away. In addition, Israel's government underwent significant changes, namely in that Minister Sharon shifted to the Ministry of Foreign Affairs and Ehud Barak became Prime Minister. Regional political turmoil, such as the Palestinian Intifada and violence in the West Bank, also impeded the plant's construction (Haddadin personal communications, 2011).

In July-August 1998, one year after the Lake Tiberias flow issue was resolved, a major water pollution crisis struck Jordan (Berland, 2000). There was speculation that the contaminated water originated in Israel and though authorities in the Jordanian government defended Israel, it soon became evident that the cause was a combination of water carrying blue algae pumped to Jordan from Lake Tiberias, Yarmouk water carrying phosphates from Syria, and unusually high summer temperatures. The combination helped rapid growth of the blue algae to densities that the Jordanian water treatment plant could not cope with. King Hussein, from his illness bed in the Mayo Clinic, blamed his government for this and other risks that happened that summer and sent a message for the cabinet to resign. A positive outcome of this incident was that Jordan and Israel began working together to try to solve the water pollution issue. Communication between the two countries increased during this time, and data and information exchange became more routine practice (Berland, 2000).

Less than a year later, the treaty was put to the test once again, this time due to a severe regional drought. Jordan officially declared a state of drought in January 1999. Realizing that the treaty did not contain drought provisions, both countries were seriously concerned with how their respective water shares would be affected. Israel requested to reduce the amount of water it supplied to Jordan on the basis that both countries must take a hit during the drought, while Jordan demanded Israel abide by the quantities stipulated in the treaty. Jordan stood firm on this, and though the situation became seriously heated for a period of time, Israel eventually agreed to provide Jordan with its full share, altering the timing of water delivery rather than the quantity (Berland, 2000).

Also shortly following the peace treaty, Jordan revisited its bilateral Yarmouk dam project with Syria that had been in the works since the 1950's. In November of 1998, Jordan and Syria reached an agreement on building the long awaited dam on the Yarmouk at Maqarin (Arabic News, 24 Nov 1998), renamed in 1987 to al-Wehda dam; construction was to commence in 2000. In 2004, Israel and Syria drafted an agreement between one another that included provisions on management of the Upper Jordan River and recognized Syria's right to use Lake Tiberias (Ha'aretz Daily Newspaper Israel, 15 Jan 2007). On February 9, 2004, Jordan and Syria held a commencement ceremony for the al-Wehda Dam. As per the agreement, the dam height would be 95 meters with a storage capacity of about 200 MCM. Syria would use 10 MCM from the

reservoir and 70% of the electricity, but would also retain some 26 dams built upstream in the catchment. Those would impound some 165 MCM of water. This was a drastic departure from the bilateral treaty of 1953 and from the allocations under the Unified (Johnston) Plan.

CURRENT STATUS

Jordan River

The main stem of the Jordan River itself is presently shared by Jordan and Israel; the Palestinian Authority is not allocated any of its water (World Bank, 2009), although it does use some small tributaries. Jordan and Israel continue to experience difficulties in sharing the river, especially in times of drought. For example, in 2008, for the first time since the signing of the peace treaty, Israel ceased to supply Jordan with its Lake Tiberias flows for four days due to low precipitation and subsequently low lake levels (Jordan Times, 19 Sep 2008).

The desalination plant agreed upon in the late 1990's remains on the agenda. The political environment must become more peaceful, though, as donor support will be relied upon (Haddadin personal communications, 2011).

Yarmouk River

Jordan and Syria still dispute with one another over the Yarmouk waters, and tense political situations have also ensued. In addition, Israel and Syria have yet to sign a peace treaty with each other, which would allow for further cooperation among all stakeholders in regard to the Yarmouk. Some leaders in the region have suggested a Cooperation Council for Water Resources (Strategic Foresight Group, 2011). This multilateral council, among Turkey, Syria, Iraq, Lebanon and Jordan, would, among other tasks, facilitate basin level cooperation in the Yarmouk and Tigris-Euphrates basins.

Though Jordan's share from the Yarmouk as per the Unified (Johnston) Plan averages 377 MCM per year, Jordan, at the time of signature of the Treaty with Israel was left with about 245 MCM per year. Today the share is much less (less than 80 MCM) because of increased Syrian abstraction and frequent droughts. The Associated Press reported in July 2006 that Jordan requested from Syria 15 MCM of water from the Yarmouk River to help overcome the summer shortfall (Associated Press, 04 July 2006). Syria is said to have increased its withdrawals from the

Yarmouk over and above what the updated treaty of 1987 allotted to it. In particular, the political motive of Syria is to "deny Israel any part of the Yarmouk flow." Such an objective puts Jordan at a severe disadvantage. Both summer and winter flows of the Yarmouk have been diminished, imparting serious impacts on Jordan.

Most recently, in late March 2011, Saad Abu Hammour , the Secretary General of the Jordan Valley Authority, described the need to reexamine the 1987 agreement with Syria (see the full report in Annex 5). He reportedly suggested that, "Many things have changed after 24 years…. The Jordanian national interest requires a review of the terms of the agreement, and it should be re-studied to serve both Jordanian and Syrian parties (AlRai Arabic Daily News, 27 March, 2011)." He stressed that waters in the Yarmouk have declined significantly, thus necessitating reconsideration of the specified flows (Jordan Times, 18 April 2011).

THOUGHTS FOR THE FUTURE

Pressure on the waters of the Jordan and Yarmouk are only likely to grow in the future, and Jordan is in the uncomfortable geopolitical position situated between Syria and Israel. In addition, Jordan is facing growing environmental pressures to leave more water for instream flows.

Politically, stresses have shown the general resilience of the agreement between Israel and Jordan, where neither severe droughts nor water quality concerns have led to breaking the treaty. Honoring these agreements has shown itself to be hugely dependent on the individuals involved and their personal relations, however, which suggests the possibility of decreased reliability should either government turn more nationalist in its views.

Similarly, the agreement between Syria and Jordan has been shaped and managed by political relations, and Syria has actively blocked water from flowing to Jordan, ostensibly to deny Israel. Hydropolitical relations between these two countries are perhaps even more potentially volatile, given current calls for political reform in both, even regime change in Syria. How future governments will see water management in the context of regional politics is anyone's guess, and the uncertainty over the ultimate jurisdiction of the Golan Heights only makes the future more opaque.

Finally, climate change could exacerbate the stresses in the region. Droughts are increasing, and moreover, some modeling efforts suggest that the future jetstreams may migrate just a bit south, meaning that more precipitation from future storms may fall south of Lake Tiberias and the Yarmouk, where modest storage exists (King Talal Dam, Kafrein Dam, and Mujib Dam) to capture the water before it reaches the Dead Sea.

THE DISI AQUIFER

The Disi aquifer is located primarily below Saudi Arabia, with a small section underlying Jordan as well. Part of the larger Rum–Saq–Tabuk subsystem, it is a fossil aquifer with very low recharge rates, discovered during a study carried out by the UNDP in 1969 (Ferragina and Greco, 2008). It is 250 km long, 50 km wide, and over 1000 m deep (ESCWA, 2000). Saudi Arabia pumps heavily from the aquifer, many times Jordan's pumping rate of 80 MCM per year. This has resulted in a conical depression that has altered the directional flow of the groundwater (Ferragina and Greco, 2008).

There are no official agreements between Jordan and Saudi Arabia governing the Disi's use. However, one international treaty does exist that is relevant to the Disi – the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses (TFDD, 2011). Jordan is a signatory to this agreement; however, to date Saudi Arabia is not. According to the UN, the convention was designed such that the principles could be tailored as appropriate to various international watercourses (United Nations, 2005). Thus, it could potentially lay the groundwork for a future agreement between the two countries.

The history of unilateral development is described below, and includes public and private initiatives by

Jordan and Saudi Arabia, as well as international involvement.

HISTORY

1970's – 1990's

Saudi Arabia has historically extracted water from the Disi at a very high rate. Pumping began in the 1970's and increased significantly in the 1980's when wheat production became subsidized in the country (Allen, 2010). Though Saudi Arabia changed its agricultural policy in 1993, thereby reducing wheat production by 75%, it still heavily pumps from the aquifer – its annual extraction rate is estimated at over 1000 MCM per year (Allen, 2010).

Jordan initially exploited the Disi aquifer for local water supply, though this changed in the mid-1980's when the agriculture industry expanded in southern Jordan (Ferragina and Greco, 2008). At that time a project was built to transfer 20 MCM of freshwater reserves from the Disi to Aqaba (Haddadin, 2006). During the 1980's, according to the Water Authority of Jordan and the Ministry of Water and Irrigation, Jordan extracted, on average, from the Disi aquifer between 70 and 80 MCM per year (Ferragina and Greco, 2008).

In the 1990's it became apparent that additional water supplies were needed in Amman, where most of the country's demand for water is concentrated. The Jordanian government at this time proposed a 325 km pipeline from the Disi to Amman (Ferragina and Greco, 2008), intended to supply Amman with 100 MCM per year of fossil water from the aquifer (Haddadin, 2006). After a feasibility study in 1994-1995, Jordan planned to see the project through (Haddadin, 2006). Though the economic costs were high, due to the high capital construction cost and energy required to pump the water to Amman, the project offered some major advantages. For one, at the time, the water was pure and the resource seemed abundant (Ferragina and Greco, 2008). Additionally and from a "prior use" strategic standpoint, exploiting the aquifer in the 1990's would give Jordan claim to its waters in the future (Ferragina and Greco, 2008). At this time, there was already some contention over the shared resource. In 1992 and again in 1999, Jordan publicly accused Saudi Arabia of overexploiting the Disi (Ferragina and Greco, 2008). Saudi Arabia did not publically respond to either of these accusations or to Jordan's announcement of

its Disi-Amman project. It has been speculated, however, that private words were exchanged (Ferragina and Greco, 2008).

2000 – 2008

Though Jordan intended to follow through with the Disi-Amman project, there were several issues that impeded the process. For one, the project was highly controversial due to environmental implications of pumping fossil water, namely endangering the flora and fauna of a unique desert ecosystem (Ferragina and Greco, 2008). Secondly, international support for the project was lacking – the World Bank expressed concern over the impact the project would have on Jordan's relationship with Saudi Arabia; others in the international sphere argued that using fossil water for agricultural and industrial purposes was inappropriate (Ferragina and Greco, 2008). Probably the most prohibitive issue was the terminal date that the aquifer can supply the non-renewable fossil water (some 150 years), steep economic cost, which was estimated at U.S. $625 million (Ferragina and Greco, 2008). Jordan was not able to fund the project on its own and thus solicited outside for assistance. The World Bank offered Investment Guarantees in the sum of 45 million dollars contingent upon Saudi Arabia's approval. Other donor agencies refrained from chipping in because of the non-renewable character of the aquifer. Thus, Jordan eventually pursued a build-operate-transfer (BOT) scheme to fund the project. The first attempt failed, however, due to the high cost (Ferragina and Greco, 2008).

Jordan revamped the BOT design and solicited further bids. In 2006, a Turkish company, GAMA Energy AS (GAMA) won and began plans for the project, for which management would be transferred back to Jordan after 25 years (Ferragina and Greco, 2008). The project was planned to commence in late 2008 (Jordan Times, 5 Aug 2008), but was delayed for unspecified reasons (Jordan Times, 26 Jan 2011).

CURRENT STATUS

Jordan and Saudi Arabia have continued making unilateral decisions concerning the Disi aquifer. According to Ferragina and Greco (2008), though the majority of their actions demonstrate a lack of cooperation, the likelihood of open conflict between the two countries is not high. Recently, the two countries have even shown a will to cooperate in private but still refrain from

public communication and information exchange (Ferragina and Greco, 2008). A reason for lack of official agreements to date may relate to a lack of incentive to cooperate. Because the Disi's supplies are finite, there is no guarantee for long-term return on either country's investment, making short-term unilateral projects more enticing than long-term shared projects (Ferragina and Greco, 2008).

In Jordan, the Disi project is underway and is now scheduled for completion in early 2013 (Jordan Times, 26 Jan 2011). By August of 2010, three wells were completed (Jordan Times, 10 Aug 2010). Conflicts involving native Bedouins, locals in Mudawara (the Disi area) and GAMA workers continue to interrupt the process, though. The Jordan Times reported that Bedouin people regularly enter the drilling site, threatening and intimidating workers (Jordan times, 14 Feb 2011). In January 2011, workers hired by GAMA were killed, allegedly by a local Bedouin tribe member (Jordan Times, 14 Feb 2011). The Ministry of Water and Irrigation Assistant Secretary General and Spokesperson Adnan Zu'bi attributed these events to Bedouin dissatisfaction with GAMA's choice to rent water tanks from Mudawara locals rather than Bedouin tribes (Jordan Times, 14 Feb 2011).

Another issue with this project, and others that exploit the aquifer, is using Disi waters for drinking purposes. Recent hydrologic studies have identified high levels of carcinogenic Radium isotopes in samples from the Disi aquifer, levels that exceed international drinking water standards by up to 2000% (Vengosh et al, 2009). As this aquifer is considered a major source of future drinking water for the region, implications of these findings are far reaching.

THOUGHTS FOR THE FUTURE

Current Jordanian plans are to pump an average of 100 MCM per year split into 7 MCM per month in the cool half of the year, and 10 MCM per month during the hotter half of the year. The commencement of pumping is scheduled roughly for 2012 (Haddadin personal communications, 2011).

The pipeline from Disi to Amman also plays into other national projects as well. For example, bringing water from the south will help reduce overdraft of the highland aquifers around Amman as well as facilitate the filling of the Wehda reservoir (Checchi and DevTech, 2003).

Finally, the Disi pipeline will be an important link in the development of a Red–Dead Canal or an alternative water transfer project, where it would be critical for the transfer of water back to the south, thus reducing the pressure on the limited resources of the aquifer itself (Checchi and DevTech, 2003).

As with all transboundary waters, future management depends on government attitudes in the future. Unilateral, uncoordinated development is not conducive to reliability or sustainability.

THE RED SEA TO DEAD SEA CANAL (RED-DEAD CANAL)

HISTORY

As early as the 1850's, ideas for a conveyance pipeline from the Red Sea to the Dead Sea were formulating (World Bank, 2005). Initially, the focus was solely on hydropower generation. Harza Engineering of Chicago began the first preliminary assessment for such a pipeline by request of the Jordan Valley Authority in 1979. Harza's report was completed in late 1981 and showed promising results. Jordan and Israel were also severely concerned at this time with the condition of the Dead Sea, and during the negotiations preceding the peace treaty, the topic of finding a cooperative solution to ameliorate the Dead Sea's condition was raised several times (Haddadin, 2001b). Indeed, on the Common Agenda for the peace talks, under Section B on cooperation in a regional context, the topic of the Red Sea-Dead Sea Canal was listed (Haddadin, 2001b). The project was made a part of yet a major peace undertaking, the Integrated Development of the Jordan Rift Valley, which was negotiated and instated in the peace treaty under Article 22.

The Jordan Rift Valley (JRV) Integrated Development Project was presented jointly by Jordan and Israel at the first Middle East Economic Summit in Casablanca, Morocco in 1994.Thereafter, the U.S. Trade and Development Agency allocated a $1 million grant toward a prefeasibility study of the JRV Integrated Development Project. The prefeasibility study was completed by an international consortium in 1998. Soon after, however, political developments in the region (namely the death of King Hussein and the Palestinian Intifada) put the joint cooperation between Jordan and Israel on hold.

In 2005, the idea was revived when the Palestinian Authority was allowed to participate with Israel and Jordan on the project (Kuwait News Agency, 25 April 2005). The government of

Israel, under Jordanian insistence, gave its word that all three countries would be treated as beneficiaries from the project, meaning project decisions would be made by consensus only.

The project would involve several components, including a 180-200 km conduit from Aqaba on the Red Sea north to the Dead Sea, desalination plants and hydropower generation (World Bank, 2005). If successfully implemented, it would significantly ameliorate two major issues in the region – a "dying" Dead Sea and freshwater shortages. As a result of Jordan River withdrawals and extraction of Dead Sea minerals by Israel and Jordan, the Dead Sea has lowered 26 meters since 1952 and is in serious danger of drying up (Jordan Times, 18 Jan 2010), taking with it unique ecosystems, recreation opportunities and a scenery that is highly valued both socially and religiously. It also has the potential to affect the economic revenue derived by tourism in the area. Thus the project would optimally reverse or mitigate these negative consequences. The project would also produce large quantities of freshwater, which ideally would help close the supply-demand gap in some areas. In addition, due to the 400 meter drop in elevation, it would create an ideal situation for hydropower production (World Bank, 2005).

The Red-Dead linkage qualifies as shared waters for two reasons. One, the project itself would involve collaboration of two or more countries (as it stands now, three), and the resulting freshwater would likewise be shared among these countries. Thus, agreements are necessary on project finance, project construction, maintenance and operation, and allocation quantities. The pumped intake at the Gulf of Aqaba can impact territorial waters and marine life therein of four countries, namely Jordan, Israel, Egypt and Saudi Arabia. Many view the project as a means of reinforcing a lasting peace in the region. As originally envisaged by its author, Munther Haddadin, the JRV project was meant to trigger peace and cooperation among former enemies, primarily Jordan, Israel, Palestine, Syria, Lebanon, Saudi Arabia and Egypt. According to the Environment Conflict and Cooperation Platform (2007), Israeli National Infrastructure Minister Binyamin Ben-Eliezer confirmed that the project is "an excellent example for cooperation, peace and conflict reduction."

In 2006, the Red-Dead project came back on track, when authorities from all riparians of the Dead Sea, that is Jordan, Israel and the Palestinian Authority, met to discuss plans. The authorities met with the World Bank and donor countries and ultimately decided to launch a

study program (ECC, February 2007), consisting of a technical feasibility study and an environmental and social impact study (World Bank, 2007). The World Bank, with the support of several donors, acted as an agent for the owners of the project. It floated tenders and made awards – all with prior agreement of the owners – one to the French company Coyne et Bellier and one to the British firm Environmental Resources Management; the two $10 million studies were both launched in May of 2008 (Jordan Times, 18 Jan 2010).The feasibility studies are due for completion in the early summer of 2011.

CURRENT STATUS

On January 20, 2011 authorities from Israel, Jordan and The Palestinian Authority and representatives from the World Bank met with Coyne et Bellier and Environmental Resources Management to receive the study results (Jordan Times, 26 Jan 2011). The World Bank is expected to release the results in mid 2011 (Jordan Times, 16 Feb 2011). The two modeling studies are expected to be completed by August 2011.

One source reported that Israel has recently become hesitant about the project due to environmental concerns among its constituents (Green Prophet, 19 May 2009), while another source reported that Israel is still keen to cooperate (Ha'aretz, 20 May 2009). Regardless, in May 2009, Jordan announced its plans to move forward with the $10 billion Jordan Red Sea Project (JRSP), which the government claims is separate from the Red-Dead project, though by its description one would conclude it is actually an expanded yet unilateral version of the Red-Dead project. The JRSP is a five-phase project that will generate freshwater as early as 2014 (Jordan Times, 18 May 2009). The end product, if all five phases are implemented, will include three nuclear power plants and a resort to recover some of the project's costs (Jordan Valley Authority, 2011). The Water Authority of Israel pointed out that external funding would be more difficult to obtain for the unilateral project than for the original multilateral project (Ha'aretz, 20 May 2009).

Several have voiced concerns for the project, particularly environmental concerns: the impact of extraction on Red Sea ecosystems is unknown (Jordan Valley Authority, 2011), as is the impact less saline Red Sea water will have on the unique Dead Sea ecosystems (Jordan Times, 18 Jan 2010).

THOUGHTS FOR THE FUTURE

Jordan has placed great emphasis on this project for both its regional development and water resources components. Israel has been supportive to date, but continued support depends on regional politics. More insular governments might be less cooperative for political reasons, while more liberal governments could find environmental grounds for objection. Regardless, both sides would see benefits in raising the Dead Sea, and the Palestinians stand to gain from their recognition as a beneficiary, perceived as a step towards being recognized as a riparian to the Dead Sea and Jordan Basin.

The greatest uncertainty is probably a final understanding of the costs and the benefits, with the ability to attract financing hanging in the balance. A final complication involves potential impacts at the Red Sea. While Jordan, Israel and the Palestinian Authority have participated in negotiations with one another, Jordan has not participated in negotiations on this topic with the other Red Sea riparians, notably Egypt and Saudi Arabia. However, two transboundary agreements are in place among Red Sea riparians that could potentially affect the success of this project, particularly if environmental impact assessments yet to be released show potential for negative impacts on Red Sea ecosystems. These agreements are summarized in the table below.

Table 2. Regional agreements pertaining to the Red Sea to which Jordan is party (adapted from TED, 2011).

Date	Agreement Title and/or Description	Ratified Treaty?	Water Body	Countries
1998	Strategic Action Plan for the Red Sea and Gulf of Aden	No	Red Sea	Dubai, Egypt, Jordan, Saudi Arabia, Somalia, Sudan, Yemen
1996	Action Plan and Protocol on the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden	No	Red Sea	Jordan, Saudi Arabia, Somalia, Sudan, Yemen

THE EUPHRATES RIVER

The Euphrates River, 2700 kilometers long, originates in Turkey, flows southwest through Syria and Iraq, and empties into the Arabian Gulf. Historically, the river primarily supported irrigation in southern Iraq. Minor irrigation systems and irrigation works in Turkey followed (Haddadin, 2001a). Though all three countries use the Euphrates' waters, no tripartite agreement over the Euphrates has yet been reached. For a detailed description of the relations among these three countries that have led to current water management in the basin, see Annex 2.

HISTORY

Jordan's interest in the river began in the 1970's. Though Jordan is not physically riparian to the Euphrates, it has a history of negotiating (absent a formal agreement) with Iraq for a portion of Iraq's share in the river. In 1977, Jordan's National Planning Council (NPC), the predecessor to the Ministry of Planning, had a British consulting firm conduct a future supply-demand projection for municipal water in the northwest quadrant of the country, where over 90% of the country's population resided (Haddadin, 2006). The study concluded that by the year 2000, Jordan's demand would exceed its supply by 250 MCM; this projection led Jordan to explore new acquisition alternatives, including approaching Iraq for flows from the Euphrates (Haddadin, 2006). Iraq agreed in 1979 to allocate in 2000 the shortage that Jordan's water resources could not meet, an amount of 160 MCM per year. That amount would complement allocations from the Yarmouk after construction of the Maqarin Dam (Haddadin, 2006).

A feasibility study of a transfer from the Euphrates was subsequently conducted. However, the economic costs to Jordan were determined to be too high - $2.00 per cubic meter in 1984 U.S. dollars – and the project was therefore shelved (Haddadin, 2006).

CURRENT STATUS

In 2000 the Euphrates was running at 950 cubic meters per second, but today's rate is much lower (Jordan Times, 22 Jun 2009). In 2009, Iraq's flows from the Euphrates dropped to one-third of its long-term average of 27 bcm per year (Strategic Foresight Group, 2011). This may be a result of a combination of factors, including several dams constructed in the river's upper reaches by Turkey and an extended drought that lasted almost 10 years (Jordan Times, 22 Jun

2009). Recently, Iraq requested – and was granted – additional supplies from Turkey (Jordan Times, 22 Jun 2009).

THOUGHTS FOR THE FUTURE

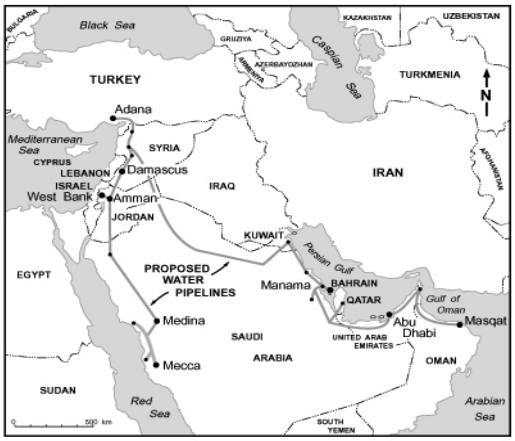
Current and future stresses amongst the three riparians of the basin, along with political complications, will likely make future water sharing with Jordan unattractive in the short term.

THE PEACE PIPELINE AND MANAVGAT TRANSFERS

HISTORY

Peace Pipeline

The Peace Pipeline was first proposed in 1986 by Turkey's Prime Minister Turgot Ozal, who had also served as head of the DSI, Turkey's State Hydraulic Works. The project was envisioned as two separate conduits that would transport water from two of Turkey's rivers, the Seyhan and the Ceyhan, to Syria, Jordan, Israel and Saudi Arabia, along with select water stressed Gulf countries, to help alleviate water shortages (Kibaroglu et al, 2005). Combined, the two pipelines would have the capacity to move up to 6 MCM per day. The 1987 agreement between Turkey and Syria, *Protocol on Matters Pertaining to Economic Cooperation*, included plans for the Peace Pipeline, which required efforts from both countries to see it through to fruition (Kibaroglu et al, 2005). Planning for the project was immobilized, however, when Turkey announced shortly after that Israel would also benefit from the pipeline's waters, as Syria was reluctant to supply Israel with water at that time (Kibaroglu et al, 2005). Simultaneously, Israel does not feel secure if the water it relies on is delivered via another country.



In the 1990's, peace talks between Israel and Syria resumed, and thus coordinated water management efforts again became possible. Dr. Boaz Watchel with Freedom House, proposed a variation of Ozal's Peace Pipeline. This time around, Gulf countries were not potential recipients of the water (Watchel and Liel,2009). Dr. Watchel's proposal was to pipe 1100 MCM per year from the Ceyhan and Seyhan rivers to

the Golan Heights, where an open channel would provide new freshwater supplies and hydropower for Israel, Syria, the West Bank, and Jordan, as well as acting as an antitank barricade on the border between Israel and Syria.

All four countries were to benefit from the project. Jordan was to receive 275 MCM via reservoirs on the Yarmouk. According to Dr. Watchel, the Peace Pipeline, along with a multilateral agreement among the four countries, could reverse Jordan's water shortage problem (Watchel and Liel, 2009). Jordan, however, expressed concern that the proposed Peace Pipeline would do little to ameliorate its problems (Watchel and Liel, 2009). In a letter to Dr. Watchel in 1993, El Hassan Bin Talal, the Crown Prince of Jordan, expressed these concerns (Watchel and Liel, 2009):

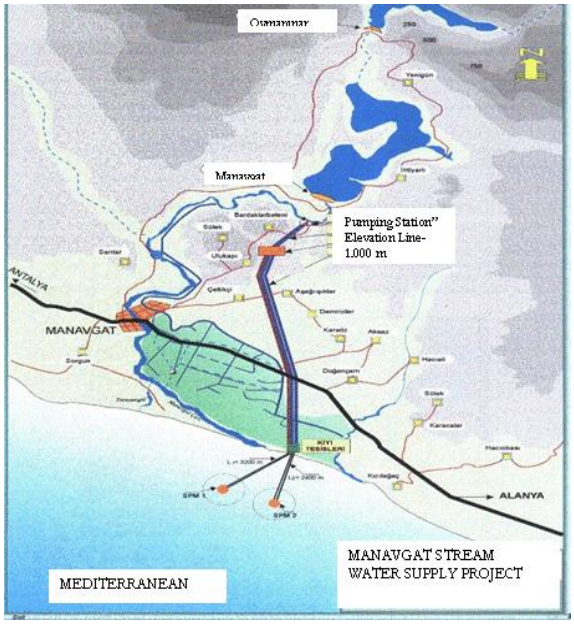
According to the proposal, Jordan will be the residual user, which is not realistic at best. Also the proposal suggests that Jordan's share will be fed into the Yarmouk River to be later stored in dams. This means that most of the water will not be suitable as drinking water, thus leaving Jordan with its present shortage of drinking water. Moreover, there will be some 25-30% loss of water from the share allocated to Jordan through evaporation and diversion.

The proposal gives its paramount attention to both Israel and Syria. The latter will get all of its water needs as well as most of the energy resulting from the project, estimated at 700 MCM. Israel, on the other hand, will get an additional 700 MCM of water…. Thus in comparison, the share of Jordan and the Palestinians are accorded secondary consideration….

It is our firm belief that the water issue must be settled in a fair and equitable manner for it to become a solid cornerstone for peace and coexistence in the Middle East. The approach must consider the various needs in order to contribute to a lasting peace.

Manavgat Transfers

In 1992 Turkey began construction of the Manavgat Water Supply Project, which was completed in 1999 (Kibaroglu et al, 2006).The terminal was originally used to bring water to Turkish Cyprus, but for several years, Israel and Turkey had been discussing the option of water transport from Turkey's Manavgat River to Israel (Anderson and Gaines, 2002).A proposed project would transport water from the Manavgat River in Turkey to water stressed countries in the region via 250,000-ton capacity tankers (Kibaroglu et al, 2006).In August of 2002, Israel agreed to buy 50 MCM of water annually for 20 years. However, a price was not determined at that time. After a few years of negotiations, an agreement was signed in March 2004. Israel and Turkey agreed to a "water for arms" deal, in which Turkey would supply water to Israel, and Israel would provide certain hi-tech weapons to Turkey (Anderson and Gaines, 2002).



Jordan expressed interest in acquiring some of the water, perhaps through trade for other sources, in 2005.In April of 2006, movement forward on this water transport project halted. The governments of Israel and Turkey agreed it was not feasible, but hoped to return to it in the future (U.S. Water News, April 2006). The reasons cited for such a decision were the rising price of oil and the privatization of the water treatment facilities on the Manavgat River, both of which have contributed to raising the price of the water transport project (U.S. Water News, April 2006).

CURRENT STATUS AND THOUGHTS FOR THE FUTURE

Neither topic has been seriously considered in recent years. Political relations between Turkey and Israel have deteriorated seriously, and Jordan would stand to gain only incrementally even if such agreements should develop.

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ATTACHMENT A

History of the Jordan River, 1930's – 1950's

The following is an excerpt from Diplomacy on the Jordan: International Conflict and Negotiated Resolution, by Jordan's former Minister of Water and Irrigation Munther Haddadin:

In 1935 the first regional plan to supply water to western Galilee was drafted and implemented by the new Jewish water company, Mekorot.

In 1939 the British Woodhead Commission issued a report that included a section on the limitations scarce water resources would place on population resettlement. Soon after, the government of Jordan (then Transjordan) launched an investigation of the Jordan Valley water resources. Mr. M. G. Ionedis, a British engineer working for the Government of Transjordan and who had done work on the Tigris and Euphrates basins in Iraq, conducted the study. Ionedis published his findings in 1939. He estimated, for the first time, the available water resources and irrigable land in the Jordan Valley and concluded that the water resources were not adequate to support a Jewish state. His plan was based on water availability from the Jordan River and Lake Tiberias. According to his plan, both sides of the Jordan Valley would receive water through surface canals. Lake Tiberias would be used as the main reservoir for the collection of excess winter water including Yarmouk floods. Ionedis suggested conservation measures in the side wadis to improve existing irrigation schemes. He also proposed the diversion of the Yarmouk waters into a canal down the east side of the Jordan Valley to expand irrigation there, and the excess flood water be diverted for storage in Lake Tiberias. This idea was taken up seriously in the 1950's.

About the same period of time, the United States Department of Agriculture appointed a land conservation specialist, Professor Walter C. Lowdermilk, to look into means of land conservation in the Near East. In 1939, after a flight over the area, Lowdermilk conceived of the idea of the Jordan Valley Authority. His plan focused on the use of the Jordan River and the Auja (Yarqon) River, and the collection of winter floodwater. He proposed bringing seawater from the Mediterranean to the Dead Sea, an idea found in the analytic study of Bourcart in 1899 (see above). The transfer would compensate the Dead Sea for water diverted from the Jordan

River for use outside the basin (irrigation of the Negev in southern Palestine). Similar ideas were concurrently advanced by Simcha Blass of Mekorot.

Lowdermilk plan, published in 1944, reinforced the Jewish argument that proper water management would generate resources for 4 million Jewish immigrants in addition to 1.8 million Palestinians and Jews already living in Palestine. He included the Litani in his regional management scheme, and proposed the use of the Jordan and the Litani to irrigate the Negev, the diversion of the Yarmouk into Lake Tiberias, and gravity flow canals down the foot of the escarpments to irrigate the Jordan Valley, in addition to the Mediterranean-Dead Sea Canal. His recommendations were included in his book, "Palestine, Land of Promise," and were seriously taken up in the water planning of Israel in the early 1950's.

Concurrently, Simcha Blas prepared in 1944 what some viewed as the most comprehensive plan for solving the water shortage problem. An extension of his earlier work, the plan included the major water resources in the region: the Jordan, the Yarmouk, the Auja (Yarqon), water from springs, underground water, flood water, drainage water, and sewage water.Blass' plan also considered another problem that the diversion of the Yarmouk and the Jordan would cause, namely, the lowering of the level of the Dead Sea. To solve this problem, he recommended conveying water from the Mediterranean to the Dead Sea, which would also enable the generation of electricity - an idea Theodore Herzl had proposed eight decades earlier, elaborated analytically by Bourcart in 1899, and reiterated by Lowdermilk in 1944.

The World Zionist Organization later commissioned two American engineers, Hays and Savage to prepare an all-inclusive study, "Water Resources in the Land of Israel", which would form the basis for the laying out of a national water network. The plan was published in 1948 as "TVA (Tennessee Valley Authority) on the Jordan". They included Syria, Lebanon, and Transjordan and thereby the suggestion for a TVA duplication. If all the waters in the region, including the Yarmouk and the Litani were included, the Plan envisaged the expansion of irrigated areas from 10,000 acres to 110,000 acres, and the supply of industrial and domestic water for about 4 million inhabitants in Palestine. The Plan mentioned the possibility of using a canal from the Mediterranean to the Dead Sea to maintain the Dead Sea level and to generate electrical power. In fact, the Hays - Savage effort served as a detailing of the Lowdermilk Plan.

In 1947, before the partition of Palestine was decreed by the United Nations, the special UN Commission on Palestine (UNSCOP) examined the Hays' Plan. The Commission received a British memorandum criticizing Hays for exaggerated estimates and not considering the rights of Jordan and the Palestine Electric Company (the Rutenberg concession). The British proposed a more limited alternative plan, which included the waters of the Litani, a multiyear water storage for irrigation and electricity generation in Lake Tiberias, and a reservoir for annual storage at Beit Natofa, a depression in northern Palestine, as suggested by earlier studies.

ATTACHMENT B

History of Euphrates River Development, Conflict and Cooperation:

Turkey, Syria and Iraq

The following is an excerpt from "An Initiative on the Euphrates" by Jordan's former Minister of Water and Irrigation Munther Haddadin (cite reference):

The first dam built on the [Euphrates] River was in Turkey for purposes of power generation (Keeban Dam). Since the use was not consumptive, the water sharing issues among riparians were not crucial and finance for the dam was provided by development agencies. Another dam was built in Turkey for similar purposes (Kara Kaya Dam).Next was a dam in Syria for irrigation and power generation (Tabqa Dam, 11 billion cubic meters capacity), followed by another in Iraq (Qadisyya Dam, 7 billion cubic meters capacity) for irrigation and power generation. The biggest dam came in the 1980's when Turkey started the construction of the Ataturk Dam, 48 billion cubic meters total capacity (dead + live). Since the dams with purposes of consumptive use were built without reaching riparian agreements, they were mostly financed by the treasury of the respective country.

The attempts to work out riparian agreements were started by the World Bank in the wake of their success in settling the dispute between India and Pakistan over the Indus River. The World Bank stopped their attempts in the early 1970's.Contacts between the riparians were initiated, first between Iraq and Syria in the early 1970's. Syria offered, and Iraq declined to accept, a sharing formula between the two countries that would have given Iraq 60% of the flow that crosses the Turko-Syrian borders, and leave 40% for Syria. In 1974, the two countries had a sharp dispute in which the Euphrates came to the fore, and a collision was avoided by the intervention of the good offices of Saudi Arabia and the Soviet Union. The dispute between Iraq and Syria had its roots in the affiliation of the ruling classes of the Ba'th Party in the two countries: a military class in Syria and a civilian class in Iraq. The two countries sharply disagreed in the wake of the acceptance by Syria of U.N Security Council Resolution 338 that ordered the cease fire in October 1973 to end the war between Egypt and Syria on the one part, and Israel

on the other. Iraq had rushed its armored forces to help Syria hold on to the Golan and to defend Damascus. The Euphrates flow, in 1974, was reduced to a trickle in Iraq because of the simultaneous filling of the Keeban dam in Turkey and the tabqa dam in Syria.That was the straw that was thought would break the camel's back.

In the early 1980's, a joint water committee was formed and talks between the three riparian parties took place periodically. No tangible results were reached. Issues that further complicated the riparian talks were related to the Syrian-Turkish relations. One was the issue of Alexandretta, the Syrian province in the northwest that was annexed to Turkey at the time of the French Mandate in 1939 as a present from France to Turkey to keep it away from a possible alliance with Germany; and the other complication was the covert support Syria was giving to the Kurdish Workers Party, PKK of Turkey. However, in 1987, at the peak of Iraqi-Syrian row, Turkey and Syria came to a "temporary" agreement when Prime Minister Torgut Ozal visited Damascus. The temporary agreement stipulated that Turkey would release 500 cubic meters per second of Euphrates water to cross the borders with Syria, and Syria had to share that flow with Iraq. In 1989, when Turkey designated the date of closure of the diversion tunnel of the Ataturk dam on 15 February, 1990, Turkey released 750 cubic meters per second starting September 1989 until the closure date so that Syria can impound additional water in the Tabqa Dam to compensate for the flow that would be substantially depleted during the closure period.

In April of 1990, Iraq and Syria came to an agreement to share the flow that crosses the Syrian borders with Turkey. Iraq would get 58% of the flow and Syria 42% of it. A joint Iraqi-Syrian delegation headed by the Iraqi Minister of Oil, Acting Minister of Irrigation, visited Ankara in June of 1990 to come to terms with Turkey on the sharing of the Euphrates. The meeting ended without agreement but a date was set for another serious high level round to take place in December of 1990. The Iraqi invasion of Kuwait on 2nd August, 1990 put an end to that endeavor.

In their talks over the Euphrates, Turkey considered both the Tigris and the Euphrates as one basin by virtue of their confluence at Qarna.Syria and Iraq insist on treating each river as a separate basin. Syria, too, is a riparian on the Tigris as the River forms about 40 kilometers of the Syrian-Turkish borders before it enters Iraq. The parties also disagreed on the total areas that can

be irrigated inside the territories of each country, and on the transfer of river water by artificial means to irrigate vast areas inside Turkey.

The Alexandretta complication draws hostile reaction from Turkey.Because of it, Syria does not recognize Turkey as a legitimate riparian on the Orontes, a river that rises in Lebanon, crosses the Ghab plains and other territories in Syria, and enters the Alexandretta province before it curves westward to discharge into the Mediterranean.

Riparian agreements on water sharing are not likely to be reached if left to the parties themselves to work out. The factors that separate them are substantial and it takes a strong will and a resolution of other political matters before that can be made possible. However, the environmental threats that the parties are up against could be an entry point for a third party to start a meaningful dialogue between the three riparians.

ATTACHMENT C

The Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan Annex 2[3]

Annex II Water Related Matters

Pursuant to Article 6 of the Treaty, Jordan and Israel agreed on the following Articles on water related matters:

Article I: **Allocation**

1. Water from the Yarmouk River

a. Summer period - 15th May to 15th October of each year. Israel pumps (12) MCM and Jordan gets the rest of the flow.

b. Winter period - 16th October to 14th May of each year. Israel pumps (13) MCM and Jordan is entitled to the rest of the flow subject to provisions outlined herein below: Jordan concedes to Israel pumping an additional (20) MCM from the Yarmouk in winter in return for Israel conceding to transferring to Jordan during the summer period the quantity specified in paragraph (2.a) below from the Jordan River.

c. In order that waste of water will be minimized, Jordan and Israel may use, downstream of Adassiya Diversion/point 121, excess flood water that is not usable and will evidently go to waste unused.

2. Water from the Jordan River

a. Summer period - 15th May to 15th October of each year. In return for the additional water that Jordan concedes to Israel in winter in accordance with paragraph (1.b) above, Israel concedes to transfer to Jordan in the summer period (20) MCM from the Jordan

[3] Accessed from Government of Jordan website, 2011

River directly upstream form Deganya gates on the river. Jordan shall pay the operation and maintenance cost of such transfer through existing systems (not including capital cost) and shall bear the total cost of any new transmission system. A separate protocol shall regulate this transfer.

b. Winter period - 16th October to 14th May of each year. Jordan is entitled to store for its use a minimum average of (20) MCM of the floods in the Jordan River south of its confluence with the Yarmouk (as outlined in Article II below). Excess floods that are not usable and that will otherwise be wasted can be utilized for the benefit of the two Parties including pumped storage off the course of the river.

c. In addition to the above, Israel is entitled to maintain its current uses of the Jordan River waters between its confluence with the Yarmouk and its confluence with Wadi Yabis/Tirat Zvi. Jordan is entitled to an annual quantity equivalent to that of Israel, provided however, that Jordan's use will not harm the quantity or quality of the above Israeli uses. The Joint Water Committee (outlined in Article VI below) will survey existing uses for documentation and prevention of appreciable harm.

d. Jordan is entitled to an annual quantity of (10) MCM of desalinated water from the desalination of about (20) MCM of saline springs now diverted to the Jordan River. Israel will explore the possibility of financing the operation and maintenance cost of the supply to Jordan of this desalinated water (not including capital cost). Until the desalination facilities are operational, and upon the entry into force of the Treaty, Israel will supply Jordan (10) MCM of Jordan River water from the same location as in (2.a) above, outside the summer period and during dates Jordan selects, subject to the maximum capacity of transmission.

3. Additional Water

Jordan and Israel shall cooperate in finding sources for the supply to Jordan of an additional quantity of (50) MCM/year of water of drinkable standards. To this end, the Joint Water Committee will develop, within one year from the entry into force of the Treaty, a plan for the supply to Jordan of the above mentioned additional water. This

plan will be forwarded to the respective governments for discussion and decision.

4. Operation and Maintenance

a. Operation and maintenance of the systems on Israeli territory that supply Jordan with water, and their electricity supply, shall be Israel's responsibility. The operation and maintenance of the new systems that serve only Jordan will be contracted at Jordan's expense to authorities or companies selected by Jordan.

b. Israel will guarantee easy unhindered access of personnel and equipment to such new systems for operation and maintenance. This subject will be further detailed in the agreements to be signed between Israel and the authorities or companies selected by Jordan.

Article II: **Storage**

1. Jordan and Israel shall cooperate to build a diversion/storage dam on the Yarmouk River directly downstream of the Adassiya Diversion/point 121. The purpose is to improve the diversion efficiency into the King Abdullah Canal of the water allocation of the Hashemite Kingdom of Jordan, and possibly for the diversion of Israel's allocation of the river water. Other purposes can be mutually agreed.
2. Jordan and Israel shall cooperate to build a system of water storage on the Jordan River, along their common boundary, between its confluence with the Yarmouk River and its confluence with Wadi Yabis/Tirat Zvi, in order to implement the provision of paragraph (2.b) of Article I above. The storage system can also be made to accommodate more floods; Israel may use up to (3) MCM/year of added storage capacity.
3. Other storage reservoirs can be discussed and agreed upon mutually.

Article III: **Water Quality and Protection**

1. Jordan and Israel each undertake to protect, within their own jurisdiction, the shared waters of the Jordan and Yarmouk Rivers, and Araba/Arava groundwater, against any pollution, contamination, harm or unauthorized withdrawals of each other's allocations.
2. For this purpose, Jordan and Israel will jointly monitor the quality of water along their boundary, by use of jointly established monitoring stations to be operated under the guidance of the Joint Water Committee.
3. Jordan and Israel will each prohibit the disposal of municipal and industrial wastewater

into the courses of the Yarmouk and the Jordan Rivers before they are treated to standards allowing their unrestricted agricultural use. Implementation of this prohibition shall be completed within three years from the entry into force of the Treaty.

4. The quality of water supplied from one country to the other at any given location shall be equivalent to the quality of the water used from the same location by the supplying country.
5. Saline springs currently diverted to the Jordan River are earmarked for desalination within four years. Both countries shall cooperate to ensure that the resulting brine will not be disposed of in the Jordan River or in any of its tributaries.
6. Jordan and Israel will protect water systems each in its own territory, supplying water to the other, against any pollution, contamination, harm or unauthorized withdrawal of each other's allocations.

Article IV: **Groundwater in Wadi Araba/Emek Ha'arava**

1. In accordance with the provisions of this Treaty, some wells drilled and used by Israel along with their associated systems fall on the Jordanian side of the borders. These wells and systems are under Jordan's sovereignty. Israel shall retain the use of these wells and systems in the quantity and quality detailed in an Appendix to this Annex, that shall be jointly prepared by 31st December, 1994. Neither country shall take, nor cause to be taken, any measure that may appreciably reduce the yields or quality of these wells and systems.
2. Throughout the period of Israel's use of these wells and systems, replacement of any well that may fail among them shall be licensed by Jordan in accordance with the laws and regulations then in effect. For this purpose, the failed well shall be treated as though it was drilled under license from the competent Jordanian authority at the time of its drilling. Israel shall supply Jordan with the log of each of the wells and the technical information about it to be kept on record. The replacement well shall be connected to the Israeli electricity and water systems.
3. Israel may increase the abstraction rate from wells and systems in Jordan by up to (10) MCM/year above the yields referred to in paragraph 1 above, subject to a determination by the Joint Water Committee that this undertaking is hydrogeologically

feasible and does not harm existing Jordanian uses. Such increase is to be carried out within five years from the entry into force of the Treaty.

4. Operation and Maintenance
   a. Operation and maintenance of the wells and systems on Jordanian territory that supply Israel with water, and their electricity supply shall be Jordan's responsibility. The operation and maintenance of these wells and systems will be contracted at Israel's expense to authorities or companies selected by Israel.
   b. Jordan will guarantee easy unhindered access of personnel and equipment to such wells and systems for operation and maintenance. This subject will be further detailed in the agreements to be signed between Jordan and the authorities or companies selected by Israel.

Article V: **Notification and Agreement**

1. Artificial changes in or of the course of the Jordan and Yarmouk Rivers can only be made by mutual agreement.
2. Each country undertakes to notify the other, six months ahead of time, of any intended projects which are likely to change the flow of either of the above rivers along their common boundary, or the quality of such flow. The subject will be discussed in the Joint Water Committee with the aim of preventing harm and mitigating adverse impacts such projects may cause.

Article VI: **Co-operation**

1. Jordan and Israel undertake to exchange relevant data on water resources through the Joint Water Committee.
2. Jordan and Israel shall co-operate in developing plans for purposes of increasing water supplies and improving water use efficiency, within the context of bilateral, regional or international cooperation.

Article VII: **Joint Water Committee**

1. For the purpose of the implementation of this Annex, the Parties will establish a Joint Water Committee comprised of three members from each country.
2. Governments specify its work procedures, the frequency of its meetings, and the details of its scope of work. The Committee may invite experts and/or advisors as may be

required.

3. The Committee may form, as it deems necessary, a number of specialized sub-committees and assign them technical tasks. In this context, it is agreed that these sub-committees will include a northern sub-committeeand a southern sub-committee, for the management on the ground of the mutual water resources in these sectors.

ATTACHMENT D

Agreement concerning the utilization of the Yarmouk waters[4]

Signed at Amman on 3 September 1987

SYRIAN ARAB REPUBLIC and JORDAN

Authentic text: Arabic. Registered by the Syrian Arab Republic on 20 June 1995.

[TRANSLATION]

AGREEMENT BETWEEN THE SYRIAN ARAB REPUBLIC AND THE HASHEMITE KINGDOM OF JORDAN CONCERNING THE UTILIZATION OF THE YARMOUK WATERS

The Government of the Syrian Arab Republic and the Government of the Hashemite Kingdom of Jordan,

Desiring to strengthen the bonds of Arab brotherhood and the special relation ship existing between the two fraternal countries; taking into account the results of the negotiations between their representatives in Damascus on 4 and 5 July 1987 and from 9 to 11 August 1987 concerning the utilization of the waters of the Yarmouk river as provided for in the Agreement concluded between the two countries in Damascus on 4 June 1953, and considering the advantages which the two countries would derive from the efficient collection and use of the waters of the Yarmouk Basin for the irrigation of arable lands and the generation of electric power,

Have resolved to conclude this Agreement and for this purpose have named as their plenipotentiaries:

[4] Accessed from International Water Law's online document archive.

For the Government of the Syrian Arab Republic: Mr. Abd al-RaufKassem, Prime Minister;

For the Government of the Hashemite Kingdom of Jordan: Mr. Zaid al-Rifa'i, Prime Minister;

who, having communicated to each other their respective full powers, found in good and due form, have agreed on the following provisions:

Article I

For the purpose of this Agreement it shall be understood that:

(a) "Syria" means the Government of the Syrian Arab Republic;

(b) "Jordan" means the Government of the Hashemite Kingdom of Jordan;

(c) "The State" means Syria or Jordan as the context requires;

(d) "The Jordan Valley" means the valley of the river Jordan;

(e) "The Wahdah dam and reservoir" means the dam on the river Yarmouk for the collection of the water and the reservoir for its storage situated in the territories of Syria and Jordan near the Maqarin generating station;

(f) "The Wahdah dam generating station" means the electricity generating installation situated on the south bank of the river Yarmouk inside the Wahdah dam;

(g) "The Yarmouk scheme"meanstheWahdahdamandreservoir,theelectricity generating installation, the buildings and installations required in connection with this scheme near the Maqarin generating station and the diversion of the Hejaz Railway line;

(h) "TheJointCommission"meanstheSyria-JordanCommissionreferredtoin article IX of this Agreement.

Article II

The two Governments, recognizing that, for physical and legal reasons, the additional water and the hydroelectric power needed by the two States may be provided in an economical and effective manner by constructing the Wahdah dam, have accordingly agreed to construct the following installations:

(a) The Wahdah dam and reservoir, namely the dam for the collection of the river flow and the reservoir situated on the river Yarmouk in the territories of Syria and Jordan near the Maqarin generating station in Syria, such water being utilized for the generation of electric power,

for the irrigation of land in Jordan and for other Jordanian schemes, for the irrigation of land in Syria situated below the site of the dam and along the course of the river to an altitude of 200 metres above sea level;

(b) The installation for the generation of electricity using the waters of the reservoir leaving the dam;

(c) The diversion of the Hejaz Railway line in the Yarmouk Valley as required by the scheme, and the construction of the other works and installations necessary to the scheme.

Article III

Regard being had to the provisions of article IX of this Agreement, Jordan shall assume responsibility for the establishment of the Yarmouk scheme and for the financing of every stage of the studies, plans, construction, operation and maintenance.

Syria shall furnish the necessary facilities and assistance to enable personnel employed on the scheme to obtain access to parts of the scheme located on Syrian territory in order to undertake duties connected with the scheme at all stages of the work, within the framework of Syrian regulations and in accordance with the provisions of this Agreement.

Article IV

Each State shall undertake to compensate the owners of land, estates and buildings on its territory which are expropriated for the purposes of the Yarmouk scheme in accordance with its own laws and regulations. Syria shall undertake to settle all claims of individuals relating to water rights and to compensate such claimants, while Jordan shall undertake to be responsible for all compensation and expenses paid in Syria in respect of such expropriations and claims.

Article V

Syrian and Jordanian workmen shall be employed, as needed, in the construction of the Yarmouk scheme. Syrian and Jordanian technicians shall be employed during the period of study, implementation, operation and maintenance. Companies from the Syrian construction public

sector shall cooperate for the purposes of the establishment of the project with Jordanian construction companies.

Article VI

Jordan shall undertake to design and build the Wahdah dam to a total height of 100 metres including floodgates, in order to store the waters flowing in the Yarmouk river after the filling of the reservoirs of the Syrian dams which are specified with their storage capacity in the annexed table. Syrian shall have the right to retain the total content of these reservoirs as an integral part of this Agreement. The design and construction of the dam shall ensure that it may in future be raised in height in order to increase storage capacity (height and capacity), where such measures are technically and economically justified and agreed on by the two States.

Article VII

(a) Syria shall retain the right to the use of the waters of all springs welling up within its territory in the basin of the Yarmouk and its tributaries, with the exception of the waters welling up above the dam below the 250-metre level, and shall retain the right to use water from the river and its tributaries below the dam for the irrigation of Syrian land along the course of the river.

(b) Jordan shall have the right to use the overflow from the Wahdah dam reservoir and generating station to generate electricity.

(c) The electric power generated by the Wahdah dam hydroelectric installation shall be divided between Syria and Jordan in the proportion of 75 per cent to Syria and 25 percent to Jordan.

Article VIII

Syria shall assume the responsibility of implementing the diversion of the Hejaz Railway line and constructing all the necessary buildings in accordance with the requirements of the scheme. Jordan shall undertake to assume all expenses connected with the implementation and construction.

Article IX

A Joint Syria-Jordan Commission shall be established for the implementation of the provisions of this Agreement, the regulation of the rights and obligations which the two States have assumed there under, the exercise and performance thereof and consideration of all questions arising out of its implementation.

The Joint Commission shall be deemed a legal corporate body and its members shall enjoy diplomatic privileges and immunities in the State of which they are not the representatives.

The Joint Commission shall be composed of three members from each State. The leader of each side shall be an Under-Secretary of State or Minister of State. The Joint Commission may seek advice from experts and consultants and may employ such assistants, technicians and officials as may be required for the conduct of its work. The aforementioned shall be selected from the nationals of either State or of third States.

The external relations of the Commission shall be conducted by the two leaders of the representatives of both sides acting jointly, not individually.

The Commission shall undertake all the tasks assigned to it under the terms of this Agreement. In the event of any difference arising between its members which they are unable to resolve conclusively to the satisfaction of the representatives ofboth Parties, its members shall report the matter forthwith to their Governments, which shall settle the difference and find an objective solution that will ensure the smooth continuation of work while guaranteeing the rights of both Parties under the terms of this Agreement.

The Joint Commission shall draw up its rules of procedure, which shall be approved by the heads of both Governments.

Article X

Representatives of the two States, members of the Joint Commission, employees of the technical bodies working on the scheme and all other persons working on it shall have the right to travel for work-related purposes in the areas in which the Wahdah scheme installations are situated and

in neighbouring areas to be specified by the Joint Commission. Prior authorization to that effect shall be obtained from the Joint Commission in the form of special identity papers issued by the Com mission, to the extent necessary for the carrying out of studies and investigations, and construction, administration and maintenance operations. The bearers of such papers shall not be subject to any restrictions resulting from the application of the passport and similar laws and regulations in force in either State. In all other respects, however, the domestic legislation of each State shall remain in full force within its territory.

ArticleXI

The two States shall undertake, each within its own territory, to comply with recommendations of the Joint Commission regarding measures to prevent or reduce silting in the joint reservoir such as preventing the washing away and removal of the earth, preventing the growth of weeds and blocking cracks and other measures to facilitate the maximum use of the capacity of the reservoir. The cost of all such measures shall be borne by Jordan.

Article XII

Each State shall have the right to make use of the portion of the lake formed by the dam that is situated in its territory and to exploit, utilize and maintain it for purposes of tourism and pisciculture that do not conflict with the administration of the Wahdah dam installations.

Article XIII

The boundary line between the two countries shall remain as it was prior to the construction of the Wahdah dam and its installations and shall be considered as drawn on the surface of the water.

Article XIV

This Agreement shall be ratified in accordance with the constitutional procedures of both Contracting Parties and shall enter into force on the date of the exchange of the instruments of ratification.

This Agreement may be amended by means of annexes, which shall be ratified and the

instruments of ratification for which shall be exchanged in accordance with the procedure for the ratification of this Agreement.

IN WITNESS WHEREOF, the two Parties have signed this Agreement in two original copies in the Arabic language, each copy being equally authentic. Each Party has received a copy of the Agreement.

Article XV

The Agreement between the two States concerning the utilization of the Yarmouk waters, signed at Damascus on 4 June 1953, is hereby abrogated.

DONE at Amman on 3 September 1987.

For the Hashemite Kingdom of Jordan:ZAID AL-RiFA'i Prime Minister

For the Syrian Arab Republic :ABD AL-RAUF KASSEM Prime Minister

ATTACHMENT E

AlRai Arabic Daily News (Unofficial English Translation)

March 27, 2011, Amman, Jordan

The Secretary General of the Jordan Valley Authority, Engineer Saad Abu Hammour, revealed Jordanian hardships in the investment agreement, the Yarmouk River which signed with the Syrian side in 1987, referring to the request of Jordan to reconsider the terms of the Convention, and describing Israeli cooperation in the application of water appendix in the peace agreement as "large cooperation."

He told reporters the day before yesterday ,in response to a question on Jordanian – Syrian water cooperation, that the Minister of Water and Irrigation, Eng. Mohammed Al-Najjar, requested in a letter to his Syrian counterpart a few months ago the need to reconsider the Convention on the investment of the Yarmouk River water signed in 1987. Abu Hammour also added "I think that many things have changed after 24 years from signing the agreement, which leads us to the request to reconsider the terms of the Convention and discuss it".

He also said "the Jordanian national interest requires a review of the terms of the agreement, and it should be re-studied to serve both Jordanian and Syrian parties."

At the same time, Abu Hammour refused to say more about the amendments requested by Jordan, or where the Syrians stand on reviewing the Convention. He also referred to a Jordanian invitation directed several days ago to the Syrian Minister of Irrigation to visit Amman, in order to discuss the water situation for the current year, and also discuss common cooperation of water, which can be described as "the worst in years".

He also clarified "the Unity Dam does not exceed the storage of 12 million cubic meters, and the flow of the Yarmouk River is still low, and rarely rises to 627 liters per second, and soon goes down due to the rising temperatures to become scarce, not exceeding 100 liters per second."

As for the study of the Yarmouk basin shared between the two countries, he said that the Eastern Jordanian Company which is concerned with conducting the studies is nearly done with those studies, and will complete the geological and hydrogeological study next month and we will observe all the currents of the Yarmouk basin for the past 30 years of digging for wells and the changes that have occurred in the basin from both sides ,Jordan and Syria, in terms of the number of groundwater wells and dams on the Syrian side. Meetings will be held and readings will be shared by the two studies conducted by the Jordanian East company and the Syrian Company - Homs Company for Hydraulic Studies - to see where everyone stands on this matter.

Regarding the meetings of the Jordanian-Israeli Joint Water, under the peace agreement, he declared that the total amount of water liquefied naturally is 35 million cubic meters since May 15th this year, a period that in which we need for the liquefaction of water and the demand for irrigation and drinking water, which ends on 15th of May 2012.

He also added "there are other amounts considered as storage in Lake Tiberias, and unfortunately in this rainy season we only stored 3 million cubic meters, due to poor rainfall and lack of continuous flooding in the Yarmouk River, in contrast to past years where last year reached 6 million cubic meters and the for the preceded year it was more than 10 million cubic meters.

He said that “the Israeli side responds to any amounts being requested by us for borrowing”, pointing out that we need this year more than 10 million cubic meters to rectify the consequences of lack of storage dams and low rainfall. It is noted that the peace treaty signed in 1994, set the share of the Yarmouk River of Jordan to 25 million cubic meters (12 million in summer and 13 million in winter)."

ANNEX 7 - ISSP LEGAL ANALYSIS: AN OVERVIEW OF GAPS AND NEEDS

INTRODUCTION

For the purposes of this analysis, the following laws and by-laws were reviewed in detail:

- Law No. 18 of 1988: The Water Authority Law and Amendments;
- Law No. 19 of 1988: The Jordan Valley Development Law, as amended;
- Administrative Organization Regulation for the Ministry of Water and Irrigation (No. 54 of 1992);
- Law No. 52 of 2006: The Environmental Protection Act;
- Law No. 44 of 2002: The Interim Agricultural Law;
- Law No. 54 of 2002: Temporary Public Health Law; and
- By-law 85 of 2002: The Underground Water Control By-law.

Other laws and by-laws that were reviewed were retrieved from the Rewab database of documents and did not constitute the official English translations for those documents. As such, the provisions referred to from these documents will be reviewed during the full legal review once an official translation is available, or in Arabic by the local legal consultant, to ensure accuracy.

It is expected that the following additional laws, by-laws and standards, which are not available in English, will need to be reviewed by the local legal consultant in order to complete the full analysis:

- Environmental Impact Assessment Regulations;
- Jordanian Drinking Water and Wastewater Standards;
- Wastewater By-law;
- Land and Water Settlement Act; and
- Water Protection Regulations (2005, not in force);
- Privatization Law (No. 25 of 2000);
- Draft PPP Law.

As indicated in the "Legal Implications" section of the Institutional Analysis, two levels of legal reform are recommended to achieve Jordan's water sector goals. In the short-term, amendments may be made to existing laws and by-laws to enable the transfer of necessary authority among organizations and creating the necessary new bodies for implementing the recommendations in this Report. Over a longer timeframe of 2-4 years, the remaining gaps, overlaps and conflicts in the existing legal framework should be addressed through a more comprehensive and consultative review and drafting process leading to the creation of a comprehensive water law that more fully reflects and supports implementation of Jordan's water strategies and policies.

The short-term recommendations for amendments to existing legislation and by-laws are provided in the main body of this Report. This Annex captures the research done to date to review the current gaps, issues and needs of the current legal framework governing water management in Jordan as compared to best practices in domestic water laws around the world. Specific attention is paid to legal and regulatory issues and provisions related to water scarcity. This will provide a basis for a more comprehensive analysis, to be undertaken in partnership with the Legal Advisor to the Ministry of Water and Irrigation, once implementation of the ISSP has begun. Thus, this annex is not intended to provide a comprehensive review of all potential areas for reform, but rather a basis from which to work in the implementation phase. The following topics are highlighted as key elements of successful water laws. The relevant provisions in the existing legal framework are elaborated along with the identification of some key gaps, overlaps or other issues that will likely provide the basis for future reform.

POLICYMAKING AUTHORITY

Pursuant to Article 5 of the Water Authority Law No. 18 (1988) ("WAJ Law"), the Ministry of Water and Irrigation (MWI) is responsible for setting forth a water policy and submitting it to the Council of Ministers. The specific aspects of such a policy are not defined in the legislation.

Pursuant to Article 10 of the of the WAJ Law, the WAJ Board of Directors is responsible for development a policy that "reserves the right of the Kingdom in all the water resources, including development, maintenance and use, and will approve a plan for development, conservation, distribution, uses, provision of additional water resources and construction of water and public sewage networks."

While there is a potential conflict between these two provisions, that conflict appears to be resolved (although somewhat ambiguously) by the Administrative Organization Regulations for MWI of 1992. Article Four of these regulations state that "with due observance to the provisions of…" the WAJ and JVA Laws, MWI assumes full responsibility for formulation and transmission of national water policy to the Council of Ministers. It remains to be determined whether the provisions of a regulation hold sufficient legal stature to clarify provisions in legislation.

The Ministry of Environment is also arguably responsible for policymaking relative to water quality pursuant to its broader authority to set the general policy for environmental protection (Art. 4(A), Environmental Protection Law No. 52 (2006)).

The Ministry of Agriculture has the authority to issue instructions to organize procedures and policies governing the limitation of agricultural possessions in the kingdom (Interim Agricultural Law No. 44, Art. 4).

COMMENTS

It is recommended that policymaking authority relative to water resource management reside solely with MWI, and that this authority be clearly elaborated in a new water law to remove any uncertainty regarding the legal status of the Ministry in relation to WAJ or other Ministries.

Existing policies (and strategies) will also require review and integration in light of any institutional reforms made. This review will enable MWI to define more carefully what aspects of water management goals and authorities are stated within the policies and what should be implemented and supported within specific strategies and within the legislative framework. The current sectoral policies are extremely thorough, but also appear to be a blend of policy and strategy documents, neither of which are fully supported or enabled through existing legislation.

INSTITUTIONAL AUTHORITY/FUNCTIONS

Ministry of Water and Irrigation (MWI). The functions of the MWI and its various Directorates are set forth in the Administrative Organization Regulation for the Ministry of Water and Irrigation (No. 54 of 1992) ("MWI regulations"). The MWI Regulations state that, with due authority granted to the provisions of the constitutive laws of the Jordan Valley Authority (JVA) and Water Authority of Jordan (WAJ), the Ministry assumes full responsibility for water and public sewage in the Kingdom, the projects related to water and sewage, and the policymaking authority over those sectors (MWI Regulations, Art. 4). In addition, MWI is authorized to take full responsibility for the social and economic development of the Jordan Valley (Id.). There is no inherent conflict in this statement, as JVA and WAJ are "attached" to the Ministry, however, in practice, there is considerable ambiguity over the division of authority among the three bodies pursuant to these regulations. In addition, it needs to be clarified whether regulations have the legal status to override, or at least amend, existing legislation, as these regulations attempt to do.

Article 5 of the MWI Regulations creates six Directorates within the MWI: Planning, Development and Information; Financing and Loans; Projects Follow-up; Legal Affairs; Citizens Services; Financial and Administrative. The Council of Ministers may set up additional Directorate on the recommendation of the Minister, and the Minister (upon recommendation of the Secretary General) has considerable flexibility in setting up, canceling, merging or otherwise sub-dividing the Directorates.

FUNCTIONS OF THE MWI DIRECTORATES:

Directorate of Planning, Development and Information:

- Participates in the preparation and development of a sectoral strategy;
- Formulates long term plans and programs to secure the Kingdom's water requirements at all times and for various uses;
- Conducts and evaluates the studies pertaining to economic, social and population feasibility connected with the water policy and formulate relevant work plans;
- Conducts studies and submits proposals on:
    - The productivity of MWI and create plans for training specialists;
    - The productive capacity of water resources as the basis for its preservation and protection from pollution; and
    - Water quality and make recommendations on the necessary solutions for treating poor water quality.
- Establishes a computerized Information Bank to analyze and classifies the information pertaining to the water sector and development of water resources.

The Directorate of Financing and Loans oversees/"studies" the financial aspects of Ministry projects; prepares budgets for Ministry projects and submits the relevant reports; and administers disbursements from the local and foreign loans, grants and technical aid.

The Directorate of Projects Follow-up is to facilitate execution and report on Ministry projects. It is unclear what is entailed in this "follow-up."

The Directorate of Legal Affairs undertakes legal consultations for the Ministry; prepares and reviews draft legislation, regulations and instructions; prepares and reviews Ministry contracts and agreements and prepares legal opinions thereon as required; follows the legal cases of the Ministry and assists the litigating attorneys in such cases; any other legal functions assigned by the Minister.

The Citizens Services Directorate is charged with undertaking information dissemination, awareness raising and education of the public to encourage conservation of water resources and protection of those resources from pollution.

The Directorate of Financial and Administrative Affairs carries out personnel, financial and accounting, budgeting, and other administrative matters.

Pursuant to the Underground Water (Groundwater) By-law ("GW Regulations"), MWI is mandated with undertaking the necessary studies and monitoring of quantity and quality of groundwater and its uses (GW Regulations, Art. 4(A)). The Board of MWI determines the maximum quantity of groundwater permitted to be extracted annually from each ground water basin within the limits of safe yield (GW Regs, Art. 4(B)) and sets the regulatory measures for safe extraction in coordination with the Ministry of Agriculture. "Without violation of The Jordan Valley Development Law in force, the rules governing the construction of public and private water wells, the methods of using the underground water extracted therefrom, and the quantities thereof shall be determined by regulatory decisions issued by the Board upon the submission of the Minister." (Art. 7).

THE JORDAN VALLEY AUTHORITY (JVA), pursuant to the JVA Law, carries out the social and economic development of the Jordan Valley, including:

- Development of water resources for irrigation, domestic and municipal uses, hydroelectric power, industry and "other beneficial uses";
- Setting all necessary regulations to control the use of water in farm units in the Valley (Art 24(j));
- Developing, protecting and improving of environment in the Valley, including developing and overseeing implementation of Master and Detailed Plans for lands outside planning authority of municipalities;
- Overseeing agricultural roads networks in the Valley;
- Developing tourism in the Valley, including identifying areas of specific touristic value that should be developed for those purposes;
- Drafting of Valley development plans and programs are approved by the Board of Directors of the JVA;

- Expropriating lands and water rights necessary to encourage irrigation and dividing land into "irrigable farm units";
- "…tak[ing] all necessary measures to implement the irrigation networks in the Valley"…improving them, and protecting them whether they are in municipal land or not (Art 22(k)).
- Allocating lands for housing, provided that they were not designated agricultural lands under the Plans;
- Allocating, selling or leasing land to another government agency or corporation; and
- Licensing all construction in the Valley outside municipal boundaries.

THE WATER AUTHORITY OF JORDAN (WAJ), pursuant to the WAJ Law and By-laws, is mandated with:

- Surveying, conserving and determining the ways, means and priorities for use of water resources (WAJ Law, Art. 6);
- Setting up plans or programs to implement the policies related to domestic and municipal waters and sanitation and to develop the water resources of the country for domestic and municipal purposes (WAJ Law, Art. 6);
- The authority to dig wells, treat and desalinate water, develop springs, and execute any works to augment the potential of waters and improve their quality (Art 6(b));
- Study, design, construct, operate, maintain, and administer water and public wastewater projects including collecting, purifying, treating, disposing of water and wastewater, and the methods of dealing with water;
- Regulate the construction of public and private wells and license drillers and drilling rigs and license extraction and uses of groundwater (Groundwater By-Law, Art. 9);
- Develop the terms, standards and requirements for preservation of water and water basins (including protection from pollution, safety of structures, distribution and disposal networks) and oversee technical control and supervision, including testing;
- Carry out studies and research to achieve its objectives, including
    - Preparation of water quality standards

    - Technical specifications for construction of relevant works
- Regulate the uses of water, prevent waste and conserve consumption (Art. 6(h)).
- Broad authority to conduct "projects or responsibilities" determined by the Cabinet of Ministers and upon the recommendation of the Minister, in addition to what is in legislation (Art 7)
- Has the right to install and maintain public or private pipelines through public roads and, where that is not possible, on private lands (with compensation) and ensuing right of entry onto private lands

The Board of WAJ is responsible for setting national water policy; approving draft by-laws; obtaining loans; recommending tariffs; investing funds; and appointing members of Water Councils (WAJ Law, Art 10). The Council of Ministers retains the authority to issue regulations to ensure the execution of the WAJ Law, though the description only refers to administrative regulations (WAJ Law, Art. 32).

THE MINISTRY OF ENVIRONMENT (MOE), pursuant to the Environmental Protection Act, No. 52 (2006) (EP Act), is responsible for:

- Protecting the environment (including water), and all governmental departments must comply with decisions and instructions taken pursuant to the EP Act;
- Setting general environmental protection policy;
- Preparing "specifications and standards" relative to the "elements" (including water) and components of the environment;
- Monitoring and measuring the elements and components;
- Issuing instructions relative to environmental protection;
- Conducting research and studies;
- Preparing of emergency plans;
- Issuing reports, including a State of the Environment (no frequency specified);
- Regulating hazardous waste (including dumping in waters); and
- Overseeing the EIA process.

THE MINISTRY OF HEALTH, in coordination with the relevant authorities, is charged with the control of potable water, regardless of its source, in order to ensure its fitness for public consumption from a health standpoint and can take the necessary procedures to prevent the use of any undrinkable water. This includes taking of samples and testing those samples (Public Health Law No. 54 of 2002). This also includes control of potable water networks (to ensure that they are not exposed to pollution); and specifying the methods to be used for treatment, transmission, distribution and storage of potable water (Art. 41). The Health Ministry is also in charge of regulating the importation of potable water.

With respect to sewers, the Ministry of Health, in coordination with the relevant authorities, has regulatory control over sewage water, sewage networks and sewage treatment stations with respect to any condition that may threaten public health (Art 53). If the Ministry identifies such a threat, it is empowered to take "all the necessary measures to prevent the occurrence of the anticipated detriment to health" (Art 53).

THE MINISTRY OF AGRICULTURE is charged with introducing proper irrigation systems on farms and with coordinating terms and conditions for water and drainage lines and canals in the woodlands (Ag Law, Art 15). The ministry has general responsibility for organizing and developing agricultural sector. The Ministry also controls drainage lines, canals and other water pipe lines in woodlands (Art. 27(A)).

COMMENTS

As noted in the body of the Institutional Assessment Report, many of the functions described above lack clarity, overlap among institutions, or simply do not provide the necessary detail to be effectively implemented. It is recommended that the functions of each institution be re-allocated in line with the recommendations of this report, and that a full assessment of missing or incomplete authorities be concluded as part of the preparation of a new water law. For example, there are areas related to water quality that do not appear to be addressed at all within the current legislative framework, such as regulation of non-point sources of pollution. Another example is the lack of clarity in the water rights regime. Currently, historical rights are blended with new licenses to meet specific sectoral needs, but not within a coherent framework that provides

priorities and procedures for allocation and re-allocation among sectors and users. Each of these issues, along with many others, will need to be explored in detail in the full legal assessment.

INSTITUTIONAL COORDINATION

Pursuant to both the WAJ Law and the JVA Law, the Minister is empowered to call special meetings of the Boards of both organizations. If a legal quorum of both organizations is present, they are able to study "all matters presented by the Minister, such as the mutual tasks and duties assigned to both Authorities." (WAJ Law, Art. 9(b)).

The MWI Regulations create a Consultative Body within the Ministry that consists of the Secretaries General of the MWI, WAJ and JVA, and four additional "qualified and experienced" members appointed by the Council of Ministers for a 2-year term (MWI Regs, Art. 17). The Body provides technical, economic, legal, financial, and administrative advice on the policies, programs and plans submitted to it (MWI Regs, Art. 18). It also evaluates strategies, policies and objectives of the MWI to provide advice on their development and analyzes sector performance (water and irrigation), and submits proposals on improving sectoral coordination (MWI Regs, Art. 18).

The Groundwater By-Law specifies that MWI's Board set the regulatory measures for safe extraction of groundwater in coordination with the Ministry of Agriculture (GW Regs, Art. 4(B)).

COMMENTS

The role of existing consultative bodies should be more clearly defined, and reassessed according to the institutional restructuring that will likely take place in the sector. Other mechanisms for coordination should also be considered, as well as clarification of roles and responsibilities within the new water law to avoid the need for overlapping authorities.

PLANNING AUTHORITY

MWI, Directorate of Planning, Development and Information is mandated with preparation and development of a sectoral strategy, long-term plans and programs to secure the Kingdom's water requirements at all times and for various uses (MWI Regs, Art. 10).

Pursuant to the Groundwater By-law, the Council of Ministers (on recommendation of the Board of MWI) determines where wells may not be drilled (GW Regs, Art. 6(A)).

Under Article 6 of the WAJ Law, WAJ has the authority to set up plans or programs to implement the policies related to domestic and municipal waters and sanitation and to develop the water resources of the country for domestic and municipal purposes. The WAJ Board of Directors is also responsible for development a policy that "reserves the right of the Kingdom in all the water resources, including development, maintenance and use, and will approve a plan for development, conservation, distribution, uses, provision of additional water resources and construction of water and public sewage networks."

Pursuant to the JVA Law, the JVA has the authority to develop, protect and improve the environment in the Valley, including developing and overseeing implementation of Master and Detailed Plans for lands outside planning authority of municipalities and development plans for the Valley (JVA Law, Art. 3(b)).

COMMENTS

There do not appear to be many coordination mechanisms for ensuring that these planning processes are integrated or, at the least, do not conflict one another where there is potential for overlapping mandate (as is the case, for example in the Jordan Valley). In theory, the Consultative Body established within the MWI pursuant to the MWI Regulations, or potentially the Council of Ministers, could oversee planning coordination, but it remains to be seen whether this happens in practice.

It is recommended that the planning authority for water resource management and development reside within MWI and JVA and be clearly elaborated in the new water legislation. In addition, a full analysis of the potential overlaps in planning authority among the Ministries of Agriculture, Environment and MWI should be undertaken in order to determine how to ensure coordinated and integrated planning with respect to impacts on water resources.

Another critical aspect of effective planning is having the necessary data to inform decision-making. The provisions for planning should thus be carefully linked to the provisions on data collection, management, and monitoring (discussed in detail below).

WATER RIGHTS, ALLOCATION AND LICENSING AUTHORITY

All water resources available within the boundaries of the Kingdom, whether surface or groundwater, regional rivers, internal rivers or internal seas, are the property of the State and subject to the provisions of the WAJ Law (WAJ Law, Art. 25(a); GW Regulations, Art. 3). Ownership of land does not include ownership of groundwater resources appurtenant to that land (GW Regulations, Art. 3(B)). Any waters that are not under State control shall not be used in excess of domestic and personal needs or in excess of legal water rights (including drinking and irrigation rights applicable to any piece of land) (WAJ Law, Art. 25(b)).

Written approval of WAJ is required for all "natural and juridical bodies" to sell water from any source and such sale must comply with all terms and conditions of that permission (WAJ Law, Art. 25(c)). There are no details regarding the requirements for such a licensing system.

The JVA controls all water acquired by means of projects constructed by the Authority and not used or exploited for irrigation purposes in any area pursuant to the land and water settlement act. The Board can sell, lease, or otherwise dispose of these waters as it sees fit. When developing a new irrigation project, the JVA must consider all water rights registered in the Water Register. "Consider" is not defined. Any water in excess of those rights is government property.

Within the Jordan Valley or in the basins of the Jordan River Tributaries, the JVA can expropriate and immediately acquire lands, water shares or both as necessary for its projects, either by absolute expropriation against compensation or by lease for any period it deems appropriate.

ALLOCATION

WAJ is required to survey the different water resources of Jordan, conserve them, determine ways, means and priorities for their implementation and use, except the for irrigation (WAJ Law, Art. 6(a)). Water Councils at the local level are meant to provide a mechanism for citizens and local authorities to participate in determining local priorities for water and wastewater projects (WAJ Law, Art. 23(A)(2)). There is no indication within the legislation of how much flexibility is

provided to the Councils, nor how the priorities must relate to those set forth by WAJ. Presumably, Councils are required to comply with national priorities for allocation, implementation and use.

Pursuant to the Groundwater By-law, government agencies, universities, industry and universities may be granted licenses to drill in prohibited areas if necessary (Art 6(B)). There is no justification offered for this exemption.

The JVA is mandated with the development of the water resources of the Valley and utilizing them for purposes of irrigated farming, domestic and municipal uses, industry, generating hydroelectric power and other beneficial uses (JVA Law, Art. 3(a)). In addition, JVA is meant to oversee development of tourism in the Valley and delineate areas of touristic value for those purposes (Art. 3(d)). Waters used or exploited for irrigation purposes in any area prior to the declaration of a water settlement in accordance with the land and water settlement law in effect and water rights in the Register are allowed to remain with holder of the right, save for the possibility of expropriation by JVA (Art. 18).

While it appears from the tariff structure, along with the emphasis provided on water development for irrigation, that irrigated agriculture is a priority use. No process is provided for re-allocation of water priorities in times of severe drought, or emergency.

LICENSING

WAJ is authorized to license engineers and other professionals to perform public water and wastewater works (WAJ Law, Art. 6(g)). Written approval of WAJ is required for all "natural and juridical bodies" to sell water from any source and such sale must comply with all terms and conditions of that permission (WAJ Law, Art. 25(c)). The Article, however, refers to the permission of WAJ as "agreements or contracts" rather than licenses.

The Groundwater By-law specifies that no groundwater may be extracted or utilized except pursuant to a license issued by WAJ (GW Reg, Arts. 3 and 9). The production capacity and quality of a well and its water is to be determined by the party proposing to drill the well under the supervision of WAJ (GW Regs, Art. 9). This test shall provide the basis for the allowable extraction amounts (Id.). A well owner must refrain generally from over-use and pollution of the

groundwater, and adhere to all conditions of the license (GW Regs, Art. 11). Additionally, private owners may not sell water to tankers providing drinking water without written authorization from the Secretary General of WAJ (Art 11(B)). Transfer of licenses (drilling or extraction) is not permitted to accompany transfer of lands unless fees due are paid to WAJ (Art 12).

WAJ has the authority (by virtue of a Board decision) to take over any well and access thereto in pursuance of the objectives of legislation in force (GW Regs, Art. 13). If a licensee violates any of the conditions of a license, or if it is considered to be in the public interest, the Board may cancel any drilling or extraction license or require the well to be shut down until the breach is rectified (GW Regs, Art. 17). WAJ also has broad authority to deny a drilling license if it is "in the public interest" (GW Regs, Art. 23).

License application requirements are to be elaborated by the WAJ in compliance with Article 21 of the Groundwater By-law, with further elaboration of conditions in Articles 27-34.

The JVA is charged with licensing all construction in the Jordan Valley (JVA Law, Art. 6). It is prohibited to grant a license for drilling a well for irrigation purposes in a land of an area of less than one hundred Dunums and no drilling licenses may be granted in the Jordan Valley areas unless due consultations take place with JVA (GW Regs, Art. 22). It appears that, according to the MWI Regulations, the Ministry has taken over or at least has oversight over these processes.

Pollution of the waters of the Jordan Valley is prohibited without written permission of the JVA Secretary General (JVA Law, Art 38). The permission should include the conditions of usage and storage of such material with which the licensee must comply. JVA is mandated with conducting water quality testing, but no standards, frequency or methods are specified within the legislation. Moreover, no licensing process or requirements are stipulated. See water quality section for more on overlapping authorities with respect to this area of water management.

COMMENTS

As noted in the section on Institutional Authorities/Functions, the current water rights system in Jordan lacks the kind of detail that will enable clarity, transparency and accountability in allocation and re-allocation of user rights. While it is clear that the MWI should have the

authority to license uses and impacts on water resources, there is insufficient detail within the current legislative framework to ensure that this is done according to a clear policy of allocating among sectors and users in the public interest according to a set of national priorities. The laws also lack the necessary procedural mechanisms to ensure that allocation and re-allocation of user rights is undertaken in a manner that is consistent, transparent, and accountable and allows for realistic assessment of the water budget and water needs of the country. Such a system needs to be adaptive, to ensure that the MWI can respond to changing resource availability, social and economic priorities, and other circumstances.

It is recommended that a full review of the current rights system be undertaken as part of the full analysis leading to the drafting of a new law that would include a coherent water rights regime, as described above. This would include a review of existing rights and analysis of the pertinent information related to how those rights have been

In a water scarce environment such as Jordan, priorities for allocation and re-allocation of usufruct rights are also essential tools for mitigating and avoiding conflict among sectors and users, as well as for enabling the government to adapt to changing availability and circumstances. Additionally, procedural mechanisms to enable re-allocation in times of drought or increased scarcity are critical. These tools should be explored and adapted for use according to the policies of the government of Jordan, which should be clarified with respect to allocation priorities and contingencies.

With respect to licensing, while the groundwater permitting system is well developed, it lacks certain details that would enable the process to be more accountable and effective. For example, there are only very elementary requirements for stakeholder and public engagement in the process. Given the scarcity of water and the potential for conflict among users, as well as for non-compliance with permitted uses, there is a need for more institutionalized mechanisms for engaging users in the process of permitting to enable awareness raising and conflict prevention.

Water quality permitting does not appear to be elaborated within any of the relevant laws. This could provide a major challenge as quality deteriorates and begins to be a major constraint on use. Clarity of authority is needed among the Ministries of Environment, Agriculture and MWI with respect to a coherent permitting system for controlling both point and non-point sources of

pollution. This will also require thinking through the role of user associations and other groups to facilitate compliance and enforcement of pollution controls.

It is recommended that a comprehensive analysis of all permitting authorities, including the relevant regulations and by-laws prescribing administrative procedures for processing permits, be reviewed in detail as part of the legal review and that a more coherent, transparent, accountable, and integrated system for water quantity and water quality permitting be instituted. The information gathered as part of the permitting process should also be considered as part of the data management aspect of MWI's mandate.

PUBLIC PARTICIPATION

Under the JVA Act, the holder or beneficiary of a water right has the ability to contest an expropriation decision following publication of the Authority's decision to expropriate in more than one local paper and in a visible place in the City or village in which the shares are to be acquired for 15 days (JVA Act, Art. 21(c)). The Minister forms a committee, whose decision after review, is final. In practice, it is likely that this process provides limited access to information, even for the intended beneficiaries. In addition, each tract for which an objection is raised costs 15 JD to be placed in escrow by the landowner. This charge is unusual and likely discourages the use of this appeals tool.

The JVA Law also establishes Farmers' Selection Committees. The Committees include JVA Chair and 2 others, one of whom is a farmer with local knowledge and they are meant to guide allocation decisions vis a vis Valley land (Art 24). The Board must approve the Committee's decisions.

Under WAJ law, Art. 23, each Water Department has to establish a Water Council, comprised of representatives of government and private sector actors concerned with water and sewage. This is to "allow citizens and local authorities to participate in deciding priorities regarding water and sewerage projects and plan for their implementation." There are no details provided on the process for establishing such Councils, nor on the composition of their members. It is thus difficult to know whether they are truly representative structures in practice.

Decisions and notices to be served by the Authority to concerned parties are served through local newspapers. Each decision or notice published for three consecutive days in more than one local newspaper is considered a decision or a notice legally served to concerned parties. Pursuant to the groundwater by-law, this includes applications for well drilling licenses (GW Regs, Art. 21).

In terms of the right to access justice, any landlord who disputes the amount of compensation assessed by WAJ for land or water rights, rights of water projects or public sewerage, can appeal to the Court in accordance with the Acquisition Law in effect (WAJ Law, Art. 26).

The MWI Regulations create a Consultative Body within the Ministry that consists of the Secretaries General of the MWI, WAJ and JVA, and four additional "qualified and experienced" members appointed by the Council of Ministers for a 2-year term (MWI Regs, Art. 17). The Minister may also invite consultants to participate in the meetings of the Body to seek their opinion, without giving them a voting right (MWI Regs, Art. 17).

COMMENTS

Overall, these provisions are only skeletal and do not provide enough detail to guarantee effective inclusion of stakeholders and the public in water-related decision-making. Even where information is mandated to be provided to the public, it is limited in nature. The exception may be in the mandate of the Directorate of Information of the MWI, but this is left open to interpretation and does not provide any concrete participatory rights or processes. Indeed, the limited opportunities for notice and comments, for judicial or administrative appeal, for participation in decision-making, and the large discretion allowed the agencies likely results in very limited public participation.

There are many areas in which participatory management could be improved, both within the legal framework, as well as in the practices of the relevant institutions. The three main components, or "pillars" of public participation include: access to information, participation in decision-making, and access to justice. Each of these areas should be assessed across all of the existing laws and regulations to determine how best to build procedural requirements, institutional mechanisms (such as water user associations), and where to elaborate on existing

provisions to ensure that users and the public are able to make informed decisions about their water use and consumption, to facilitate compliance and enforcement of the legal and regulatory framework, to avoid and mitigate conflicts over water resources, and to ensure informed decision-making on the part of the government.

WATER QUALITY

WAJ is authorized to set water quality standards "for different uses" as part of its broad authority to undertake research and studies (WAJ Law, Art. 6(f)). It is also required to design, operate, and maintain all water and wastewater projects, including purification, treatment and disposal of waters and wastewater (WAJ Law, Art. 6(d)) and set standards and specifications for protection of waters and water basins from pollution (WAJ Law, Art. 6(e)).

According to the Groundwater By-Law, the Board of WAJ can set appropriate measures to end the pollution or depletion of groundwater, including the rationalization or reduction of the extraction rate, to an extent that would allow the halt of pollution or depletion, and the restoration of the natural balance to the aquifer or to the underground water basin (GW Regs, Art. 16).

Pollution of the waters of the Jordan Valley is prohibited without written permission of the JVA Secretary General (JVA Law, Art 38). The permission should include the conditions of usage and storage of such material with which the licensee must comply. JVA is mandated with conducting water quality testing, but no standards, frequency or methods are specified within the legislation.

According to the Environmental Protection Act, it is forbidden to dump, dispose of, or collect any materials harmful to the environment, whether such materials are solid, liquid, gaseous, radioactive or thermal, in the sources of water. It is also forbidden to store any of those materials in the proximity of water sources within the safe limits set by the Ministers by virtue of instructions issued for that purpose, including the protection of water basins, in coordination with the concerned parties (EP Act, Art. 11). The Ministry of Environment (or whomsoever the Ministry delegates authority to) has enforcement authority over this provision. It would be useful to determine whether the MoE has delegated this authority to MWI.

In addition, the Ministry of Health is charged with the control of potable water, regardless of its source, in order to ensure its fitness for public consumption from a health standpoint and can take the necessary procedures to prevent the use of any undrinkable water. This includes taking of samples and testing those samples (Public Health Law No. 54 of 2002). This also includes control of potable water networks (to ensure that they are not exposed to pollution); and specifying the methods to be used for treatment, transmission, distribution and storage of potable water (Art. 41).

With respect to sewers, the Ministry of Health, in coordination with the relevant authorities, has regulatory control over sewage water, sewage networks and sewage treatment stations with respect to any condition that may threaten public health (Art 53). If the Ministry identifies such a threat, it is empowered to take "all the necessary measures to prevent the occurrence of the anticipated detriment to health" (Art 53).

In 2006, MWI engaged with GTZ (now GIZ) to engage in development of drinking water protection guidelines. These guidelines outline the delineation of various levels of ground and surface water resource protection zones to ensure water quality. The Guidelines note that implementation of these protection zones would require the participation and oversight of MWI, including JVA and WAJ, the Ministry of Environment, the Ministry of Agriculture, and private well owners. The implementation status of these Guidelines needs to be confirmed.

COMMENTS

There are a number of provisions related to setting, monitoring, licensing and enforcing water quality regulations, but no provision for coordination among the various authorities. It appears that various authorities set standards, so there is a risk that conflicting or incompatible standards and requirements may be set. This also creates regulatory uncertainty for the permitted community, undermining compliance and enforcement.

It is recommended that a comprehensive review of all water quality authorities, standards and regulations be integrated into the legal analysis and that water quality (both from point and non-point sources) be regulated under the new water law in an integrated and comprehensive manner. This may entail some authority being delegated to the Ministry of Health (drinking water) or Agriculture (non-point sources emanating from agricultural operations), but a

mechanism for coordination and ensuring coherence should be clearly stated in the water law, along with the necessary planning, permitting, monitoring, and enforcement provisions.

MONITORING, REPORTING AND INFORMATION MANAGEMENT

MWI, Directorate of Planning, Development and Information, is required to establish a computerized Information Bank to analyze and classify the information pertaining to the water sector and development of water resources (MWI Regulations, Art. 10). The same Directorate is charged with undertaking studies pertaining to the social and economic feasibility of water policies; and on the productive capacity of water resources and water quality in order to formulate the basis for protecting those resources (MWI Regulations, Art. 10).

Pursuant to the Underground Water By-law, MWI is mandated with undertaking the necessary studies and monitoring of quantity and quality of groundwater and its uses (GW Regs, Art. 4(A)). The competent officials have the authority to enter any land for conducting studies or investigation or collection of information related to underground water or for carrying out any measures required by this By-Law (Art. 5). WAJ must also keep official records of rigs and drillers and all activities related to the profession of well drilling whereby technical and regulatory data and measures taken against the licensee are registered (GW Regs, Art. 35).

WAJ shall "obtain data and information regarding the water needs and consumption and will use the data for planning and for conservation. It will also keep records of costs of construction, maintenance and operation of Authority projects…" (Art. 23(a)(6)).

WAJ is also empowered to supervise water projects, including testing (WAJ Law, Art. 6); and is required to publish the finding of its studies and research and any standards set as a result (WAJ Law, Art. 6(f)).

The Ministry of Health is required to take the necessary procedures to prevent the use of any undrinkable water. This includes taking of samples and testing those samples (Public Health Law No. 54 of 2002).

The Ministry of Environment is authorized to monitor and measure the "elements" of the environment (including water) and issues instructions for protection of those elements

(Environmental Protection Law, Art. 4(C)). The Ministry is also authorized to monitor and supervise public and private bodies and corporations to ensure compliance with environmental specifications and technical standards (EP Law, Art 4(E)) and to conduct research and studies related to matters of environmental protection (Art 4(F)).

All of the monitoring requirements are quite general. Further elaboration may be available in various regulations.

JVA is required to report annually on its works, finances and projects to the Cabinet of Ministers, as well as on "Any other reports or data as may be requested by the Cabinet of Ministers."

WAJ must also submit an annual report on its activities, budget and accounts to the Council of Ministers (WAJ Law, Art. 29).

The Ministry of Environment is required to produce a "State of the Environment" Report, which presumably includes the state of water resources. The frequency and details of this reporting requirement are not specified in the legislation.

THE MINISTRY OF AGRICULTURE is mandated with collecting agricultural information, data, static, analysis, classification, and approving prior to advertisement in accordance with applicable regulations (Ag Law, Art. 4).

COMMENTS

Information collection and management provided the basis for sound water management. Currently, the legal requirements in this area are quite vague and leave much open to administrative discretion. This can be a problem, given how costly data collection and management can be. There are a number of legal and regulatory tools for ensuring better information access and management, and these will be explored fully in the legal review as part of ISSP implementation. The authority for data collection, analysis and management should be consolidated within the MWI.

Reporting can be a valuable tool for encouraging compliance and ensuring effective enforcement. It is also a mechanism for collecting much-needed data and for effectively adapting

to changing circumstances. The current legal provisions for monitoring are quite skeletal and require review and updating according to the needs and capacities of the relevant agencies.

PRIVATE SECTOR REGULATION

The 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." This includes contracts or leases for management of projects or transfer of ownership in accordance with the conditions of the contracts that shall be concluded for this purpose (WAJ Law, Art. 28(a)). Under management contracts or leases, the Council can bestow all the legal authority of WAJ onto the management body for the purposes of achieving the provisions of the WAJ Law (WAJ Law, Art. 28(b)).

COMMENTS

The law governing private sector involvement in Jordan also includes a Privatization Law (No. 25 of 2000) and a draft Public Private Partnership Law, which will replace the Privatization Law. These two pieces of legislation will need to be reviewed in order to provide further guidance in this area.

Other relevant issues surround the parameters within which the contracts between government and private sector are drawn and implemented. These should be included in the relevant legislation, specific to the water utilities sector.

TARIFFS AND FINANCIAL PROVISIONS

Under the JVA Law, prices for water sold for irrigation are set by the Cabinet of Ministers (Art 24(j)).

Under WAJ law, all tariffs collected are available for use by the Authority. They are considered Amerie (State) funds (WAJ Law, Arts. 15-16)). WAJ's financial affairs are regulated under a separate set of by-laws (need to locate). All buildings existing and erected in future (except houses of worship) are subject to a 3% tax on net rent to be paid to the to the Ministry of

Finance and transferred to WAJ as part of its financial revenues (WAJ Law, Art. 21). There are a number of additional provisions related to the capacity of WAJ to raise funds through issuance of bonds, property acquisitions, etc.

To enable WAJ to collect dues under the Groundwater By-law, WAJ should coordinate with the Land and Survey Department and the Income Tax Department to make use of the process of transactions through these two departments, by their ascertainment that the transactions submitted to either department by owners of lands with ground water wells, have fulfilled their obligations to pay the amounts due from them to the Authority, in the light of lists containing the names of these persons presented to the said Department from time to time by the Authority (GW Regs, Art. 20).

The Groundwater By-law specifies tariffs for various quantities of water extracted from a well. It appears to set up an increasing block tariff that favors agricultural use (lower cost per cubic meter) over industry, municipal use, tourism or university use (Art. 38).

COMMENTS

Tariffs and financial incentives are powerful tools for encouraging demand management and conservation of the resource, as well as for allocation among sectors. Further analysis of the structures for setting tariffs (and how those might change with the new institutional structuring) and the potential areas where tax incentives and other financial tools can be used to alleviate the burdens of water scarcity will be undertaken as part of the full legal review.

DISPUTE/ARBITRATION

Any dispute about amounts paid for property or right of water projects and public sewage can be referred to the court or to arbitration (WAJ Law, Art. 26).

COMMENTS

While it is possible that the relevant provisions lie elsewhere in an administrative procedure law, there appears to be little legislative guidance on arbitration and dispute resolution outside of the courts. In many places, in order to facilitate dispute resolution, there are a number of stages that

come before a case is referred to the court system, including administrative review and even the creation of administrative "judges" who specialize in settling such cases.

There also do not appear to be any provisions for citizen suits in the current framework. Enabling citizens or interested parties to have standing before an administrative appeals body or before the courts can transfer some of the burden for enforcement and dispute resolution away from the managing agencies.

In addition, because this is such an important area, Jordan may want to consider the creation of a specialized water court or tribunal that can decide on these cases in the most informed and effective manner. Regardless, judicial training should form an integral part of the implementation phase of the ISSP.

ENFORCEMENT AND PENALTIES

The WAJ Law prescribes a minimum jail sentence of 6 months (maximum 2 years), fines of JD 1000-5000 or both for the following:

- building within the strip of land prohibited pursuant to Art. 24 of this Act
- causing damage to any WAJ projects or causing to be "ruined or destroyed" any water resources or public sewers or WAJ property
- pollution of any water resource under the management or authority of WAJ (or caused pollution and failed to remedy within specified period)
- drilling of unlicensed wells or violating the conditions of such a license

Lower penalties are prescribed for encroachment on State lands without permission (where no actual harm is done to water works); carrying out works or responsibilities that are legally the mandate of WAJ; illegal use of water, related projects or sewers in contravention of this law and ensuing regulations (WAJ Law, Art. 30).

Duly nominated WAJ enforcement officials are granted the authority of judicial police in relation to crimes committed in violation of the WAJ Law. (WAJ Law, Art. 30(E)). The Secretary General of WAJ can remove the enforcement authority from WAJ officials and seek instead the assistance of members of the security forces (Art 30(E)).

Under the Groundwater By-law, any licensee that pumps water without conducting the necessary pumping tests under the supervision of WAJ must cease to do so within 30 days or lose the license and subject the well to backfilling without notice (GW Regs, Art. 9). WAJ may backfill unlicensed wells or wells whose license was not complied with (Art. 18) or cancel the license if violations aren't rectified within a specified period (Id.).

Anyone caught drilling, deepening, cleaning, maintaining or testing any well or extracting water therefrom, or operating or possessing a drilling rig in contradiction to the provisions of this By-Law, is subject to a "restraint report", and the drilling rig and other equipment shall be seized. The offender shall be referred to the competent court to inflict upon him the punishment provided for under this By-Law. This provision covers the owner or possessor of the land where the breach took place. The offender shall bear the costs of the seizure act until a decision by the court is made there upon, without affecting the right of the Authority to remove the offence by administrative means in accordance with of the law (GW By-law, Art. 19).

The JVA Law (Art. 31) also provides minimum jail sentences and fines for:

- Each person purposely damaging or sabotages any project of the Authority,
- Any person who receives benefit from any of the Valley's water resources other than his rightful share as evidenced by a water title deed legally recorded in the Water Register;
- Anyone who negligently or carelessly damages, changes or obstructs any JVA project or causes the flow of water to be interrupted resulting thereby in damages to roads, buildings, projects or property of any kind owned by the Authority or privately owned by individuals, societies or public organizations in the Valley;
- Anyone who damages, harms, spoils, or removes any sign, device or water gauge installed by the Authority or for its purposes;
- Anyone who prevents JVA employees or contractors from doing their work;
- Anyone who contradicts any provisions of any announcement published by the Authority in the Official Gazette preventing or organizing the passage of animals or

carts across any part of its projects; or

- Anyone who violates other provisions of this law or regulations passed pursuant to this law.

Area directors and zoning managers are given the authority to act as law enforcement for the purposes of this Law within the Valley (JVA Law, Art. 31).

It is also unlawful to pollute the waters of the Valley without a license (JVA Law, Art. 38).

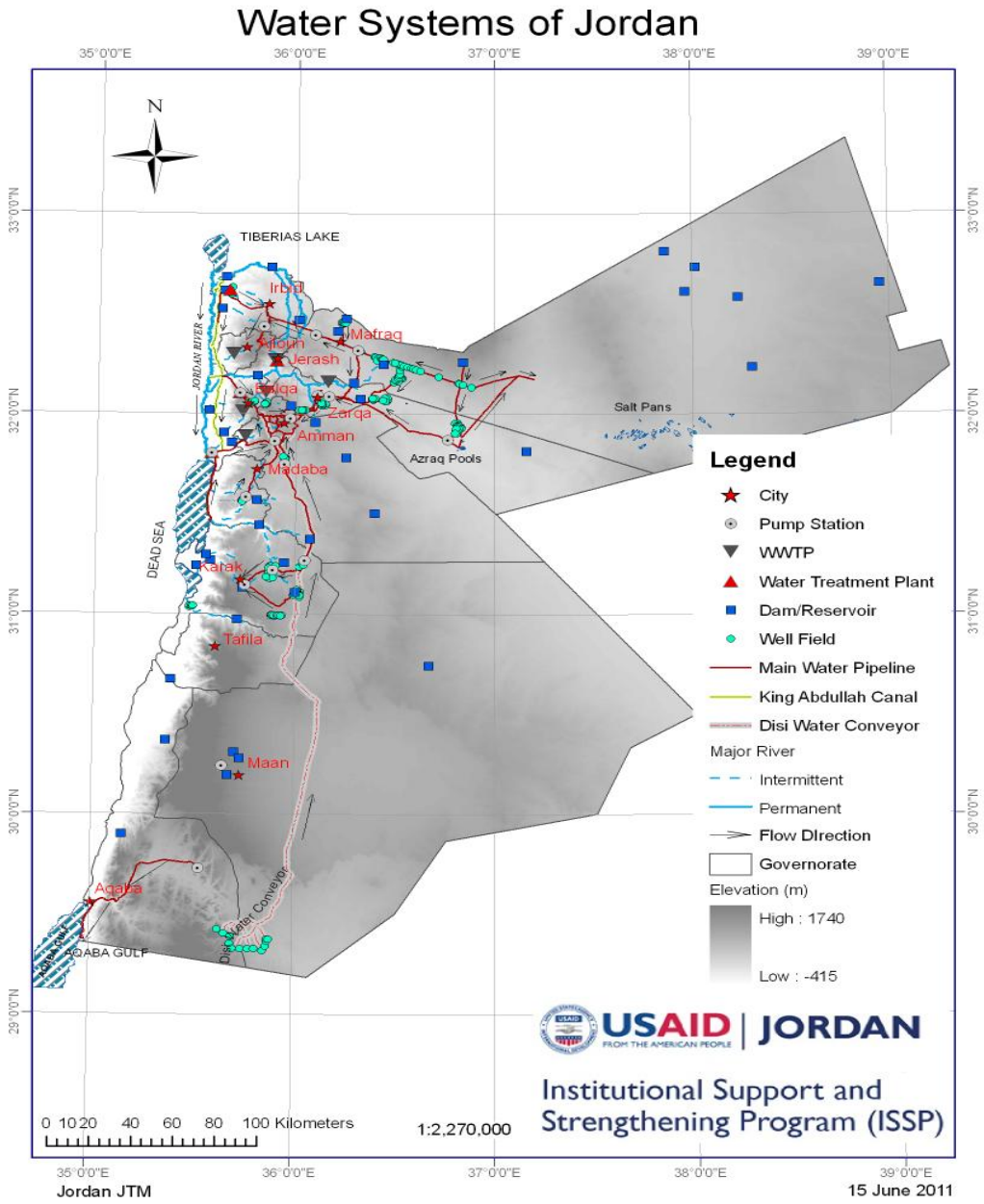
COMMENTS

The current legal framework focuses on traditional enforcement measures, including fines and prison terms. In order to encourage compliance, MWI policies and strategies should include compliance assistance requirements, for example ensuring that all relevant stakeholders are educated about what the requirements of the law are and what is required of specific users and government regulators. Compliance incentives can also be integrated into the law, such as waiving penalties for voluntary disclosure of violations. More elaborate compliance monitoring provisions could also help the relevant institutions achieve their goals more effectively and efficiently.

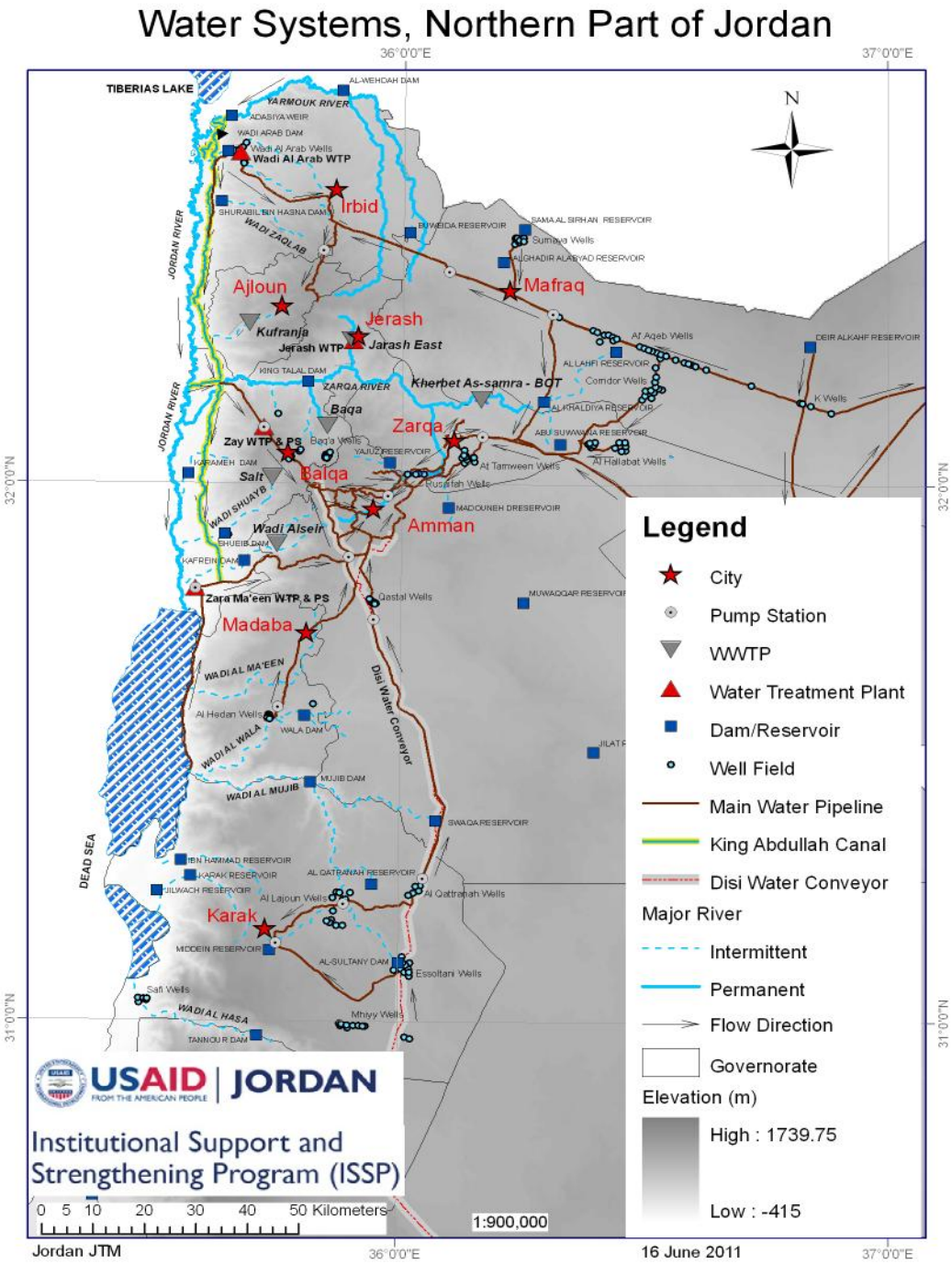
With respect to enforcement, in addition to fines, suspension or canceling of licenses, imprisonment, and so on, there must be a focus on capacity building within the relevant agencies for monitoring and for persecuting violations. This could include judicial training to enhance enforcement of existing water laws, training of agency officials, inspection capacity building, establishment of accredited monitoring agencies/institutions, and so on. All of these tools should be part of the full legal review to ensure that the appropriate ones are selected for Jordan's legal framework.

ANNEX 8 - MAPS

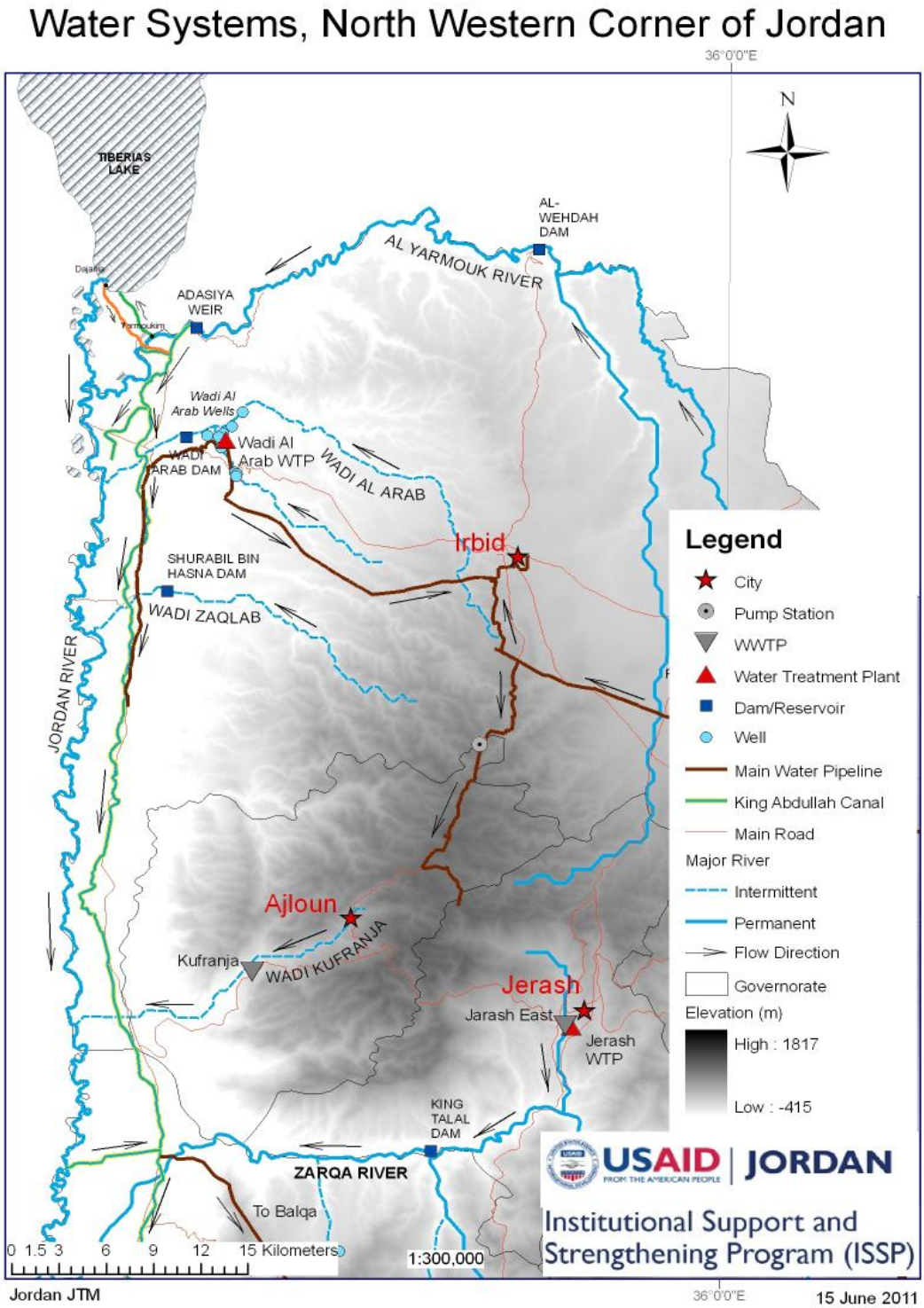
WATER SYSTEMS OF JORDAN



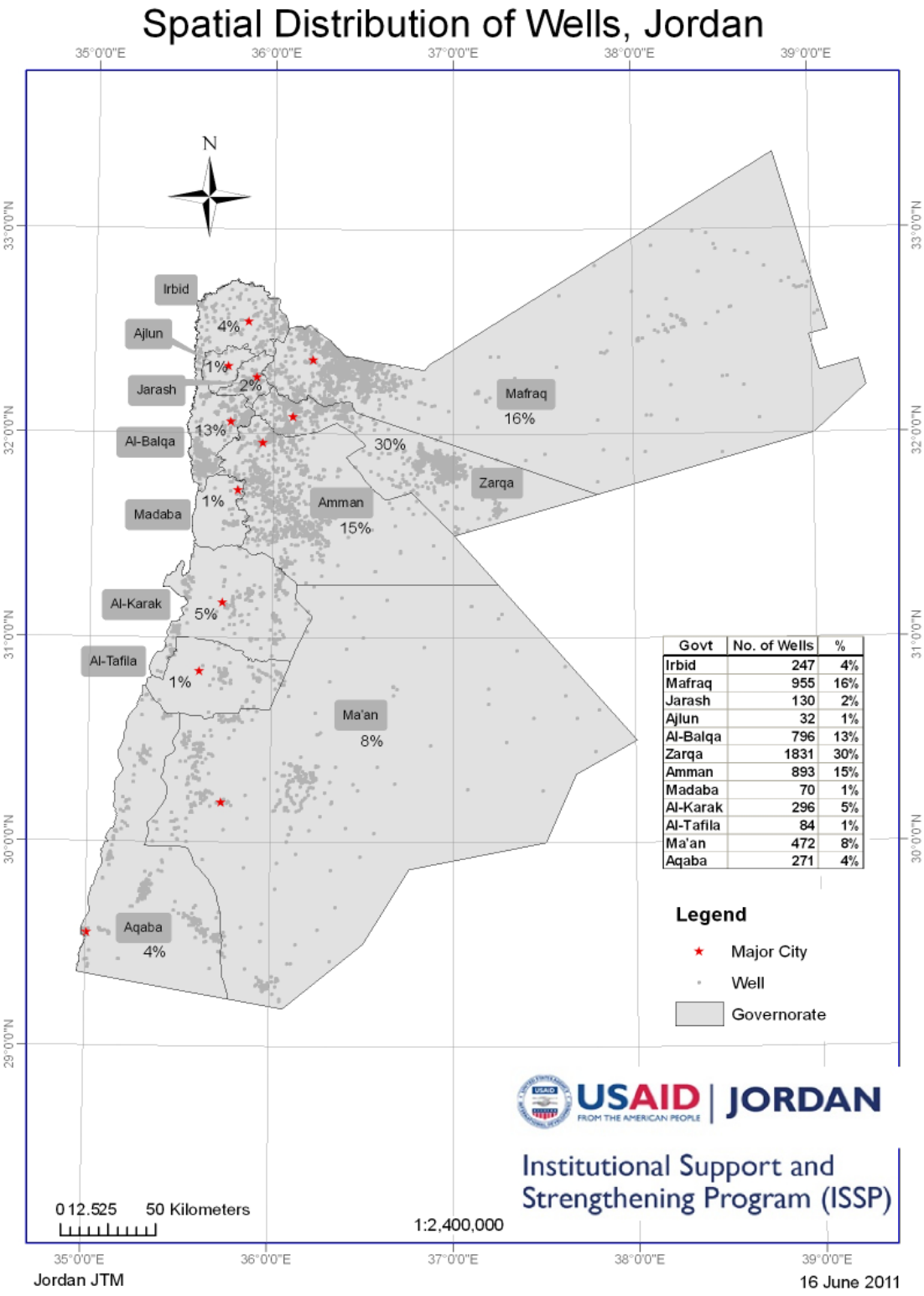
WATER SYSTEMS, NORTHERN PART OF JORDAN

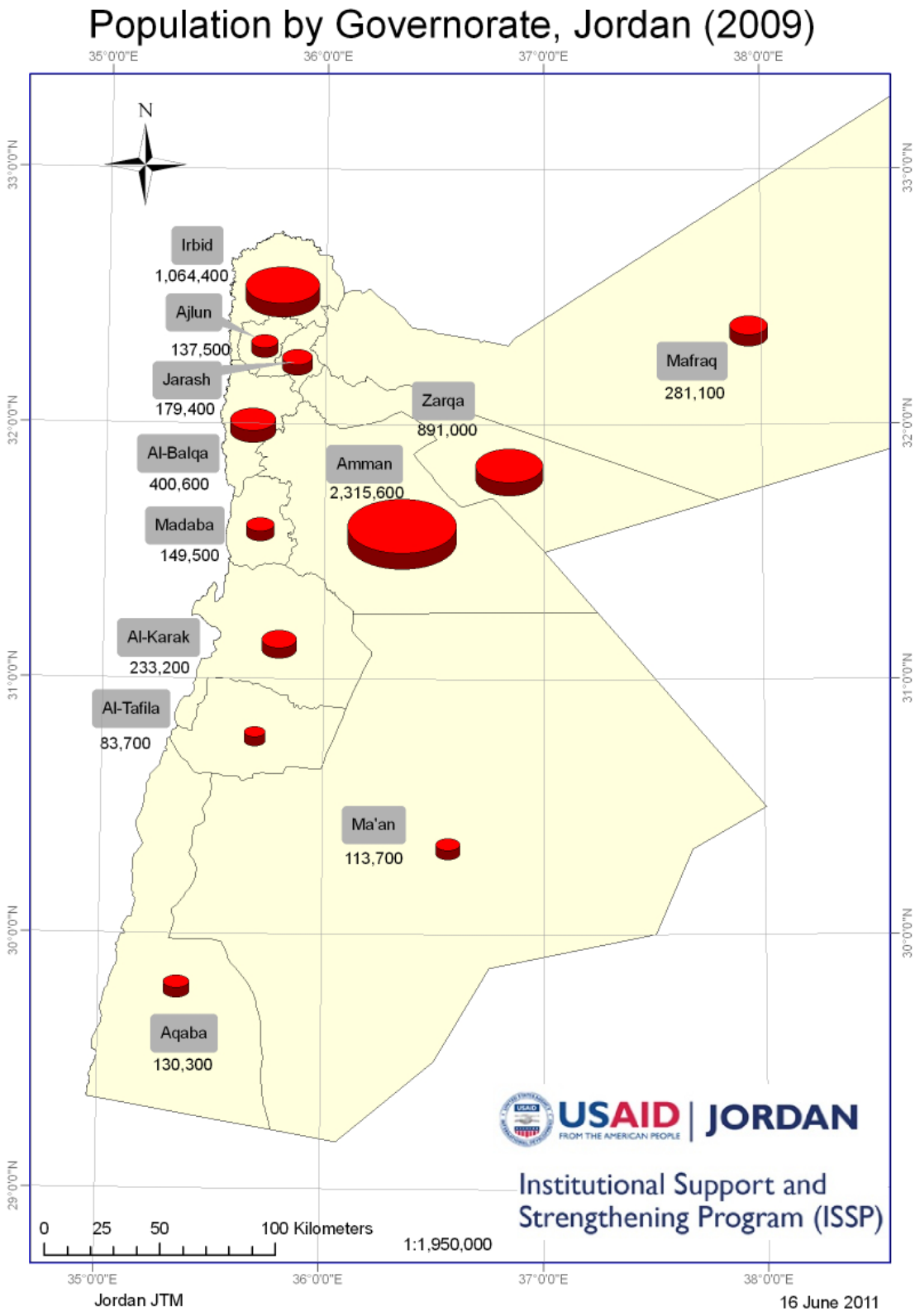


WATER SYSTEMS, NORTH WESTERN CORNER OF JORDAN

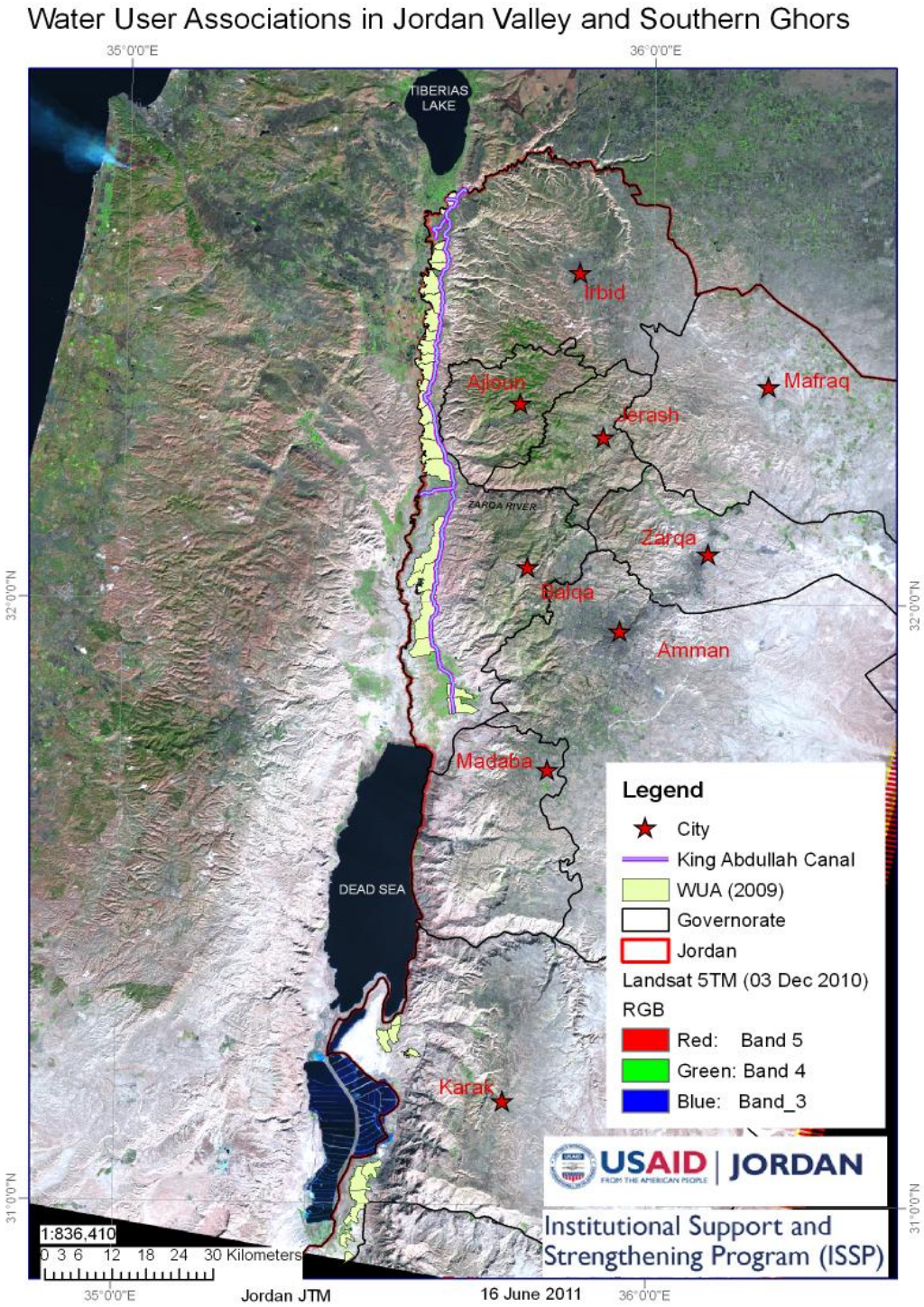


SPATIAL DISTRIBUTION OF WELLS, JORDAN




Population by Governorate, Jordan (2009)
35°0'0"E
36°0'0"E
37°0'0"E
38°0'0"E
33°0'0"N
32°0'0"N
31°0'0"N
30°0'0"N
29°0'0"N
N
Irbid
1,064,400
Ajlun
137,500
Jarash
179,400
Al-Balqa
400,600
Madaba
149,500
Zarqa
891,000
Amman
2,315,600
Mafraq
281,100
Al-Karak
233,200
Al-Tafila
83,700
Ma'an
113,700
Aqaba
130,300
USAID | JORDAN
FROM THE AMERICAN PEOPLE
Institutional Support and
Strengthening Program (ISSP)
0 25 50 100 Kilometers
1:1,950,000
Jordan JTM
16 June 2011

WATER USER ASSOCIATIONS IN JORDAN VALLEY AND SOUTHERN GHORS



ANNEX 9 - MIYAHUNA PROFILE

MISSION AND OBJECTIVES

Miyahuna is the water utility responsible for water and wastewater operations within Amman Governorate, and it also supplies some bulk water to other governorates (13 million m^3 in 2010, as reported by Miyahuna Production Department). It is a corporatized government-owned company, operating under an Assignment Agreement with WAJ, meant to operate as a financially viable, self-sustaining entity managed under modern commercial principles and private sector practices. It is governed by Jordanian laws and regulations for private businesses.

Miyahuna's mission, as stated in its 2007 (first) annual report, is: "to enhance quality of life by providing all its customers with sustainable, efficient and reliable water and wastewater services".

BASIC STATISTICS

According to figures from Miyahuna Production Department, in 2010, the company sold 82 MCM of water, had approximately 480,000 metered customer accounts and 350,000 sewage accounts, served a permanent population of approximately 2.5 million people (expanding to over 3 million in the summer), of which 95% live within the borders of the Greater Amman Municipality (GAM). Miyahuna's service territory is 8,231 km^2. A map of Miyahuna's urban service territory appears in section 5.12.

HISTORY OF FORMATION AND PREDECESSORS

Over the years, the government of Jordan has implemented a number of alternative organizational arrangements for the provision of water and sanitation services in towns and cities. First, it established a government-owned water and sewerage company in Amman (1973) whilst the rest of the water systems remained operated directly by central government departments. Ten years later, the government started to directly operate the water and sanitation services in Amman through the Water Authority of Jordan (WAJ). In 1999, the GoJ signed a management contract with a private operator, LEMA, a joint venture consisting mainly of Suez and Montgomery Watson Arabtech, to operate Amman's water and wastewater facilities and systems. It also created the Project Management Unit (PMU) within the

Ministry of Water and Irrigation (MWI) to monitor the performance of the private operator under the management contract and to oversee the capital investment program for Amman Governorate.

Miyahuna started its independent corporatized operations at the beginning of 2007. It is governed by a General Assembly responsible for the appointment of the Management Committee's Chairman and its members, who in turn take the responsibility of appointing the Chief Executive Officer (CEO) and the executive staff.

THE LEMA PERIOD

The LEMA management contract was a development experience for WAJ and PMU, as it was the first of its kind in the water and wastewater sector in Jordan. The contract provided LEMA with a management fee, and incentives and penalties based on performance as measured against contractual benchmarks. The responsibility for supervising contract performance was under the jurisdiction of WAJ, which discharged this responsibility through the PMU. In addition, LEMA's technical and financial performance was independently audited every year.

The contract design made it difficult for LEMA to achieve its objectives, which were as follows:

- Increasing effectiveness and efficiency of Greater Amman Governorate water management;
- Increasing water billed as percentage of production;
- Attracting capital for improving and refurbishing the water infrastructure;
- Improving the hours of service and the quality of customer services;
- Ensuring sound financial management and improved cost recovery.

The monitoring reports indicate that LEMA was not able to achieve any improvements under the contract in several areas including the quality of customer service and the cash flows and was also unable to make a sufficient dent on the issue which most directly affected the standard of living and the economic activities in Greater Amman, which is the intermittent water supply. However, LEMA put a sound organizational structure in place and implemented important training programs.

At the end of the management contract in 2006, 40% percent of customers received water less than 36 hours per week[6]. Only a small number of customers had continuous service (subsequent performance under Miyahuna has not reversed this trend; as shown in the table below.

	2005	2006	2007	2008	2009	2010
Total water production (millions of m^3)	**126**	**128**	**133**	**138**	**140**	**147**
Average % NRW	**45.7%**	**42.1%**	**39.8%**	**36.8%**	**35.3%**	**34.3%**
Volume of NRW (millions of m^3)	**58**	**54**	**53**	**51**	**49**	**51**
Average hours of service/week	**66**	**51**	**47**	**44**	**38**	**36**
	LEMA	**LEMA**	**MYHN**	**MYHN**	**MYHN**	**MYHN**

(Source: Miyahuna Production Department)

LEMA's shortfalls in meeting its targets were to a large extent explained by weaknesses in the management contract including:

- Accountability issues arising from split responsibilities; LEMA was responsible for operations while WAJ was responsible for capital expenditures. WAJ tended to focus capital expenditure on the major assets while neglecting the distribution system, which was the source of many problems such as non-revenue water (NRW);
- Imbalances between the fixed fees and the incentives for performance under the management contract. The incentives were low compared to the fixed fee;
- Cumbersome procurement practices due to the interaction with WAJ;
- Insufficient allocation of resources to operations and maintenance and capital expenditures (cash surpluses from operations were transferred to WAJ);

[6] Reference: "Reforming the water and sanitation sector. The case of Jordan. The corporatization of the services in Greater Amman and Aqaba". Segura-IP3 2008

- Uncertain provision of bulk water.

Such matters were not specified in the management contract but turned out to be significant issues that would logically be considered in future outsourcing contracts.

During the LEMA contract, a major rehabilitation project costing US$250 million was carried out (between about 2002 and 2005, the "Greater Amman Restructuring") with the assistance of the donor community. This project was primarily directed to improve the primary/secondary distribution system and to create some 44 zones containing 330 districts (each zone and district is designed to be hydraulically independent). This rehabilitation project was conceived to significantly improve the operation of the distribution system, but less emphasis was given to rehabilitation. Hence NRW was reduced from over 50% to about 45% by the end of the project, according to Miyahuna Production Department, but this was still a high figure and above expectations.

THE FORMATION OF MIYAHUNA AND ITS EARLY PERFORMANCE

In 2005, the MWI and WAJ studied options to manage the water services in Amman. The study recommended entrusting the management of water and sewage services to a government-owned company with financial and administrative independence and operating on a commercial basis. The result was the creation of Miyahuna. WAJ granted Miyahuna the right to manage water services in Amman with ownership of customer revenues.

The relationship between the government and Miyahuna is regulated by the provisions of four main legal documents signed between WAJ and Miyahuna and approved by the Council of Ministers:

- The Articles of Association.
- The Memorandum of Association.
- The Assignment Agreement.
- The Bulk Water Agreement.

The first is the legal document for the creation of the company in accordance with the Companies Law. The second and third are more detailed documents outlining the rights and responsibilities of WAJ and Miyahuna respectively. These documents include items such as WAJ's delegation of authority to Miyahuna, terms and conditions for the provision of the water and sanitation service, Miyahuna's governance and personnel policies, tariffs and other charges, reporting, performance monitoring

indicators and regulation. The bulk water agreement specifies the terms and conditions for WAJ to provide bulk water to Miyahuna. This is a highly sensitive area in the relations between the two organizations because of the scarcity and variability of bulk water sources.

A summary of the main items included in the Assignment Agreement are presented below. They provide insights into the government's policies regarding issues such as centralization versus decentralization, autonomy and accountability, and finances.

1. ***Personnel policies***. The government provided Miyahuna with the opportunity to introduce changes in personnel systems and policies, which were among the most difficult issues under the LEMA management contract. Under LEMA's contract, there were two types of employees subject to different pay scales and benefits. One group of employees was made up of WAJ-seconded staff which had salaries and benefits corresponding to government employees. The other group was made up of LEMA-hired staff on contracts only for the life of the contract. LEMA-hired staff were subject to salaries and benefits more in line with the private sector. In contrast, Miyahuna has a common salary scale and similar type of contracts for all employees.

2. ***Scope of services***. The decision was that the JVA and WAJ would continue being responsible for providing bulk water from sources outside the Amman service area, while Miyahuna would be responsible for the operation of water supply systems within its service area. Miyahuna would be responsible for sewage collection and delivery to WAJ, which would be responsible for its treatment and disposal.

3. ***Raw water: supply and price***. The GoJ's decision to continue managing most bulk water resources through JVA and WAJ reflects its view that the management of scarce water resources, which vary highly from year to year, is a primary duty of the government, which has to mediate among competing agricultural, domestic and industrial users. However, no sector or locality in Jordan is happy with its share; a chronic problem for the country. The scarcity and high variability of water resources in Jordan poses a significant challenge for Miyahuna and its customers, as neither JVA nor WAJ is able to commit itself in advance to supplying a given quantity of water per year.

   The bulk water sources are specified in the Assignment Agreement, which also includes the prices and fees payable for water from different sources. Some of the sources are operated and

maintained by Miyahuna while others are operated by WAJ. The Assignment Agreement establishes that WAJ and Miyahuna should coordinate the timely provision of water and the development of additional sources to meet the demand.

The prices of bulk water are set by WAJ and are highly subsidized which can lead to a lack of incentive for water and electricity conservation. Coupled with the lack of water usage restrictions, this is not what one would expect to see in such a water-short and energy-short region.

4. ***Sewage treatment***. The major treatment facility for Amman (As-Samra) is operated under a BOT agreement between Suez and WAJ. WAJ charges Miyahuna for this wastewater treatment and Miyahuna's tariffs include a charge for this service.

5. ***Ownership of fixed assets***. WAJ handed over rights to Miyahuna to use applicable fixed assets in the provision of Miyahuna's services without transferring ownership.

6. ***Revenues***. The government allocated two sources of revenue to Miyahuna. Firstly, it allocated all customer charges and fees resulting from the provision of water and sanitation services. The charges and fees are set periodically by the Council of Ministers upon request from Miyahuna. It also allocated three percent of the property tax raised within Miyahuna's service area to Miyahuna.

7. ***Management and financing of investment projects***. The Assignment Agreement establishes two categories of capital investments; one designated as "normal" and the other as "major". Miyahuna is responsible for planning, funding and executing normal investments without exceeding an aggregate amount per year. Normal capital investments are defined as:
    - Fixed and mobile assets related to maintenance, rehabilitation and expansion of the water distribution and wastewater collection systems.
    - Maintenance of wells and other sources of water operated by Miyahuna; and
    - Maintenance of wastewater treatment plants operated by Miyahuna.

MIYAHUNA'S GOVERNANCE AND OWNERSHIP

Miyahuna is a government-owned limited liability company, meant to operate as a financially viable, self-sustaining entity and managed under modern commercial principles and private sector practices.

However, WAJ has a high degree of control over Miyahuna achieved through the appointment of the members of the main governing bodies of the company, and through the PMU.

WAJ, as the sole owner of Miyahuna, makes up its General Assembly, which is the highest authority of the company. The General Assembly appoints the seven members of Miyahuna's Management Committee (board) which is the entity responsible for oversight of the company. The board appoints the CEO and the executive managers of the company. In addition, the PMU monitors Miyahuna's performance against a set of performance indicators.

Miyahuna's tariffs have to be approved by the government, and the company is subject to certain government policies such as in procurement. At the same time, Miyahuna is subject to sales tax on inputs and income tax, just like a private company. It is therefore in practice neither a private company nor government agency, and in a sense suffers the disadvantages of both with limited benefits of either. It is best characterized as a partly-corporatized government agency.

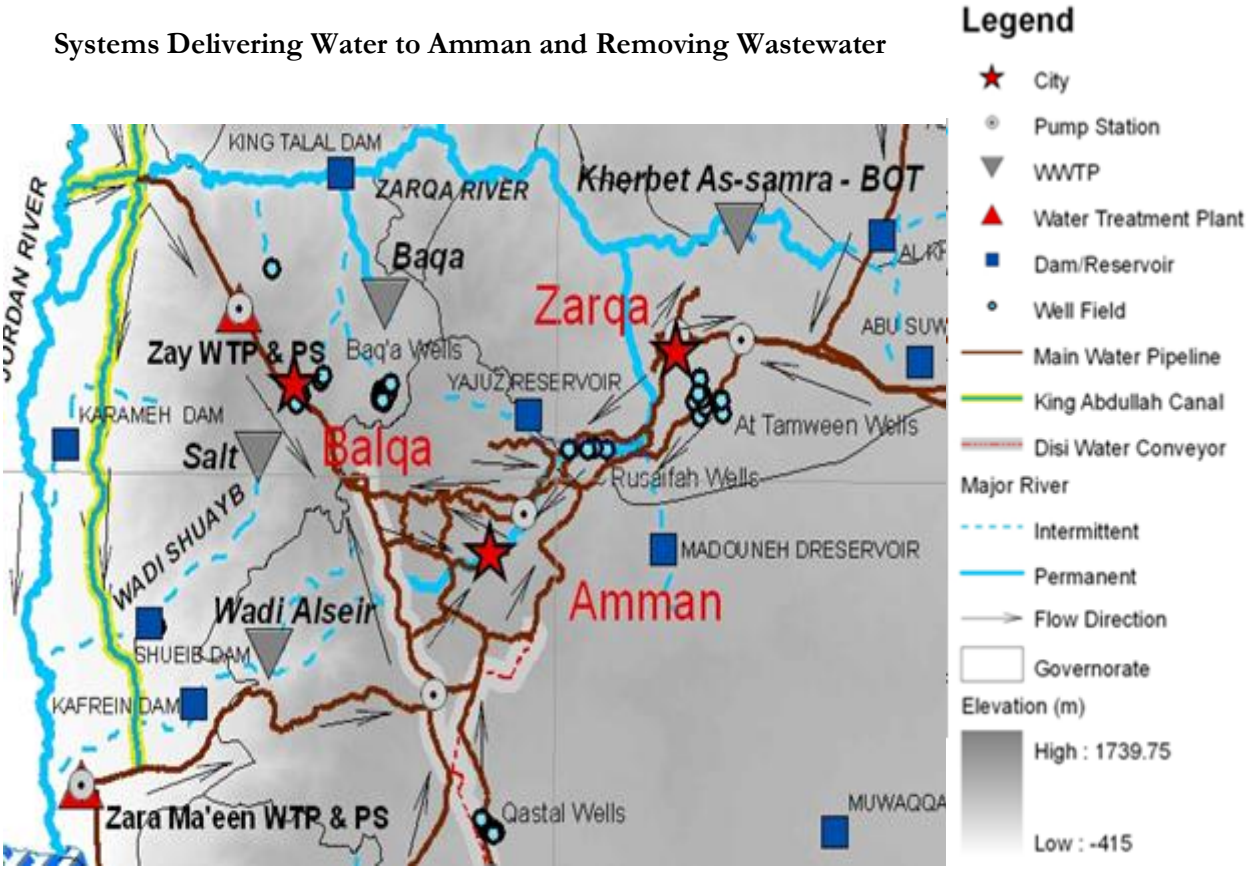
MANDATES, SERVICE STANDARDS, KEY PERFORMANCE INDICATORS

Miyahuna's mandates and Key Performance Indicators (KPIs) are stated in its Assignment Agreement with WAJ. Its main mandates are listed below:

8. Operate, maintain and monitor water and wastewater facilities within its service area;
9. Plan, finance, and implement capital improvements and expansion plans to expand water distribution and wastewater collection networks to timely meet demand;
10. Coordinate with WAJ on the timely provision of bulk water and the development of additional bulk water and wastewater treatment facilities to timely meet demand.

Water delivered to Miyahuna comes from systems operated by WAJ and the JVA. The largest source is the King Abdullah Canal, which receives its water from the Yarmouk River and also water collected from 10 other sources located in the northern part of the Jordan Valley. The intake at the canal located in Deir Alla is 230 meters below sea level, and raw water is pumped through a system of 4 pumping stations to 880 meters above sea level to the Zai Water Treatment Plant. From Zai WTP the treated water is pumped to the Amman distribution system.

Systems Delivering Water to Amman and Removing Wastewater



The water distribution system in Amman has 6,150 km of pipelines. It is divided into three subsystems:

- ***Primary***. This comprises major pumping stations, about 500 km of large pipes (diameters ranging from 400 mm to 1400 mm), and 26 large storage tanks;

- ***Secondary***. This comprises smaller pumping stations, 1,180 km of pipes with diameters ranging from 100 mm to < 400 mm, and about 30 storage tanks; and

- ***Tertiary***. Water from in-system storage tanks is distributed (meant to be by gravity but in some areas directly from the primary system) to end users. The tertiary system includes 3,000 km of mains (diameters ranging from 25 mm to < 100 mm) and about 1,400 km of house connection pipes to about 480,000 metered service users (customers).

In-system storage tanks with a total capacity of 447,000 m^3 are meant to supply and regulate the volume demanded by the end users, however in practice these reservoirs are often run on empty due to

combination of the shortage of water, the way the system is operated, the high NRW and the lack of effective demand management. Consequently, Miyahuna's distribution system does not benefit from the normal buffering effect of the in-system storage, and therefore supply disturbances are felt more quickly than should be the case.

The actual buffering capacity is in customer storage tanks, which store about one week's worth of water when full. Customers control their water usage so that their tanks do not empty, assuming the water distribution schedule occurs as planned.

PERFORMANCE TRENDS

According to the latest available (2009) Annual Monitoring Report compiled by the PMU, Miyahuna's performance for some indicators is better than the final year's performance by LEMA, but worse in other ways. The main measures are:

	Miyahuna 2009	LEMA 2006
NRW % system input volume	35	42
NRW volume, MCM	49	54
Complaints about service (non-billing), % of customers	31	N/A
Water quality complaints, % of non-billing complaints	0.2	0.5
Average supply hrs/week	38	51
No. of staff	1444	1263
% customers receiving continuous supply	2	13
KwH/ m^3 system input*	4.0	3.0

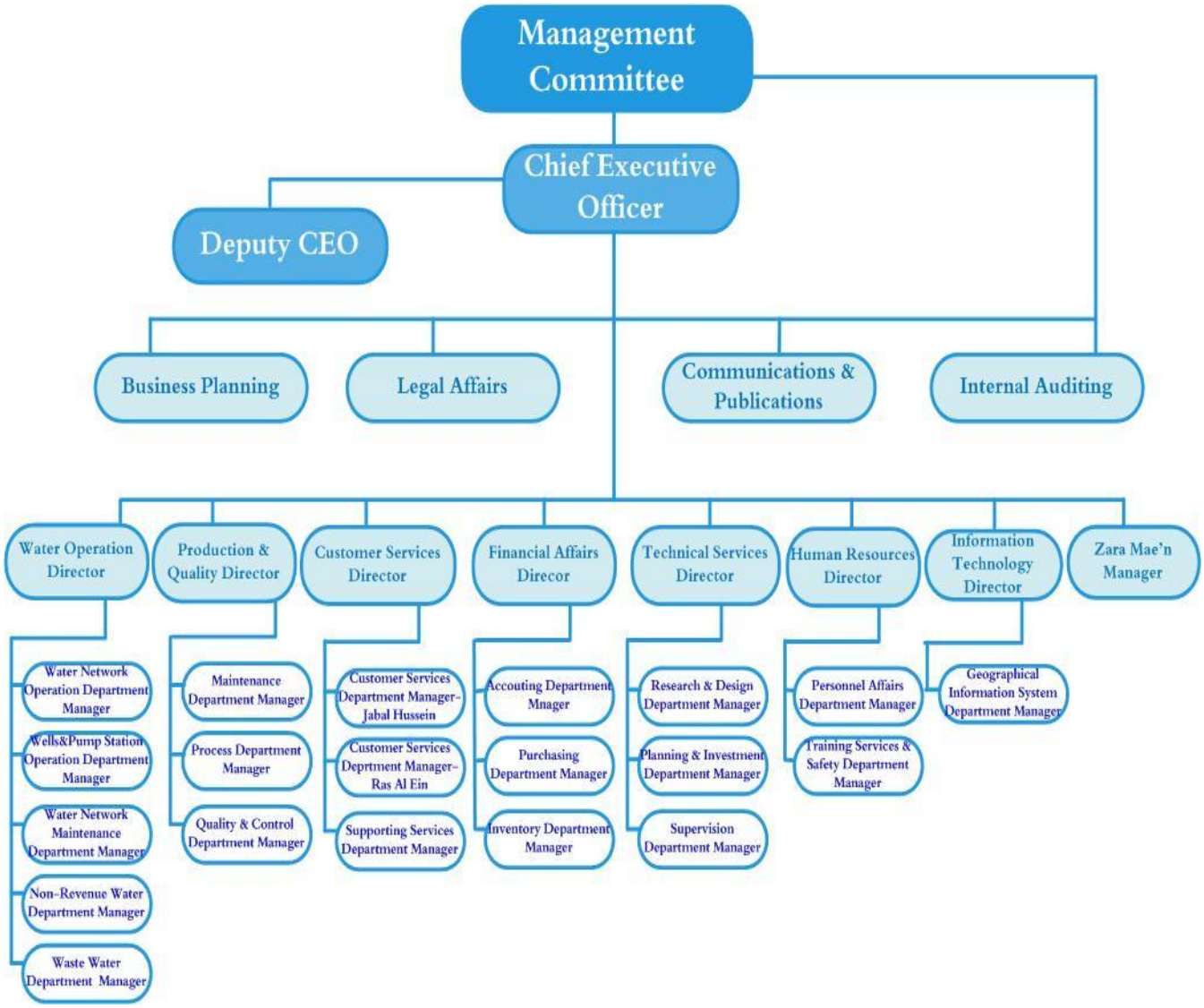
(Source: PMU monitoring reports 2007, 2008, 2009, and 2010

* Increase mainly the result of new water desalination plants)

The above figures highlight the need to focus on staff productivity, energy usage and NRW.

The PMU has commented that Miyahuna's overall performance was improving but that this has tapered-off recently.

ORIGINAL ORGANIZATIONAL STRUCTURE



STAFFING

According to PMU reports Miyahuna had approximately 1,260 staff when it came into being, and now (early 2011) has about 1500. In late 2010, staffing was increased by approx. 100 to cope with the change from quarterly to monthly meter reading/billing. In so doing, it is reported (from Miyahuna Accounting Department) that meter reading/billing costs will increase by about 2 million JD/year, eating into the estimated 6 million JD/year of revenue increase expected due to the tariff changes from January 2011.

There has been significant turnover at the executive level in Miyahuna's short history. The original CEO retired in March 2009, and the position has seen instability, with a permanent holder of the position for only 6 months out of the past 2 years. For most of the other 18 months, the WAJ Secretary General has acted as Miyahuna's CEO. The current CEO was appointed in June 2011. Miyahuna's directors (i.e. the direct reports to the CEO) have also seen a lot of turnover. The original Finance Director, HR Director and Production and Quality Directors have changed, and the position of Deputy CEO (who was also the original Production and Quality Director) has been abolished. The first Internal Audit Manager, who was hired in 2010, resigned shortly afterwards.

> *"Tariffs do not cover total costs. Accounting systems are weak."*
>
> (Water for Life – Jordan's Water Strategy 2008-2022 prepared by the Royal Committee for Water)

FINANCIAL POSITION

Presenting Miyahuna's financial picture is not a simple task. For example, there are several large subsidies that affect Miyahuna's true costs, and depreciation is understated (because major assets are still on WAJ's books). With these caveats, below are various analyses of Miyahuna's finances, starting with the financial projections from Miyahuna's original business plan (which has not been updated).

	2007	2008	2009	2010	2011	**Total**
Operating revenues						
Water and sewer billings	42.1	47.9	52.8	58.7	64.8	**266.2**
GAM 3% sewerage tax	11	11.3	11.7	12	12.4	**58.4**
Water connection fees	5.8	5.8	5.8	5.8	5.8	**29.1**
Sewer connection fees	5.8	5.8	5.8	5.8	5.8	**28.9**

	2007	2008	2009	2010	2011	**Total**
Other	3.6	3.6	3.6	3.6	3.6	**18**
Total Revenue	**68.3**	**74.4**	**79.7**	**85.9**	**92.4**	**400.6**
Variable Costs						
Electricity	20.6	22.3	23.3	25.1	27	**118.3**
Purchased water	5	6.7	7.9	9.5	11	**40.1**
Sewerage fees	4.6	11.1	12.8	15	17.4	**60.8**
Chemicals	1.3	1.7	2.1	2.5	2.9	**10.4**
Water connection costs	6	6	6	6	6	**29.8**
Salaries and benefits	7.7	8.9	9.9	10.4	10.9	**47.9**
Maintenance	2.1	2.4	3.1	4.1	5.2	**16.9**
Special operating projects	1.1	2.2	1.1	1.2	0.9	**6.6**
Fixed Costs						
Depreciation	1.6	2.6	3.1	4.3	5.4	**17**
Other	4.2	4.6	5.3	6	6.5	**26.6**

Note: Assumed no tariff increase from 2006, but tariffs increased in Jan 2011.

Shown below are Miyahuna's O+M costs Jan 2009 from a Dec 2010 GIZ report[7].

WAJ Calculation for O&M Cost Recovery

DETAILS	WAJ	NORTH	AQABA	MIYAHUNA	COMBINED
WATER SALES	28,680,464.0	12,101,868.0	8,217,784.0	40,165,553.0	89,165,669.0
SUBSCRIPTION&CONNECTION FEES	1,697,496.0	1,863,334.0	550,152.0	4,988,755.0	9,099,737.0
SEWERAGE & SEEPAGE FEES	3,875,268.0	1,166,030.0	2,090,076.0	20,703,832.0	27,835,206.0
SEWERAGE TAX	5,361,110.0	689,826.0	418,946.0	5,690,332.0	12,160,214.0
WATER SALES TO RELATED PARTIES	5,696,438.0	382,199.0	-	2,954,289.0	-
METERS MAIN.FEES	301,338.0	266,288.0	89,558.0	511,058.0	1,168,242.0
WATER SALES BY TANKERS	123,755.0	456,901.0	123,662.0	217,789.0	922,107.0
B. INTEREST	356,979.0	-	475,223.0	-	832,202.0
MISC. REVENUES	5,247,730.0	758,240.0	1,307,799.0	2,396,704.0	9,710,473.0
TOTAL REVENUES	51,340,578.0	17,684,686.0	13,273,200.0	77,628,312.0	150,893,850.0
SALARIES & WAGES	20,668,595.0	7,654,811.0	2,795,715.0	4,737,731.0	35,856,852.0
OPERATING & MAIN. EXPENSES	20,458,461.0	14,838,238.0	2,603,519.0	46,809,553.0	84,709,771.0
MISC. EXPENSES	-	-	-	27,503.0	27,503.0
G&A EXPENSES	621,285.0	524,125.0	548,746.0	3,459,976.0	5,154,132.0
WATER PUR. FROM RELATED PARTIES	3,313,754.0	-	3,536,754.0	2,560,284.0	-
SEWERAGE &WATER TREATMENT	-	-	-	10,471,402.0	10,471,402.0
TOTAL EXPENSES	45,062,095.0	23,017,174.0	9,484,734.0	68,066,449.0	136,219,660.0
INCOME BEFORE DEP & INTEREST	6,278,483.0	5,332,488.0-	3,788,466.0	9,561,863.0	14,674,190.0
O&M-COST RECOVERY RATIO	114%	77%	140%	114%	111%

[7] Established Baselines and Proposed Indicators of the German-Jordanian Water Sector Strategy 2010-2015

As can be seen, there are (understandably) differences between the 2006 projections and these results. However, there are some significant discrepancies such as the sewerage tax and salaries/wages being apparently only half the originally projected cost. To clarify Miyahuna's current financial state a function-based financial model was developed based on 2010 figures, a summary of which is given in section 5.5.

As mentioned earlier, one aspect of Miyahuna's financial position is reduced input costs. The two most important reductions are on electricity and bulk water charges. Electricity is sold[8] to Miyahuna at 42 fils/KWh against the Jordan average price of 60 fils and the price for large industrial users of 82 fils, resulting in a saving of between 10 and 25 million JD/year, depending on which price is taken as the reference point. These price reductions could be classified as indirect subsidies. Bulk water purchases are only about 2.5 million JD/year (from Miyahuna Accounting Department), however, quantifying the "subsidy" therein is not possible since there is no unambiguous reference price for bulk water.

Shown below are Miyahuna's 2009 balance sheet and income statement, as available in May 2010. It should be noted that these reports have been restated since then and therefore some figures have changed). The following points stand out:

i. Fixed assets are very low for a utility of Miyahuna's size, as most of these are on WAJ's balance sheet.

ii. "Leasing expenses of government infrastructure" is an arbitrary expense that could perhaps better be used to better maintain and improve Miyahuna's systems.

iii. Miyahuna seems not to account for depreciation even on the small asset base on its balance sheet.

iv. Any profit is almost all consumed in income tax.

[8] Prices were as at April/May 2010 as reported by Electricity Regulatory Commission

Miyahuna

Limited Liabilities Company

Amman-Jordan

Balance sheet as of 31 December 2009

Assets	Clarifications	2009	2008
Current assets		JOD	JOD
Cash & cash equivalents	4	2,172,668	7,806,718
Accounts receivable	5	9,725,780	10,647,926
Other current assets	6	10,737,751	11,132,924
Accounts receivable - WAJ	7	103,769	946,346
Inventory	8	9,233,907	7,836,526
Total current assets		**31,973,875**	**38,370,436**
Non-current assets			
Right to use government infra structure	9	1	1
Intangible assets	10	17,118,185	6,265,052
Properties, plant and equipment	11	7,085,464	5,780,213
Projects under construction	12	15,430,907	12,435,979
Total non-current assets		**39,634,557**	**24,481,245**
Total assets		**71,608,432**	**62,851,681**
Contra account			
Refundable subscriber's deposits under the custody of WAJ	13	3,246,994	3,313,517

Miyahuna
Limited Liabilities Company
Amman-Jordan
Balance sheet as of 31 December 2009

Liabilities and shareholders' equity **Current liabilities**	**Clarifications**	**2009** **JOD**	**2008** **JOD**
Accounts payable	14	3,988,348	4,977,971
Other current liabilities	15	1,992,852	2,848,715
Income tax provision	16	366,709	102,264
Total current liabilities		**6,347,909**	**7,928,950**
Non current liabilities			
Water subscriber's insurance		2,320,629	1,271,474
WAJ's contribution		62,850,436	53,581,436
Total non-current liabilities		**65,171,065**	**54,852,910**
Total liabilities		**71,518,974**	**62,781,860**
Shareholder's equity			
Capital	1	30,000	30,000
Obligatory provision		30,000	14,235
Optional provision		15,141	15,141
Retained earnings		14,317	10,445
Total shareholder's equity		89,458	69,821
Total liabilities and shareholder's equity		**71,608,432**	**62,851,681**
Contra account			
Liability against subscriber's deposits under the custody of WAJ	13	3,246,994	3,313,517

Miyahuna
Limited Liabilities Company
Amman-Jordan
Income statement for the year ended 31 December 2009

Revenues	Clarifications	2009 JOD	2008 JOD
Water revenues	18	43,848,689	42,730,198
Sewage revenues	19	20,703,832	20,492,069
Subscription and water delivery fees		4,988,755	5,957,689
Subscription and sewage system delivery fees		5,690,332	6,223,174
Other revenues		2,396,704	2,134,200
Total revenues		**77,628,312**	**77,537,330**
Expenses			
Water purchases	21	2,560,284	3,288,533
Operating & maintenance expenses	22	46,809,553	45,594,752
Water and sewage treatment		10,471,402	10,535,840
Leasing expenses of government infra structure	9	9,269,000	10,950,000
General & administration expenses	**23**	**8,197,707**	**6,984,162**
Other expenses	**24**	**27,503**	**50,957**
Total expenses		**77,335,449**	**77,404,244**
Profit before tax		**292,863**	**133,086**
Income tax expense	**16**	**273,226**	**100,000**
Net profit		**19,637**	**33,086**

FINANCIAL PROJECTIONS AND TRENDS

A financial model of Miyahuna was developed for this profile using 2010 actual figures as the basis. The table below describes the outcomes from running various scenarios based on that model. Any number of additional scenarios could be developed to test various options for Miyahuna. The model could also be used for other utilities, and for WAJ or the proposed Bulk Water Supply Authority.

Scenario	Description
Actual 2010 Results	Actual 2010 results showed that the company broke even. If the reduced charges for electricity are classified as a subsidy and then removed whereby Miyahuna would pay retail electricity prices, the change in financial value, if also taking deferred maintenance into account, would be a loss of 55 million JD.
Full Cost Recovery	This scenario shows that, all else being equal, Miyahuna's weighted average tariff would have to rise from the 0.51 JD/ m^3 charged in 2010 to 1.16 JD/ m^3 to break even with a proper level of maintenance and without low-cost electricity. (The tariff was increased in Jan 2011 to an estimated 0.6 to 0.65 JD/ m^3.)
Water Tariff Raised to 0.8, 1.0 JD/ m^3	These scenarios show the marginal effect of raising the weighted average tariff to 0.8 and 1.0 JD/ m^3, which is to improve Miyahuna's financial value by 25m JD if the tariff is increased to 0.8 JD/ m^3, or by 42m JD if the tariff is 1.0 JD/ m^3.
Non-Revenue Water Reduced from 50 MCM/yr to 40 or 30 MCM.	These scenarios show the marginal effect of reducing NRW by 10 or 20 MCM/year, which is to improve Miyahuna's financial value by 26 million or 41 million JD respectively. The assumed increase in annual maintenance needed to achieve these results is 10 million and 20 million JD respectively, and the assumed short term increase in capital expenditure needed is 20 million and 30 million JD/year respectively. Once the catch up capital expenditure is completed, the long term annual investment needed will probably be less than this. Once the Disi water arrives, financial modeling under the NRW reduction pilot project shows a very positive payback on investment in NRW reduction (the lower payback under current circumstances is due to the low tariff). These scenarios also take into account low-cost electricity.
Bulk Water Price Raised to 0.75, 1.5 JD/ m^3	These scenarios show the marginal effect of raising the bulk water price paid from almost nothing (the current situation) to 0.75 JD/ m^3 (indicative Disi water cost) and 1.5 JD/ m^3 (indicative cost of desalinated seawater from either the JRSP or Red-Dead Projects). The result is a massive increase in cost by 107 million JD/year to pay the full price of Disi water, and 217 million JD/year to pay for desalinated seawater. To put this in perspective, Miyahuna's total revenue is only about 80 million JD/year. These scenarios also take into account low-cost electricity.

The model uses costs both by function and by category.

The functional costs used to build the model are:

- Potable water sourcing and pumping
- Potable water treatment
- Bulk potable water pumping
- Potable water distribution
- Wastewater collection and pumping
- Wastewater treatment and disposal
- Revenue collection
- Customer services
- Planning
- Engineering
- Finance
- IT
- HR
- General management

For the first six above cost categories, each was further split into operations, planned maintenance and reactive maintenance.

The cost categories also included in the model are:

- Salaries, wages and benefits
- Electricity
- Chemicals
- Contracted services
- Bulk water
- Vehicles maintenance and fuel
- Other

Revenue was broken down thus:

- Water volumetric charges
- Wastewater volumetric charges
- GAM sewerage tax (a wastewater fee not related to volume)
- Connection fees for water and sewer
- Water sales to other governorates
- Other

All the cost and revenue figures were provided by Miyahuna's accounting department, except for the estimates of the splits between operations/planned maintenance/reactive maintenance, which involved some discussions with other managers[9].

Non-revenue water and its components are also shown in the model, mainly to provide a focus on this issue. In addition, the model provides for future revenues from treated wastewater sales[10] and system expansion charges[11]. The model includes all non-operating costs: income tax, royalties[12] and has provision to include future loan repayments.

Electricity is accounted for in the model at its current low cost level where the cost saving is estimated at 26 million JD in 2010 using 82 fils/KWH as the reference price. Even so, electricity is Miyahuna's largest cost.

Deferred maintenance is estimated as the difference between depreciation and the sum of maintenance and asset replacement. The estimated replacement value of Miyahuna's assets (about 1 billion JD) came from an analysis of total network lengths and current construction costs per kilometer, and estimated replacement value of the treatment plants. The assumed depreciation rate used (4%) reflects the accelerated decline in water network life caused by the current intermittent supply. The actual figure used can be changed if appropriate.

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[9] This 3 way breakdown is not completely accurate as Miyahuna does not track costs this way. In the time available, it was not possible to obtain a more accurate split but this would be a worthwhile task later. Miyahuna lumps "operations and maintenance" costs together, but conceptually operations, planned maintenance and reactive maintenance are different, even it sometimes performed by the same people.

[10] Currently, use of Amman's treated wastewater does not result in any revenue to Miyahuna. In contrast, the Aqaba Water Company sells treated wastewater.

[11] Such charges are common in high growth areas, and are not meant to cover the direct cost of connecting customers to the water or sewer systems, but are to cover broader costs driven by growth, such as expansion of treatment plants and major transmission pipes, even though such expansion may not be needed at the time of a particular project.

[12] It was stated that this item is not actually paid to WAJ but is offset by WAJ allowing Miyahuna to make capital investment on WAJ's assets. However it also was stated that the royalties accumulate as a debt owed by Miyahuna to WAJ, so have been shown as a cost since at some point they may have to be paid.

Asset replacement is added to maintenance costs, and the total subtracted from depreciation to estimate the level of deferred maintenance (which is substantial, estimated at 29 million JD in 2010).

The last two items above are included in the model to indicate the importance of a proper level of maintenance/asset replacement.

Capital investment is included in the model, but not counted as a cost in 2010. Rather, depreciation is used, as discussed above, to estimate the annual cost of capital provision. Capital investment is split between new assets and asset replacement. New assets are not counted as a cost, as they are simply the exchange of one type of asset (money) for another (assets).

This analysis shows that although the company made a small profit in 2010, if the effect of reduced cost electricity and deferred maintenance is taken into account, Miyahuna's financial value would decline by 55 million JD in 2010. The model also shows that Miyahuna's average tariff of 0.51 JD/ m^3 would have to be increased to 1.16 JD/ m^3 to counter this decline in financial value.

As can be seen, by far the largest upcoming impact on Miyahuna's financial position relates to the Disi water conveyance project. The Disi project water, expected to arrive in Amman in 2013, will result in an increase in the cost of water supply for Miyahuna from approximately 0.35 JD/ m^3 to between 0.7 and 1.0 JD/ m^3. The second major impact on Miyahuna's financial value is tariff-setting. For the first time in almost 20 years, the tariff structure was changed as of January 1, 2011. Tariffs are now based on monthly charges instead of quarterly and were increased by an estimated 10 to15% on average[13]. This was the first price increase since 2005. Even though the additional cost of meter reading and billing monthly instead of quarterly will reduce the positive effect of the tariff increase, with the projected revenue increase of approximately 6 million JD offset by approximately 2 million JD in collection costs (estimates from Miyahuna accounting department) it is still a significant gain for Miyahuna.

Reducing non-revenue water shows a positive effect on Miyahuna's financial value, even with the recognition that maintenance and investment must increase substantially to achieve it.

[13] The exact attributable revenue increase due to increased consumer rates is not possible to determine because of the change in structure to monthly from quarterly. The actual revenue increase will only be seen over 2011 compared to 2010.

INTERFACES WITH OTHER WATER ORGANIZATIONS, PROVIDER/CUSTOMER RELATIONSHIPS

Both WAJ and the JVA supply Miyahuna with bulk water: the JVA supplies bulk water to the Zai and Zara Main water treatment plants, WAJ supplies bulk water from other governorates, and Miyahuna obtains some supplies from its own wells. Miyahuna also supplies some bulk water to other governorates (13 MCM in 2010).

The JVA receives about 75 MCM/year of treated wastewater from the As-Samra wastewater treatment plant, with about 60 to 65 MCM originating from Miyahuna and the balance from Zarqa.

KEY ISSUES AND CONSTRAINTS

It is important to note that many of Miyahuna's issues and constraints are outside of its control and are socio-political in nature and tied to national water policy decisions. As such they warrant attention and consideration at higher levels. Many of Miyahuna's issues result from its lack of independence from WAJ and government-imposed constraints. Water sector reform needs to tackle these issues and impediments.

The most commonly articulated vision for Jordan's water sector comprises commercialized retail utilities, with a commercial bulk water supplier, and "megaprojects" supplying raw water under BOT or similar private sector arrangements. Miyahuna is meant to be one of the commercialized retail utilities, but is constrained in this as discussed below.

The major issues seen at the time of Miyahuna's formation, as stated in its 2007 business plan, were:

- Continuing significant water losses, which were 43% of system input, a high figure where water is scarce and increasingly expensive;
- A rehabilitation backlog, both for the tertiary water distribution system and the wastewater collection system;

  (Note: These two issues are related and persist, albeit that Miyahuna reports that NRW has reduced to about 34% of system input, and that about 70% of house connection pipes have been renewed, with most of the remainder programmed for renewal over the next few years.)
- Lack of capital investment planning capability, which was a new responsibility for Miyahuna. It was seen as important to develop Miyahuna's capabilities in design, analysis, procurement, monitoring and supervision and develop critical tools such as water and wastewater master plans and hydraulic modeling so important for a complex topography city as Amman;

- Human resources systems and compensation: needed personnel management system included a coherent and streamlined organizational chart, a proper position and classification structure and a compensation scale to retain good employees and promote career growth;
- Weak IT Department: the IT department was seen as having inadequate staff to develop and maintain current systems, to integrate them into more effective solutions, or to develop new systems; (Note: the IT Department has been able to make improvements in these areas since 2007)
- Limited internal and external communications: the existing program was mostly oriented to anticipate and manage crises rather than the full range of needed communication activities. There was also no program to inform and consult employees on a variety of issues.

Most of the above issues have seen progress made, but persist. For example NRW is high at 50 MCM/year from a total supply of 147 MCM (2010 figs).

The major issues seen currently are:

LEADERSHIP

There has been instability at the CEO level for the past 2 years and many of the original senior staff members have left, although there is now a stable management team in place under the leadership of the CEO who was appointed in June 2011.

POPULATION AND ECONOMIC GROWTH

According to Miyahuna Production Department the company is allocated about 2.5% more water each year, but this barely keeps pace with population growth, with a reported increase in customers of 5% per year, allowing nothing for demand increases from the commercial and industrial sector. There is clearly a widening gap between supply and demand which needs to be addressed. This is more fully explored in Annex 1: Water Balance.

FINANCIAL POSITION

Miyahuna covers its recurrent costs although it is recognized that low cost electricity and bulk water charges and deferred maintenance contribute to this achievement. Its future financial position is critically impacted by projected increases in bulk water costs after the Disi water becomes available, scheduled from 2013. The sustainability of Miyahuna will be determined by its capacity to cope with the projected increases in bulk water costs and in other areas and the level of "subsidies" provided by the GoJ. The

value of treated wastewater needs to be considered for reuse in agriculture (60 to 65 MCM/year, which if sold even at a low price could provide substantial new revenue).

PLANNED MAINTENANCE

Preventive routine maintenance is essential for ensuring that assets are able to function for the long term, thereby reducing or deferring investments. With a lack of adequate funds for proper preventative maintenance, service suffers and assets age prematurely, undermining past investments.

DECLINING TRADITIONAL WATER SOURCES

For decades, water demand (including losses) has outstripped supply in Amman, resulting in a "rationing" regime that first was used in summer and now operates year round. Average supply hours are ever shorter, declining from 66 hours/week in 2005 to 36 hours in 2010.

One major response to this situation is the Disi Aquifer water transfer project, currently under construction. This water is expected to arrive in Amman by early 2013. From discussions with PMU and Miyahuna, Disi water is estimated to cost 0.75 JD/m^3, about 2.5 times the current bulk water cost, and above the current average tariff of approximately 0.6 JD/m^3.

In February 2009, MWI issued the "Groundwater Abstraction Reduction Plan for Amman-Zarqa and Azraq Basins". The Plan outlines actions that ensure the reduction of unsustainable groundwater abstraction from the two basins. Once the Disi Project is completed, groundwater abstractions from these basins will cease. This will alleviate pressure on groundwater in these two basins and eventually allow for their recharge, and the gradual restoration of Al Azraq Oasis.

After the Disi water is introduced into Amman's system and continuous supply is established, NRW is expected to increase substantially unless remedial actions are taken to reduce both physical and commercial losses. Due to the expected high cost of Disi water, consideration will need to be given as to how Miyahuna will be able to absorb the extra cost. Consideration will also need to be given to the water distribution system and the effect of fully pressurizing the distribution network for continuous supply.

INDEPENDENT UTILITY

As stated in the Amman Water Management/Commercialization Assessment, Phase Two Report: Feasibility Analysis of New Company[14], prior to the establishment of Miyahuna: "WAJ should not have an input into the day-to-day operation of NEWCO and should act mainly as: shareholder, provider of bulk water and of wastewater treatment services, and be responsible for major capital improvements." In contrast to the above intent, WAJ, as owner and shareholder, has dominated Miyahuna's operations and key staff appointments. It also obtains a "royalty" for Miyahuna's use of WAJ's assets and funds pass back and forth between these entities for various purposes. These are potential conflicts of interest, since WAJ is also the primary bulk water and wastewater treatment supplier to Miyahuna.

It is recognized that the corporatization of Miyahuna is not complete, and needs to be finalized before Miyahuna can achieve its required level of performance. For example:

- Deliveries of bulk water are scheduled but are not binding on JVA or WAJ. This means that Miyahuna cannot offer a defined level of service to Amman's residents. There is no mechanism for compensation to be paid to Miyahuna or to customers for short deliveries or service interruptions;
- Procurement procedures are governed by GoJ rules, rather than private sector systems;
- Salary scales are in practice benchmarked against government salaries because WAJ controls such details;
- There is little separation of finances and assets from WAJ; and,
- The GoJ Audit Bureau observes Miyahuna's financial operations continuously. As a Government organization this is a legal requirement that would not apply to a fully corporatized company.

The above issues have been recognized in the following goals stated in "Water for Life: Jordan's National Water Strategy 2008-2022:

- "Wholesale" operations (national infrastructure) and "retail" operations (service delivery) are separated";
- "To prevent conflicts of interest, all government stock in water utility companies should be sold to the private sector"; and,

[14] USAID, July 2006.

- "In view of the increasing marginal cost of supplying water in Jordan, the growing demand for water and the low rate of cost recovery, move towards private sector participation and privatization".

TARIFFS AND SYSTEM EXPANSION CHARGES

Having low tariffs is a well-recognized issue. Not so well recognized is the lack of system expansion charges to recover the full cost of expanding water and wastewater facilities as the result of growth. The National Water Strategy had the goal of setting municipal water and wastewater charges to cover the cost of operation and maintenance, and recover all or part of the capital costs of water infrastructure within five years (i.e. 2013, now stated by the Minister of Water and Irrigation as the goal of 100% cost recovery by 2021). While the poor were to be protected, profitable undertakings in industry, tourism, commerce and agriculture were to be made to pay the full costs incurred to supply them with water.

Other relevant goals from the National Water Strategy included:

- Setting differential prices for water based on water quality, the end users, and the social and economic impact of prices on the various economic sectors and regions of the country;
- Structuring water tariffs as a tool to drive water consumption behavior change;
- Selling treated effluent at a price covering at least the operation and maintenance costs of delivery[15].

Current income levels do not provide sufficient funding for a proper level of planned maintenance and rehabilitation. The consequence is that physical infrastructure deteriorates sooner than it should. The constant shortage of funds also impacts employees' work environment and morale, contributing to staff turnover.

In addition, connection fees do not include system expansion charges (this weakness was recognized in the 2007 business plan). This appears to be a result of GoJ policy to encourage economic development. However, by not charging developers the cost of expanding water system components such as treatment plants and major pipes/pumping stations, supply problems are exacerbated. The table below from

[15] The Aqaba Water Company does this, selling treated wastewater to the phosphate company for ~0.7 JD/m3.

Miyahuna's 2007 business plan shows that connection fees are only designed to cover direct connection to networks (all figures are in millions of JDs).

Water Connection Fees	2007	2008	2009	2010	2011
# of new water connections	25	25	25	25	25
x avg. connection fee	233	233	233	233	233
= water connection fee revenue	5.8	5.8	5.8	5.8	5.8
Cost of Water Connections					
# of new water connections	25	25	25	25	25
x avg. cost per connection	238	238	238	238	238
= water connection expense	6.0	6.0	6.0	6.0	6.0
Sewer Connection Fees					
# of new sewer connections	19	19	19	19	19
x avg. connection fee	304	304	304	304	304
= sewer connection fee revenue	5.8	5.8	5.8	5.8	5.8
Other Revenues					
Water sales to other governorates	2.4	2.4	2.4	2.4	2.4
Water sold by tankers	0.2	0.2	0.2	0.2	0.2
Interest earnings	0.5	0.5	0.5	0.5	0.5
All other	0.5	0.5	0.5	0.5	0.5
	3.6	3.6	3.6	3.6	3.6

Because Miyahuna does not have ownership of all of the assets then there is a limited provision for asset depreciation within the budget, as shown in the table below from Miyahuna's 2007 business plan (all figures are in millions of JDs). Depreciation is only counted on new assets created by Miyahuna. Since WAJ did not transfer ownership of most assets to Miyahuna, Miyahuna does not recognize the related depreciation on its books, even though it is responsible for maintenance and "normal" capital investment within the systems it manages.

Salaries & Benefits	2007	2008	2009	2010	2011
Number of employees	1,260	1,300	1,370	1,370	1,370
x avg pay rate / employee (1)	6127	6,884	7,228	7,590	7,969
= projected salaries and benefits	7.7	8.9	9.9	10.4	10.9
Other Expenses					
Incentives	0.5	0.5	0.5	0.6	0.6
Vehicle rental and maintenance	2.1	2.4	3.1	3.5	4.0
Administration	0.8	0.8	0.8	0.9	0.9
Abu payment to contractor	0.8	0.9	0.9	1.0	1.0
	4.2	4.6	5.3	6.0	6.5
Depreciation					
Normal capital investments	7.3	13.4	12.2	14.4	13.7
Cumulative normal capital investment	7.3	20.6	32.8	47.3	60.9
Estimated composite depreciation rate	8%	8%	8%	8%	8%
Depreciation on normal capital investments	0.6	1.6	2.6	3.8	4.9
Depreciation on initial mobil assets	1.0	1.0	0.5	0.5	0.5
	1.6	2.6	3.1	4.3	5.4

NON-REVENUE WATER AND CONTINUITY OF SUPPLY

Progress has been made in recent years on NRW, with the NRW percentage decreasing from 39.8% in 2007 to 34.3% in 2010. However, these figures do not tell the whole story: from 2008 to 2010, NRW volume was static at approximately 50 million m^3/year despite greatly reduced supply hours, which means that the water distribution system is empty for more and more of the time. It seems that recent approaches have run their course and new ones are needed to further reduce NRW and prepare the system to receive the Disi water.

Recent pilot projects involving 3 teams of international NRW specialist firms in combination with some Jordanian water engineering firms have studied this issue, prepared an implementation plan, and taken initial remedial steps such as surveying all bulk and customer meters. At the time of writing, the optimal implementation plan is being discussed with Miyahuna, WAJ and the MWI.

The lack of continuous supply means that the full benefits of the Greater Amman Restructuring, which cost donors $250 million, have yet to be realized, as well as exacerbating water losses by damaging the network with each weekly turn-on. Intermittent supply can also increase energy usage.

DEMAND MANAGEMENT AND GREYWATER USE

Miyahuna has an opportunity to decrease water demand by providing technical assistance to customers wishing to reduce their water demand, by offering conservation programs, and by promoting use of grey water. For example, water utilities in arid regions have found that rebate programs to encourage customers to replace high water use fixtures with low water use ones can free up enough supply water to

delay the need for new high cost supplies. Comparisons of the cost of rebates vs. the cost to develop new water supplies often show the rebate programs can satisfy water demand at lower cost. Miyahuna has had several programs in this area, such as distributing 2 liter bladders that can be filled with water and put into toilet cisterns.

At present, the institutional framework in Jordan does not provide regulations on grey water reuse and recycling in buildings. The quality management and health aspects of reusing grey water are also challenges. Furthermore, the Construction Law in Jordan does not include guidelines on indoor grey-water recycling. USAID's IDARA project is working on developing standards in this area. Currently, there are only a few examples in Jordan of industrial or commercial development projects that have adopted grey water treatment systems.

Public awareness messages are being delivered in schools, public places and with the water bill.There is significant potential to reduce water demand in Amman. However, since the As-Samra WWTP now treats nearly all of Amman's wastewater for agricultural use, care should be taken in analyzing water conservation options so that reduced water pumping is not confused with end-use reduction from a whole of Jordan perspective.

RESPONSIVENESS TO CHANGE

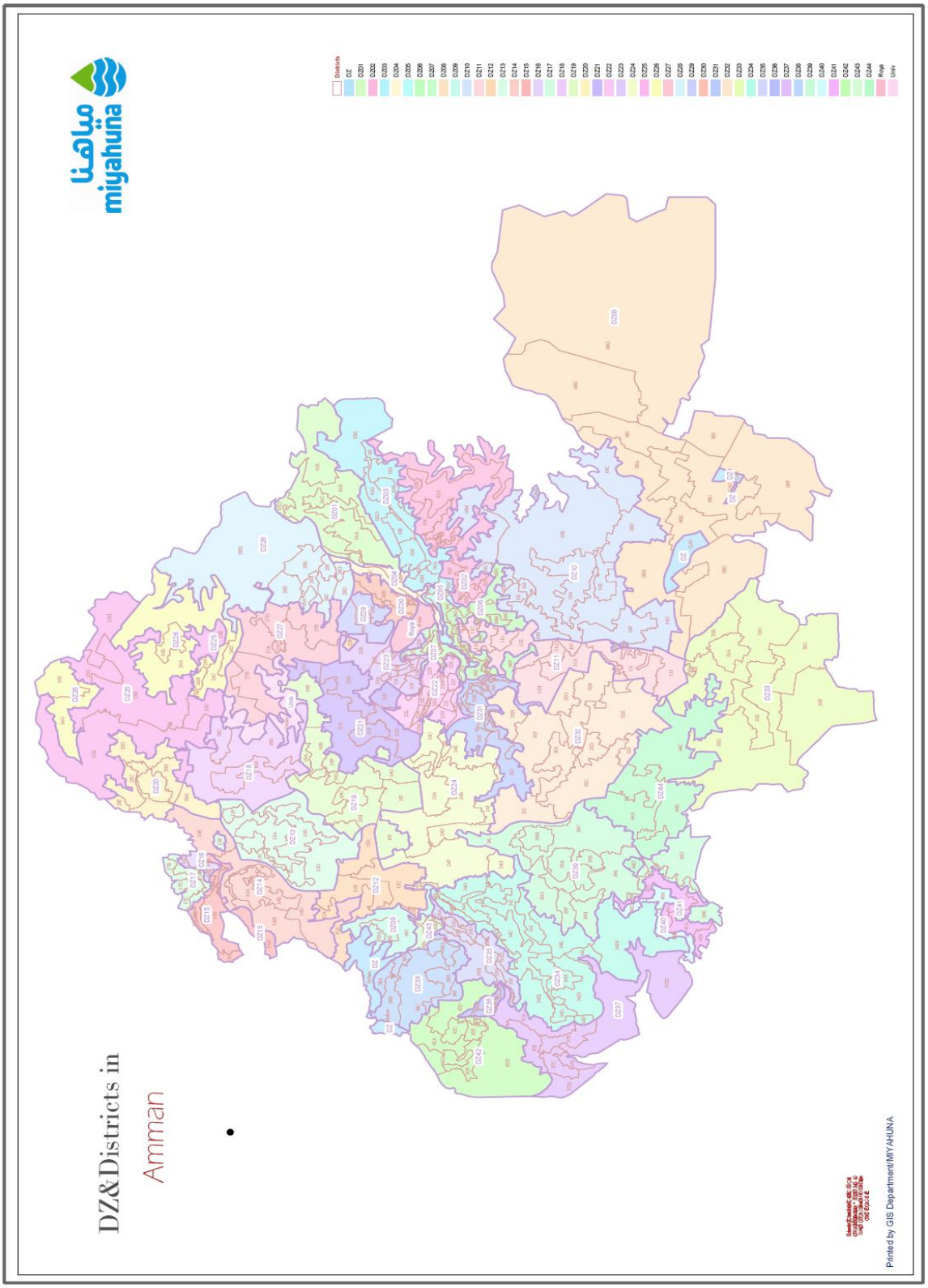
Finally, a recent assessment of Miyahuna (and other water agencies) appears below from the MCA Jordan Country Concept Paper, 2008.

Critical Success Factor	Effect	Responsiveness to Success Factor				
		Amman	As Samra	NGWA	Madaba	Aqaba
Process ownership by public partner and creation of win-win-situations	Increase process speed Increase credibility and reliability of process Reduce frictions	L	M	L	H	H
Cooperation for performance	Reduce frictions and improve performance Create trust and flexibility	VL	H	n.a.	VH	H
Knowledge about PSP and expectations management	Reduce information asymmetry Create awareness and provide basis for rational judgments Create learning processes in the sector	L	L	L	L	L
Speedy preparation and respect for timelines	Increase dynamics and motivation Reduce risk of unnecessary delays	L	M	M	M	H
Focused approach during contract preparation with few but enforceable targets	Increase likelihood to achieve objectives Reduce potential for misinterpretation	VL	VH	M	M	H
Speedy preparation and respect for timelines	Reduce potential for disappointment concerning bonuses Reduce frictions	H	H	H	M	H
Effective monitoring	Reduce frictions, improve cooperation Increase reliability of monitoring and regulation	L-M	H	M	H	L
Risk allocation and incentives to perform	Streamline interest of public and private partner Increase likelihood to achieve projects Increase risk for private sector	L	VH	VL	M	L
Baseline knowledge	Reduce insecurity through more reliable data base Reduce frictions and improve performance	L	n.a.	L	H	n.a.
Flexibility for private operator	Enable private sector to reap maximum of efficiency potential	VL	VH	M	M	VH
Staffing structure avoiding diverse salary and employment schemes	Reduces risk of frictions within staff Increases motivation of staff	VL	VH	M	VL	VH

CURRENT AND PAST INSTITUTIONAL REFORM EFFORTS, SUCCESSES AND FAILURES

Miyahuna is itself an example of institutional reform. It has been in existence for only 4 years, and until mid 2009 there was a USAID project (Amman Water Management/Commercialization Assessment) that supported the organization in its formative phase. This effort has had some successes and failures as discussed above, but Miyahuna's ongoing problems mean that the reform is not yet completed. Jordanian water officials and USAID agree that despite the progress made, further improvement is needed.

MAP OF URBAN AMMAN SERVICE



ANNEX 10 - WATER AUTHORITY OF JORDAN (WAJ) PROFILE

MISSION AND OBJECTIVES

The Water Authority of Jordan (WAJ) was created in 1984 as an independent body under the Prime Minister. The government monitors its operations and performance through the Central Audit Bureau and the Bureau of Supervision and Inspection. In 1988, WAJ was brought under the newly created MWI.

WAJ is currently responsible for municipal and industrial water supplies and wastewater treatment throughout the Kingdom. All of Jordan's water and wastewater networks come under WAJ's ambit.

The following[16]summarizes WAJ's responsibilities under Art. 6 of the WAJ law:

- Survey different water resources and determine ways, means and priorities for their implementation and use (except for irrigation);
- Set up plans and programs to implement approved water policies related to domestic and municipal water (i.e. supplied through public networks) and sanitation, including developing water resources, treating and desalinating water;
- Direct and regulate the construction of all public and private wells in the Kingdom, license well drilling rigs and drillers;
- Study, design, construct and operate wastewater projects;
- Draw terms, standards and special requirements in relation to the preservation of water and water basins, protect them from pollution;

[16] Source: Sector Review and Restructuring Options Report, Stone + Webster, 2004

- Carry out theoretical and applied research regarding water and wastewater;
- Issue permits to engineers and licensed professionals to perform water and wastewater works; and,
- Regulate the uses of water, prevent its waste and conserve its consumption.

Additional responsibilities can be conferred on WAJ by the Council of Ministers, upon the recommendation of the Minister for Water and Irrigation (Art.7). WAJ also has extensive ability to delegate functions to other entities. WAJ also takes roles that would logically fall to corporatized retail utilities.

WAJ has corporatized its two largest water distribution and wastewater collection systems. The Aqaba Water Company (AWC) was formed in 2005 and Miyahuna (Amman's water utility) came into existence January 2007. However, WAJ retains ownership of AWC and Miyahuna, and the Secretary General of WAJ chairs their boards. WAJ retains responsibility for providing water and wastewater services outside the boundaries of these two corporatized utilities.

The organizational structure of WAJ is centralized, except for location-specific operations. The utilities in each governorate are responsible to it for operating and maintaining their water and wastewater systems, dealing with customers' issues, and project supervision. Most of them enjoy some autonomy, though many key tasks are managed centrally, including financial and human resource affairs, workshop services, billing, capital investment, water quality monitoring, and planning.

WAJ's Strategic Objectives as stated in its 2009 Annual Report are to:

- Raise the level of water services (water and wastewater) on the service level scale by 5% annually;

- Increase the percentage of citizen satisfaction on satisfaction level scale from 57% in 2006 to 80% in 2012; and

- Increase the financial capability in the Authority annual budget by 2% until 2012.

WAJ's strategies, from its 2008-2012 business plan, are stated as:

- Uplifting the Supply and Demand Management System to a Comprehensive platform that includes Water resources, Water and Waste Water Management System by Adopting a Water Supply Cycle Management System;
- Building A Partnership With Citizens To Improve The Approval Level By Adopting "Citizen Resources Management Strategy";
- Reengineering Operations and Resources Management with Efficacy to Control Cost and Improve Productivity; and
- Raising the Capabilities of the Employees by Adopting a Knowledge Program, Building a Culture of Satisfying Subscribers and Service Excellence.

As can be seen, WAJ's role seems to be all-encompassing regarding the supply of non-agricultural water across Jordan, together with some regulatory roles[17], but that its stated strategies are quite general and ambiguous.

BASIC STATISTICS

WAJ's service territory is essentially the whole of Jordan, either directly or via agencies under its control.

- WAJ had 524,000 water customers in 2009; the projection for 2010 was 550,000;
- The quantity of potable water supplied in 2009 was 313 MCM;
- Total NRW for Jordan was 45% in 2009 and 42%[18] in 2010;
- WAJ 2007 estimates are that available water supply for Jordan is 750~900 MCM/yr, while demand[19] is 1350~1500 MCM/yr;

[17] Interviews with senior WAJ officials inducated their opinion; that due to the shortage of water "there is nothing to regulate" in an economic sense. This notion is being explored as part of the ISSP.

[18] Source: PMU, see table in section 6.7.

[19] The concept of "demand" as used in Jordan is unclear, since it includes a vision of expanded uses which may never occur. In practice, the supply of water in Jordan exceeds its sustainable levels, due to over pumping of groundwater. Demand projections appear to be set to justify major supply projects rather than meet any objectively-set or realistic demands considering the very high cost of supply expansion in Jordan

- Groundwater is being abstracted at 270 MCM/yr, which is twice the estimated recharge rate;

- WAJ owns or is the GoJ counterparty for the major drinking water and wastewater assets in Jordan, including owning the Zai and Zara Ma'in WTPs and all the major water/wastewater assets within Amman, and being the counterparty for the As-Samra and Disi BOT projects;

- WAJ only supplies a very small quantity of irrigation water, most irrigation wells are privately owned;

- WAJ plans to increase supply to 1150~1650 MCM/yr by 2022 (including 230-300 MCM/yr of treated wastewater, up from 100 MCM/yr.).

HISTORY OF FORMATION (DATES, PREDECESSORS, ETC.)

WAJ was originally established in 1983, pursuant to the Water Authority Law No.34 of 1983 (temporary law), as an autonomous corporate body, with financial and administrative independence. The main feature of this law was that the Water Authority took over all responsibilities of the entities responsible for water and wastewater.

According to this law the Water Authority was responsible for public water supply and wastewater services, as well as for overall water resources planning and monitoring. Furthermore, it took over all responsibilities of the former Amman Water and Sewerage Authority, Drinking Water Corporation, Natural Resources Authority's Water Studies Directorate, Excavation Directorate, Jordan Valley Authority's Hydrology Directorate, Dikes Directorate, Water and Wastewater Divisions, and Water Divisions of the municipalities of the Kingdom.

The permanent Water Authority Law No. (18) Of 1988 replaced the above-mentioned law. According to Article 3, WAJ was established as an autonomous corporate body, with financial and administrative independence. WAJ retained responsibility for the public water supply and wastewater services as well as for the overall water resources planning and monitoring, construction, operations and maintenance.

WAJ's policy responsibilities, as enshrined in the WAJ law, pre-date the formation of the MWI in 1992, and are no longer carried out; policy matters were taken over by the MWI according to the MWI by-law.

GOVERNANCE

WAJ has a Board of Directors, chaired by the Minister of Water and Irrigation. Board composition is mandated within the WAJ law. The ten other members of the Board are the Secretaries-General of various ministries, including the Ministries of Planning, Agriculture and Health, as well as the Secretary-General of WAJ and the Secretary-General of the Jordan Valley Authority (JVA)[20]. Provision is also made for one private sector member to be appointed by the Minister for Water and Irrigation.

The Board's responsibilities are summarized as:

- Setting forth a water policy for the Kingdom[21];
- Approving the water policy of the Kingdom [22]and plans for the development and conservation of water resources;
- Submitting draft regulations[23] to the Council of Ministers for approval;
- Obtaining loans, with the approval of the Council of Ministers;
- Making recommendations to the Council of Ministers concerning water tariffs[24]; and
- Investing WAJ's funds and revenues, with the approval of the Council of Ministers.

[20] This board composition is an example of overlapping roles in Jordan's water sector between the MWI, WAJ and JVA.

[21] An overlap with the MWI

[22] Ditto.

[23] A potential conflict of interest with WAJ's operational role.

[24] Ditto.

The Secretary-General of WAJ is responsible for implementing WAJ's policies and plans and its day to day administration. The Secretary-General is responsible to the Minister for Water and Irrigation.

The Council of Ministers, on the recommendation of the Minister for Water and Irrigation, may assign any of the Authority's duties or projects to any other body from the public or private sector or to a company owned totally by the Authority. This may include transfers of project management, a lease or ownership.

MANDATES, SERVICE STANDARDS, KPIS

There are no mandated supply quantities or hours of service, but there are targets as shown in the tables below from WAJ's 2009 annual report. In practice, water supplies are "juggled" between competing uses as best as possible.

There are drinking water quality standards (based on WHO standards but with some differences such as increased sampling frequency due to the inherent contamination risks associated with intermittent supply) but it is unlikely that water at the point of consumption meets international drinking water quality standards, because of the customer storage tanks that are often unsealed, resulting in potential contamination. Jordanians are wary of the quality of the public water supply and the vast majority purchase bottled water and or use in-home treatment systems to minimize precieved quality issues.

No.	Performance Indicator	achieved Value 2008	Target Value 2009	Achieved Value 2009	% of Deviation	Target Value 2010
1	% of citizens serviced with potable water	98%	98%	98%	0%	98%
2	Quantity of Potable water supply (million m^3)	310.3	327	313.4	-4.3%	342
3	Per capita share of potable water (liter/day)	145	146	144	1.38%	146

(**Source: WAJ Annual Report 2009)**

Governorate	Water production	Water Supply	Per capita share (liter/day)
Capital	133,5	129	153
Zarqa	48,4	46,7	143
Irbid	35,5	37	95
Mafraq	24,3	20,3	198
Balqa	13,1	23,1	158
Karak	20	14,6	172
Tafila	5	4,9	161
Ma'an	11,6	9,1	219
Jarash	2,8	4,6	71
Ajloun	3	3,9	78
Madaba	12,4	7,8	143
Aqaba	19	12,4	261
Total	328,6	313.4	144

(**Source: WAJ Annual Report 2009**)

Note that the per capita share figures above include NRW, ie the stated amounts overstate the amount of water actually supplied[25].

Other KPIs are described in the next table.

[25] The overstated amount is leakage, a subset of NRW. Other NRW causes, primarily meter errors and theft, do not reduce the amount of water used by customers.

Performance Indicators	Performance Indicators of Water Sector as per National Agenda		Performance Indicators of Water Authority According to 2008-2012 Strategic Plan		
	2006	2012	2008	2009	Target 2010
% of Water Network-serviced citizens	97%	98%	98%	98%	98%
Percentage of Waste Water Network-Serviced Homes	58%	70%	62%	63%	65%
Percentage of Loss of Domestic Water	46.5%	30%	43.9%	44.7%	40%
Annual per capita Share of Water (all uses) in cubic meters.	150	160	145	146	147
Percentage of cost recovery (operation, maintenance and part of capital cost)	70%	75%	70%	%72	%73
Percentage of potable water quality conformity (world average 95%)	98 %	98 %	99%	99.3%	98.3%

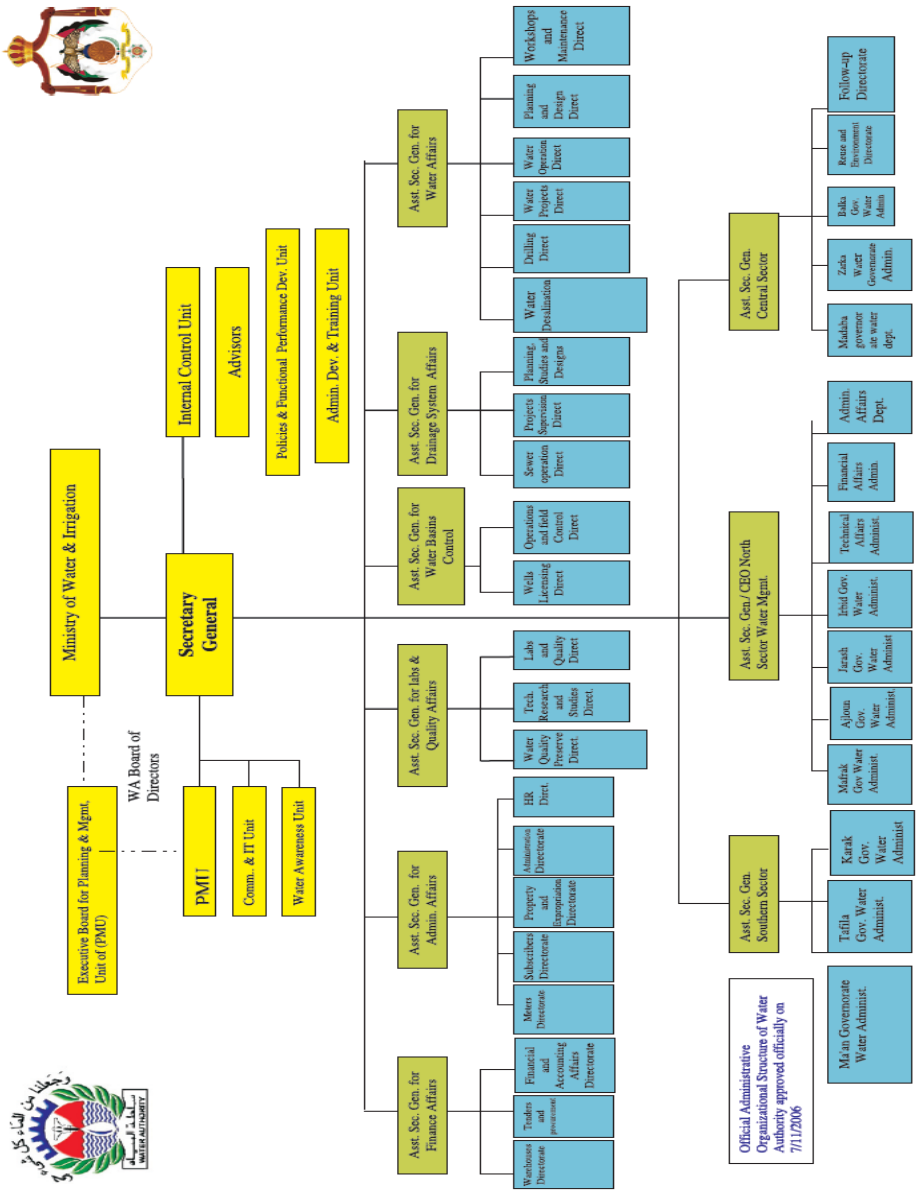
As mentioned earlier, most of Jordan has only an intermittent water supply. The major supply expansion project under way is the Disi water conveyance project, which will bring fossil groundwater from the south of the country to Amman and other northern locations[26]

While it will increase service, the Disi project includes a take-or-pay mandate (with WAJ, which is the GoJ counterparty for this project); 100 MCM/yr is to be paid for whether it is all taken or not, unless this is the result of contractor default. Originally, it was intended that all Disi project water would come to Amman, but there is now talk of sending some elsewhere. In any case, the net gain to Amman will be less than 100 MCM/yr (actual amount is unclear), as some wells will be shut down to help restore over-drafted groundwater in the Azraq and Amman-Zarqa basins, and ~10 MCM/yr will be redirected to the northern governorates once the Northern Governorates Water Conveyer is complete and the Disi water is available.

[26] The allocation of water among different locations that could be supplied from the Disi water (in gross terms and more importantly, net of transfers) has not yet been decided

ORGANIZATION CHART

Eighteen directorates under the directive of eight Assistant Secretary Generals (Water Affairs, Sewerage Affairs, Regional Affairs (Southern, Middle and Northern Region), Financial Affairs, Administrative Affairs), as well as five units directly subordinated to the Secretary General fulfill WAJ's functions.



STAFF NUMBERS

WAJ had 6034 staff in 2008, 5935 in 2009, and had a 2010 target of 5870.

INTERFACES WITH OTHER WATER ORGANIZATIONS, PROVIDER/CUSTOMER RELATIONSHIPS

WAJ interfaces with the MWI and all water utilities in Jordan, as well as being the legal owner of all the utilities. It is also a bulk water provider and wastewater treatment provider to many of the retail utilities, meaning that arms-length bulk provider/customer relationships do not exist.

The JVA is a major bulk water supplier to WAJ, at 100 MCM per year (supplied free of charge).

The MWI assumes full responsibility for water and public sewage in the Kingdom. However, responsibilities enshrined in the WAJ and JVA laws can overlap with the MWI's responsibilities, at least in theory. Art.5 of the WAJ law states that the MWI is responsible for all water and wastewater systems and related projects and shall set forth a water policy and submit it to the Council of Ministers for approval. This Article appears to conflict with the responsibilities conferred on WAJ and its Board in terms of both policy and implementation. In practical terms, however, water policy in Jordan has been developed by the Ministry and adopted by the Council of Ministers.

This lack of legal clarity is reportedly[27] not reflected in the day to day responsibilities exercised by the Ministry and WAJ, with MWI being responsible for policy and WAJ being responsible for implementation.

While the current arrangements may work in practice, it has been recommended in the past that the responsibilities of WAJ and MWI be clarified under a new water law[28] for Jordan. The Stone and Webster report summary of recommended responsibilities appears in the table below. However, this needs discussion. For example, the idea of WAJ being involved in price regulation,

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[27] By Stone and Webster

[28] In the opinion of the PMU, the water law needs to both clarify agency roles and establish water rights and customer rights regarding water.

when it is also a service provider, would be a conflict of interest and is not the recommended approach from the ISSP Institutional Assessment.

Recommended Sector Functions

Sector policy	Sector policy developed by MWI and adopted by Council of Ministers
Service provision	Water Authority of Jordan and private operators where responsibility has been delegated by the Council of Ministers
Regulation of prices, water resources and customer service standards	*Prices*: WAJ Board of Directors / Council of Ministers *Water resources*: Water Authority of Jordan *Service standards*: no regulation of service standards
Drinking water policy, monitoring and enforcement	*Policy*: Ministry of Health *Monitoring*: Water Authority of Jordan / Ministry of Health *Enforcement*: Ministry of Health
Environmental policy, monitoring and enforcement (with respect to water resources)	*Policy*: Water Authority of Jordan (as per Art.6b WAJ law) Corporation for Environmental Protection (as per Art.5f Law of Environmental Protection) *Monitoring*: Water Authority of Jordan, Corporation for Environmental Protection (as per Art.5e and Art.17 of the Law of Environmental Protection) *Enforcement*: Corporation for Environmental Protection and the courts (as per Art.22 Law of Environmental Protection)
Contracting for private investment	MWI: contract development WAJ: contract counterpart and contract monitoring

(**Source: Stones and Webstar Report 2004)**

Other interfaces exist in public health and environmental matters. In relation to environmental policy, monitoring and enforcement, the Law on Environmental Protection (No.12 of 1995) gives significant responsibilities to the Corporation for Environmental Protection. In practice, however, the Corporation has little to do with the water sector. The Ministry of Environment has overall responsibility for monitoring and ensuring compliance with legal requirements. Responsibility for monitoring quality of drinking water resides in the Ministry of Health.

FINANCIAL STATEMENTS

Shown below are WAJ's 2009 financial statements, the latest ones available. WAJ:

- Holds almost all of Jordan's water and wastewater assets on its balance sheet;
- Has an accumulated deficit, at ~1 billion JD, which is very large in the context of Jordan's economy, and is growing rapidly;
- Has revenue, at ~50 million JD/year, which is small in comparison to its asset base;
- Only barely covers cash expenses, with no provision in its tariff structure to recover depreciation. Based on this depreciation, WAJ's existing asset base value is eroding at ~60 million JD/year;
- As the agency responsible for major investments in the Kingdom, is consuming a large amount of cash during this period of heavy investment (eg Disi), much of it from domestic and foreign loans.

Water Authority of Jordan
Autonomous Public Corporation
Amman – Jordan
Balance sheet at 31 December 2009

Assets	**Number**	**2009**	**2008**
Non-current assets		**JOD**	**JOD**
Properties, machines & equipment	3	664,497,433	685,473,964
Projects under construction	4	444,908,764	374,810,940
Investment in subsidiaries	5	53,999,000	44,680,000
Total non-current assets		**1,163,405,197**	**1,104,964,904**
Current assets	**Number**	**2009**	**2008**
Inventories		14,260,016	12,984,260
Related parties debit balances	6	140,952,627	107,766,782
Other debit balances & Expenditure advances		5,502	8,977
Accounts receivable	7	21,993,325	22,126,004
Cash & cash equivalents	8	110,257,466	7,228,875
Total current assets		**287,468,936**	**150,114,898**
Total assets		**1,450,874,133**	**1,255,079,802**

Water Authority of Jordan
Governmental institution
Amman – Jordan
Balance sheet for 31 December 2009

Equity & liabilities	Clarifications	2009 JOD	2008 JOD
Equity			
Capital	9	1,883,336,470	1,724,699,755
Accumulated deficit		-1,057,311,796	-969,869,682
Net equity		**826,024,674**	**754,830,073**
Non-current liabilities			
International loans	10	216,235,638	198,396,965
Public bonds	11	234,500,000	158,000,000
Total non-current liabilities		**450,735,638**	**356,396,965**
Current liabilities			
Related parties credit balances	6	**832,944**	**---**
Other credits balances	12	63,469,657	25,389,484
Accounts payable	13	4,184,907	3,574,836
International loans-current portion	10	14,782,485	14,384,945
Public bonds – current portion		62,000,000	59,000,000
Accrued loans installments & interests		1,199,044	1,378,787
Due to bank		27,644,784	40,124,712
Total current liabilities		**174,113,821**	**143,852,764**
Total liabilities		**624,849,459**	**500,249,729**
Total equity & liabilities		**1,450,874,133**	**1,255,079,802**

Water Authority of Jordan

Governmental institution
Amman – Jordan
Profit & Loss statement at 31 December 2009

Revenue	Clarifications	2009 JOD	2008 JOD
Water sales revenue	15	28,251,988	20,555,297
Subscription, application and connection fees		1,697,496	3,478,916
wastewater and drainage charges		3,875,268	4,203,087
Sewerage tax 3%		5,361,110	5,526,766
Water sales for related parties	6	5,696,438	6,897,905
Related party's plants and water meters Maintenance charges	6	2,809,075	2,015,950
Miscellaneous revenues		1,641,519	1,823,412
Private well's license fees		491,961	1,030,502
Earned discount		--	979,960
water meters maintenance fees		606,514	707,695
Water sales by tankers		123,755	134,479
Bank interests		356,979	513,291
Total revenues		**50,912,103**	**47,867,260**

Expenses	Clarifications	2009 JOD	2008 JOD
Water purchases from Related parties	6	3,313,754	3,007,698
Salaries and wages		20,668,595	19,988,272
Operation & maintenance expenses	16	21,558,132	22,051,787
Administrative expenses	17	621,286	741,169
Total expenses		**46,161,767**	**45,788,926**
Surplus of revenue over expenditure before depreciation , used allowance for doubtful debts, bad debts, interests & currency exchange differences		4,750,336	2,078,334
Depreciations		-67,568,402	-55,549,464
Income rather than the use of property. machines and equipments	6,5	9,269,000	10,950,000
Doubtful debts		-2,920,097	-7,544,294
Loans interest & banking facilities		-21,637,189	-17,844,524
Currency differences		-9,335,762	10,384,345
Deficit		-87,442,114	-57,525,603

Water Authority of Jordan
Governmental institution
Amman – Jordan
Change in Equity at 31 December 2009

	Capital	Accumulated deficit	Total
	JOD	JOD	JOD
Balance at 1 Jan 2008	1,646,128,373	-912,344,079	733,784,294
Capital increase	78,571,382	-	78,571,382
Operating Deficit	-	-57,525,603	-57,525,603
Account for 31 Dec 2008	1,724,699,755	-969,869,682	754,830,073
Capital increase	158,636,715	-	158,636,715
Operating Deficit	-	-87,442,114	-87,442,114
Account for 31 Dec 2009	1,883,336,470	-1,057,311,796	826,024,674

Water Authority of Jordan
Governmental institution
Amman – Jordan
Cash flow list for end of 31 December 2009

Cash flow from operating activities	2009 JOD	2008 JOD
Deficit	-87,442,114	-57,525,603
Amendments for:		
Depreciation	67,568,402	55,549,464
Income rather than the use of property. machines and equipments	-9,269,000	-10,950,000
Doubtful debts	2,920,097	7,544,294
Change in operational assets & liabilities		
Inventory	-1,275,756	1,202,260
other debit balances – expenditure advances	3,475	-3,498
Debtors	-2,787,418	2,611,329
Other payables	38,080,173	-8,849,012
Creditors	610,071	445,534
Net cash from operating activities	**8,407,930**	**-9,975,232**

Cash flow from investment activities		
Investment in subsidiary companies	-50,000	-15,000
properties, plant & equipment purchases	-712,112	-1,294,656
Proceeds from selling properties, plant & equipment	723,777	---
Additions on under implementation projects	-116,701,360	-103,383,769
Related parties debit balances	-32,352,901	-19,237,816
Net cash from investment activities	**-149,092,596**	**-123,926,241**
Cash flow from financing activities		
Capital increase	158,636,715	78,571,382
International loans	18,236,213	-2,503,758
Public bonds	79,500,000	32,000,000
Accrued installments & interests	-21,816,932	-22,142,647
Interests & banking facilities	21,637,189	17,844,524
Due to banks	-12,479,928	24,587,623
Net cash from financing activities	**243,713,257**	**128,357,123**
Net change in cash & cash equivalents	**103,028,591**	**-5,544,350**
Cash & cash equivalent at the beginning of the year	7,228,875	12,773,225
Cash & cash equivalents at the end of the year	**110,257,466**	**7,228,875**

CURRENT BUDGET

This is shown below for 2009[29]; however a more detailed breakdown may be warranted as part of understanding issues and improvement opportunities.

DETAILS	WAJ	NORTH	AQABA	MIYAHUNA	COMBINED
WATER SALES	28,680,464.0	12,101,868.0	8,217,784.0	40,165,553.0	89,165,669.0
SUBSCRIPTION&CONNECTION FEES	1,697,496.0	1,863,334.0	550,152.0	4,988,755.0	9,099,737.0
SEWERAGE & SEEPAGE FEES	3,875,268.0	1,166,030.0	2,090,076.0	20,703,832.0	27,835,206.0
SEWERAGE TAX	5,361,110.0	689,826.0	418,946.0	5,690,332.0	12,160,214.0
WATER SALES TO RELATED PARTIES	5,696,438.0	382,199.0	-	2,954,289.0	-
METERS MAIN.FEES	301,338.0	266,288.0	89,558.0	511,058.0	1,168,242.0
WATER SALES BY TANKERS	123,755.0	456,901.0	123,662.0	217,789.0	922,107.0
B. INTEREST	356,979.0	-	475,223.0	-	832,202.0
MISC. REVENUES	5,247,730.0	758,240.0	1,307,799.0	2,396,704.0	9,710,473.0
TOTAL REVENUES	51,340,578.0	17,684,686.0	13,273,200.0	77,628,312.0	150,893,850.0
SALARIES & WAGES	20,668,595.0	7,654,811.0	2,795,715.0	4,737,731.0	35,856,852.0
OPERATING & MAIN. EXPENSES	20,458,461.0	14,838,238.0	2,603,519.0	46,809,553.0	84,709,771.0
MISC. EXPENSES	-	-	-	27,503.0	27,503.0
G&A EXPENSES	621,285.0	524,125.0	548,746.0	3,459,976.0	5,154,132.0
WATER PUR. FROM RELATED PARTIES	3,313,754.0	-	3,536,754.0	2,560,284.0	-
SEWERAGE &WATER TREATMENT	-	-	-	10,471,402.0	10,471,402.0
TOTAL EXPENSES	45,062,095.0	23,017,174.0	9,484,734.0	68,066,449.0	136,219,660.0
INCOME BEFORE DEP & INTEREST	6,278,483.0	5,332,488.0-	3,788,466.0	9,561,863.0	14,674,190.0
O&M-COST RECOVERY RATIO	114%	77%	140%	114%	111%

[29] Source: Established Baselines and Proposed Indicators of the German-Jordanian Water Sector Strategy 2010-2015

FINANCIAL PROJECTIONS AND TRENDS, SUBSIDIES

In 1998 the Council of Ministers decided to capitalize WAJ's local loans and to transfer that debt to the GoJ. Even so, WAJ's deficit has returned and increased dramatically in recent years as shown below. Its deficit is not a part of the total deficit of the GoJ, but is in addition[30].

The tables below, from USAID Jordan's economic development office, summarize WAJ's finances over the past decade, and show a rapidly expanding deficit and the need for various subsidies.

WAJ										
Revenue	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Current Revenue	70,718	73,437	82,273	98,731	105,828	112,000	70,247	72,113	71,656	67,218
Government Contribution/Subcidies	39,202	25,954	20,479	6,910	15,000	10,000	16,104	57,665	42,743	21,272
Other Grants and Donations	28,362	7,800	20,150	42,024	61,733	50,000	31,368	18,721	24,567	22,900
Social Security Package Support	330	1,219	-	96	2,859	1,500	2,508	2,673	-	-
Other				16,288	6,031	28,500	9,517		500	437
Total Revenues	**138,612**	**108,410**	**122,902**	**164,049**	**191,451**	**202,000**	**129,744**	**151,172**	**139,466**	**111,827**
Expenditures										
Current Expenditures	67,496	72,499	69,372	72,962	75,877	81,050	62,399	72,303	78,138	80,079
Capital Expenditures	126,953	102,580	95,429	126,182	128,581	110,950	102,962	139,769	159,000	263,606
Total Expenditures	**194,449**	**175,079**	**164,801**	**199,144**	**204,458**	**192,000**	**165,361**	**212,072**	**237,138**	**343,685**
Deficit after grants	(55,837)	(66,669)	(41,899)	(35,095)	(13,007)	10,000	(35,617)	(60,900)	(97,672)	(231,858)
Deficit before grants	(123,401)	(100,423)	(82,528)	(84,029)	(89,740)	(50,000)	(83,089)	(137,286)	(164,982)	(276,030)

[30] Autonomous GoJ-owned entities such as WAJ have their own finances which are not consolidated within the central government budget, however there are subsidies that flow to WAJ from the GoJ.

WAJ - Financing Budget	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A- Uses										
Settlement of Deficit	55,837	66,669	41,899	35,095	13,007	-	35,617	60,900	97,672	231,858
Settlement of Domestic Loans Installments	-	-	13,000	30,000	30,000	47,000	30,000	64,000	53,000	62,000
Settlement of Foreign Loans	3,680	4,072	6,965	8,792	8,885	12,000	11,311	15,494	15,036	15,195
Accumulated Deficit	5,644	1,300					16,901			
Others					24,000				34,303	43,055
Total of Uses	**65,161**	**72,041**	**61,864**	**73,887**	**75,892**	**59,000**	**93,829**	**140,394**	**200,011**	**352,108**
B- Sources										
Domestic loans	30,000	30,000	47,000	30,000	54,000	10,000	62,000	111,117	156,196	255,483
Foreign loans	33,861	43,942	23,193	26,887	11,690	37,000	11,020	29,277	23,199	96,625
Others				17,000		12,000	20,809		20,616	
Accumulated Surplus					10,202					
Total of Sources	**63,861**	**73,942**	**70,193**	**73,887**	**75,892**	**59,000**	**93,829**	**140,394**	**200,011**	**352,108**
Deficit/Surpluss after Finance	(1,300)	1,901	8,329	-	-	-	-	-	-	-

Consultation with WAJ senior staff indicated that their opinion was that apart from Amman Governorate, it will never be possible to cover even O&M costs, let alone capital. This view contrasts with other senior water leaders who say that the sector as a whole must become self sufficient within 10 years, however means to achieve that result are not specified.

But WAJ's overall performance also masks significant regional variations, as shown in the table below, even though the data is dated (updated figures requested)[31]. Financial performance in Amman and Aqaba is significantly stronger than elsewhere. Operating cost recovery ratios range from an estimated 39 per cent in Tafilah to 81 per cent in Zarqa. This compares to 106 per cent in Amman and 421 per cent in Aqaba[32].

These regional variations in financial performance reflect a range of factors, such as inherent differences in local cost structures, and scale economies.

[31] Source: Stone and Webster

[32] This breakdown does not, however, take into account sewerage tax revenue, which is collected by the Ministry of Finance and paid to WAJ, and which represents around 10 per cent of WAJ revenues. It also does not take into account subsidized electricity

Comparative Cost, Efficiency and Customer Data by Governorate

	Operating cost recovery	% of total customers 2002	% of total water revenues 2002	UFW 2002	Employees per 1000 connections 2001	% of non-residential customers 2002	Water billed per customer 2002 CM/YR	Water revenues per billed water 2002 JD/CM
AQABA	421%	2%	18%	31%	14.51	8.7%	497.57	0.873
AMMAN	106%	44%	38%	47%	3.12	7.6%	146.93	0.347
ZARQA	81%	13%	8%	56%	6.66	4.8%	150.68	0.233
MADABA	77%	2%	2%	50%	16.30	4.0%	153.74	0.319
BALQA	54%	6%	5%	54%	15.95	4.5%	169.40	0.299
MA'AN	47%	2%	3%	54%	31.42	5.2%	242.96	0.340
KARAK	42%	4%	2%	52%	14.41	5.4%	141.74	0.241
TAFILAH	39%	1%	1%	45%	28.95	5.0%	164.62	0.223
IRBID	79%	16%	9%	42%	8.93	4.4%	159.69	0.230
MAFRAQ	76%	4%	4%	71%	14.09	4.2%	177.65	0.314
JERASH	48%	2%	1%	37%	12.93	4.4%	139.48	0.206
AJLOUN	54%	2%	1%	41%	17.23	3.6%	143.91	0.210
NGWA	54%	**24%**	**15%**	**50%**	10.81	**4.3%**	**159.30**	**0.242**

Cost recovery figures for AMMAN (year 2002), AQABA (year 2000), and NGWA (year 2001) are from their respective f
Cost recovery figures for other governorates are estimates based on year 2001 data.

The table highlights how the loss of the more financially viable Amman and Aqaba systems from WAJ's revenue leaves it with only the loss-making systems.

WAJ is also the largest consumer of electricity in Jordan; 16% of the country's electricity is consumed by WAJ or its associated utilities, and WAJ (WAJ currently pays 42 fils/KwH against the full price of 82 fils/KwH for large industrial users). Which some considers as a subsidy amounting to 36m JD p.a.

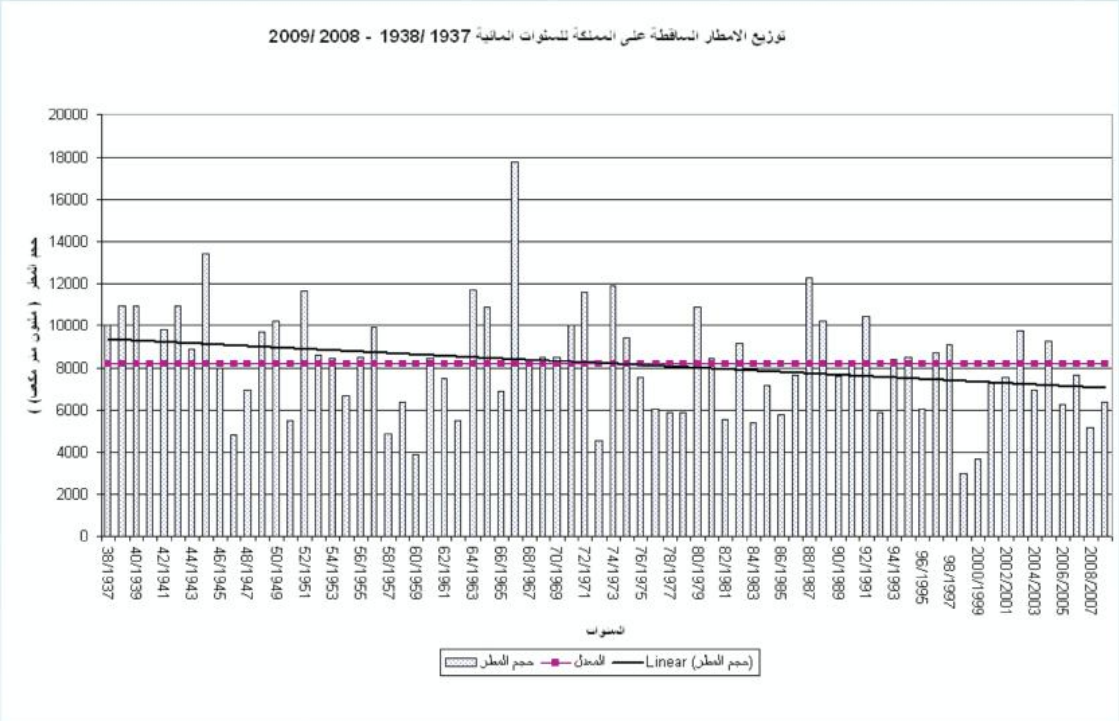
WAJ also is supplied with 100 MCM/yr of water from the JVA free of charge.

KEY ISSUES, CONSTRAINTS

It is important to note that many of WAJ's institutional weaknesses are outside of its direct control, are socio-political and legal in nature, and as such, warrant attention and resolution at higher levels.

For example, coping with population and economic growth places a huge strain on Jordan's water supplies, which are already inadequate. Another of Jordan's key water supply issues, and therefore an issue for WAJ, is declining rainfall, as shown in the chart below.

Distribution of Rainfall on the Kingdom for Water Years 2009/2008-1938/1937



Water Volume (million m^3)

Overall, many of the issues discussed in this section center on the idea that WAJ should not be both a bulk water/wastewater service provider to independent commercial water utilities, and also be able to control those companies. It may be better to focus WAJ as a bulk water/wastewater supplier only, with relationships between it and the retail utilities at arms length, to drive commercial behavior more firmly through the water sector.

LEGAL RESPONSIBILITIES FOR WATER MATTERS BETWEEN THE MWI AND WAJ

At present, there is no water resources law that governs the allocation and management of both groundwater and surface water resources. Moreover, there isn't an integrated water management approach that encompasses both water quality and supply issues. The institutionalization of the National Water Master Plan in the anticipated new water law is expected to remedy these matters.

Currently, the following laws and bylaws are in effect:

1. The Water Authority Law (No. 18 for 1988): This law created the Water Authority in Jordan (WAJ) in 1988, and is still the most comprehensive legislation dealing with water issues.

2. The Jordan Valley Authority Law (No. 30 for 2001): This law controls the use of water resources in the Jordan Valley and sets guidelines on land ownership and farming activities in the Valley.

3. The Ministry of Water and Irrigation bylaw (No. 54 for 1992): This bylaw provides the Ministry with full responsibility for water and public sewage in the Kingdom.

It was mentioned in Jordan's Water Strategy that the three water entities lack effective communication and team work, and that each entity appears to function in isolation from the others. In some instances, it was also mentioned that the present structure gives rise to conflicts of interest between these three entities[33].

In August 2007 the Jordan Ministry of Public Reform recommended restructuring of the MWI, again calling for the breakup/dissolution of WAJ and JVA, thus:

- Responsibility for developing, amending and implementing strategies and policies is unclear

- There is duplication of responsibilities between MWI and WAJ

- There is lack of coordination at the strategic and execution levels between MWI and the other entities

- Much of the work can be carried out more efficiently and at lower cost by the private sector with a new organization providing regulation and monitoring

The National Water Master plan (2004) indicated that the current water legislation is intended to define institutional responsibilities rather than defining a fully comprehensive vision for

[33] This is disputed by some senior water officials. Functions need to be analyzed to see if they fit each agency and if not, the structure needs changing.

managing national water resources. Therefore, an overlap in responsibilities is occurring amongst MWI, WAJ and JVA. A new Water Law is expected to define the structure and function of the entities managing the water sector in Jordan, and allocate the responsibilities of various ministries that are involved in the water sector in order to avoid overlap in responsibilities.

International best practices suggest that service provision be separated from regulation, i.e., not reside in the same institution, but the current structure is clearly not in line with that approach.

Examples of other ministry responsibilities for water matters include:

- The Public Health Law No.(54) of 2002, which covers the protection of public health. The Ministry of Health is authorized to monitor the drinking water resources and the drinking water networks in order to assure that it is not exposed to pollution.

- The Environment Protection Law No. (1) of 2003, which covers the protection of water resources from pollution. Article 23 provides that the Council of Ministers will issue water protection regulations.

- The Jordanian Institute of Standards and Meteorology, which is charged with the duty of issuing standard specifications according to Article 5 of the Standards and Specifications Law No.22 of 2000. Representatives of MWI, WAJ and JVA and/or representatives of the Ministry of Health participate in the preparation of standard specifications for the water sector. But according to Article 4 of the Environment Protection Law mentioned above, the Ministry of Environment became responsible to prepare the standard specifications and norms for water.

This confusing distribution of responsibilities is not academic, but contributes to issues such as overlapping roles, communication gaps, overstaffing and questions about how well some functions are carried out (for example, water quality testing by the Ministry of Health is mentioned as being deficient).

IMPROVEMENT TARGETS

Targets contained in National Water Strategy relate to the situation in 2022, so far in the future that the current WAJ (and other water agency) leadership will not be around when they fall due. There are no intermediate targets, and follow up on the NWS is said to be non-existent.

The Minister of Water and Irrigation has stated frequently that the water sector needs to be self-sufficient by 2020, including water to agriculture, but again there seems nothing binding in such statements.

FINANCIAL POSITION

WAJ suffers from a serious lack of financial resources, low cash flow levels and insufficient funding for upgrading and replacement of the infrastructure. Operation and maintenance (especially planned maintenance, which WAJ and the PMU agree is a serious problem) of the drinking water supply and wastewater disposal systems are often inefficient and do not satisfy customer demands. The Authority's ability to maintain assets depends on external funding from the government, donors and local or foreign loans.

UNREALISTICALLY LOW TARIFFS ALSO CONTRIBUTE GREATLY TO THIS ISSUE.

Low salaries and civil service hiring procedures ensure less competent staff is hired, leading to low staff productivity and a "brain drain". Training is downplayed because it is feared that trained staff are more likely to leave (this happens, however neglecting training is a poor "solution").

In addition, newer and coming sources of water are at higher unit cost. Future supplies from the desalination of seawater will be even more expensive (estimated at over 2JD/ m^3 delivered to the major cities). Reallocation of agricultural water to urban uses would be cheaper, but is politically unpalatable.

NON-REVENUE WATER

Contributing to the water supply challenge is water loss both physical and administrative, despite the reduction in NRW across Jordan to about 42% in 2010. This is still far too high for such an arid country.

EXPANDING WASTEWATER TREATMENT AND SAFE WASTEWATER REUSE

About 4 million people (62% of the population) are served by sewerage systems, and the treated effluent currently produced is estimated at about 100 MCM/yr (of which the As Samra plant produces about 80 MCM/yr). After the Disi project is complete, an additional ~60 MCM/yr of treated wastewater will be produced at various locations in the northern part of the country.

The treated wastewater is being used primarily for irrigation in the Jordan Valley but there is limited use elsewhere. Most of Amman's treated wastewater is discharged into the Zarqa River from the As-Samra WWTP and is stored in the King Talal Dam where it is blended with fresh surface water (as available, not in a controlled way) and is subsequent used in the Jordan Valley.

Elsewhere, treated wastewater is discharged in rivers where it represents a significant portion of the stream flow. Since most streams in Jordan carry very little water, the water quality situation needs to be monitored carefully.

It is estimated that by the year 2022 when the population is projected to be about 7.8 million, most towns will be connected to a wastewater system, and about 250 MCM per year of wastewater is expected to be generated (construction of some new sewage collection and WWTP capacity is needed to achieve this figure).

The following challenges need to be addressed:

- Providing all cities and most towns with adequate wastewater collection and treatment facilities;
- Ensuring that all major industries and mines treat their wastewater and meet standards for ultimate wastewater reuse;
- Ensuring that the safe use of treated wastewater, including looking after the health of agricultural labor, effects on soil (the Zara Ma'in WTP deliberately produces lower TDS water than needed for drinking so that the As-Samra effluent will have a suitable TDS for agriculture) and ensuring hygienic produce;
- Using wastewater for activities that provide the greater return;
- Promoting the use of greywater.
- That public health and the environment, including groundwater aquifers, are protected from contamination;
- Ensuring that sludge produced from wastewater treatment processes is fit to be used as fertilizer and soil conditioner.

ALTERNATIVE WATER SOURCES

There needs to be greater innovation in alternative water sources such as rainwater harvesting, eg from roof tops.

Desalination, especially seawater desalination, is very energy intensive and Jordan already has a big problem paying for energy. With current water tariffs, the subsidies will put an even heavier burden on the national budget. Possible negative environmental impacts of large desalination projects will also need to be mitigated.

Brackish water resources are available and include brackish waters from Hisban, Kafrein, Faisal Greenery, Karamah, Abu Zighan, Deir Alla, Karamah Dam Water, Znia (Mafraq).

There is limited information on groundwater aquifers generally. Recharge points are not identified and therefore cannot be protected from damage, nor can opportunities to maximize recharge be taken advantage of. Knowledge of aquifers is so weak that it is not possible to predict with any accuracy how much water remains. Water quality deterioration indicates the bottom of the fresh water is being approached in some aquifers[34]. It is felt that the limiting factor will be water salinity not quantity, and this trend is already being felt; the problem will continue to emerge slowly making it difficult to "draw the line" on abstraction.

WATER DEMAND VS SUPPLY

Jordan has implemented numerous infrastructure projects that transfer water to meet municipal demand, but rapid urbanization makes keeping up a formidable task.

The Disi Pipeline to bring water from a fossil aquifer in Southeast Jordan and the JRSP or Red Sea – Dead Sea Conveyance projects are touted as the ultimate solutions to Jordan's "demand exceeds supply" problem. Both will deliver high cost water requiring substantial increases in the water tariff or high subsidies from the treasury.

Water to agriculture and domestic users is heavily subsidized, sending the message to users that water is plentiful and not valuable.

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[34] Source: USAID

Public participation in water resources decision making has not been emphasized. Current laws do not consider public involvement in water sector policy formulation and decision making processes.

CURRENT AND PAST INSTITUTIONAL REFORM EFFORTS, SUCCESSES AND FAILURES

Although a comprehensive water strategy and water policies covering the irrigation, utilities, wastewater, and groundwater sectors were approved by the Council of Ministers in 1997-1998, nothing has been developed in subsequent years. These documents were needed to be "living" with periodic modifications, updates, and clarifying supplements, none of which have occurred.

More recently, the 2007 National Water Strategy has not been implemented.

ROLE OF THE MINISTRY OF WATER AND IRRIGATION AND THE PROGRAM MANAGEMENT UNIT (PMU)[35]

The National Water Master Plan (2004) clearly states that the MWI needs to be "legally empowered to take the lead in all matters related to national water resources and project management on the national scale to assure a sound water sector development". Therefore, the MWI's responsibilities should include the following:

- Development of water sector legislation and water standards;
- Undertaking national water master planning and drawing policies;
- Managing national water resources;
- Water rights.

The Ministry for Water and Irrigation (MWI), unlike WAJ, is not established under primary legislation. Rather, in accordance with Article 120 of the Constitution, the MWI was established under by-law no. 54 of 1992. This regulation provides for the formal organisational structure of the Ministry rather than setting out its formal roles and responsibilities.

[35] Source: Stone and Webster report.

The responsibilities of the Ministry, however, are set out in Art.5 of the WAJ law, which states that the Ministry is responsible for all water and wastewater systems and related projects and shall set forth a water policy and submit it to the Council of Ministers for approval. This Article appears to conflict with the responsibilities conferred on WAJ and its Board in terms of both policy and implementation. For example, Ministry responsibility "for all water and wastewater systems" under Art.5 might be taken to imply some kind of direct management responsibility. Further, Art.10 states that it is the Board's responsibility to set forth and approve the Kingdom's water policy. In practical terms, however, water policy in Jordan has been developed by the Ministry and adopted by the Council of Ministers.

This lack of legal clarity, however, is not reflected in the day to day responsibilities exercised by the Ministry and WAJ. This point was emphasised by the Secretary-General of MWI, who described the division of responsibilities between MWI and WAJ as MWI being responsible for policy and WAJ being responsible for implementation. Key functions actually undertaken by MWI include:

- Drafting and preparation of water sector policy;
- Water resources data collection and management, including preparation of the national water plan and advice on specific water abstraction proposals;
- Donor financing liaison;
- Management of large 'strategic' projects, particularly where international financing or PSP is involved; and
- Water sector legislation.

With the introduction of the LEMA contract, the Performance Management Unit (PMU) was established within the MWI to monitor this contract and to oversee the capital investment program for the Amman area. The PMU exists as an organisational unit with its own Board of Directors, which reports to the Minister for Water and Irrigation, but its role is not legislatively defined. Subject to any change in the current institutional arrangements, the GoJ intends for the PMU to take on responsibility for monitoring future PSP contracts, such as the As-Samra BOT contract and the Northern Governorates management contract.

NRW FIGURES AND PROJECTIONS BY GOVERNORATE AND IN TOTAL

Total Year		2009						
		Billed JD	Collected JD	%OF Collected	Pumped M3	Sold M3	Un accounted M3	%OF U.F.W
1	Amman	52,075,571	53,180,821	102%	133,549,511	83,233,190	50,316,321	37.68%
	Aqaba	11,050,192	10,762,395	97%	16,602,699	13,112,317	3,490,382	21.02%
2	Irbid	8,797,827	8,205,543	93%	37,090,420	24,819,545	12,270,875	33.08%
3	Zarka	7,962,513	7,965,043	100%	46,619,094	21,272,723	25,346,371	54.37%
4	Madaba	1,590,142	1,760,475	111%	7,801,763	3,931,707	3,870,056	49.60%
5	Balqa	4,805,342	4,511,522	94%	22,939,051	10,959,253	11,979,798	52.22%
6	Karak	2,049,029	1,973,595	96%	14,624,927	6,030,671	8,594,256	58.76%
7	Tafila	1,003,132	971,375	97%	4,930,895	2,477,832	2,453,063	49.75%
8	Maan	2,292,052	2,323,991	101%	9,108,613	4,117,918	4,990,695	54.79%
10	Mafraq	2,967,137	2,342,966	79%	20,303,147	7,420,015	12,883,132	63.45%
11	Ajloun	936,600	830,516	89%	3,907,032	2,579,644	1,327,388	33.97%
12	Jarash	1,113,450	1,088,610	98%	4,646,222	3,242,076	1,404,146	30.22%
All Gov.		96,642,986	95,916,851	99%	322,123,374	183,196,891	138,926,483	43.13%

2035	2030	2025	2020	2015	2010	2009	Governorate
18.2%	19.2%	21.0%	24.5%	28.5%	33.9%	35.3%	Amman
20.5%	23.9%	27.9%	33.1%	40.6%	49.8%	51.9%	Zarqa
20.5%	23.9%	27.9%	33.1%	40.6%	49.8%	51.9%	Balqa
19.7%	22.9%	26.7%	31.4%	38.5%	47.2%	49.2%	Madaba
18.5%	19.4%	22.2%	25.8%	30.1%	36.9%	38.4%	Irbid
18.4%	19.4%	20.8%	24.2%	28.2%	33.6%	35.0%	Ajloon
17.7%	18.6%	19.6%	21.9%	25.5%	29.7%	30.6%	Jerash
23.0%	26.7%	31.1%	38.2%	46.8%	57.4%	59.8%	Mafraq
23.3%	27.1%	31.9%	39.1%	48.0%	58.9%	61.3%	Karak
20.6%	24.0%	27.9%	33.2%	40.7%	49.9%	52.0%	Tafeeleh
22.2%	25.9%	30.2%	36.6%	44.9%	55.1%	57.4%	Ma'an
16.1%	16.9%	17.8%	18.7%	19.6%	22.9%	23.6%	Aqaba
19.2%	21.0%	24.5%	28.5%	34.3%	42.0%	43.8%	Kingdom

Source: MCA Jordan Country Concept Paper, 2008.

ANNEX 11 - JORDAN VALLEY AUTHORITY (JVA) PROFILE

MISSION AND OBJECTIVES

The Jordan Valley Authority is a governmental organization responsible for water resources management in the Jordan River Valley, including their development, utilization, protection and conservation. Its mission is to support development via water resource management and supply.

The JVA develops and provides irrigation water in the Jordan Valley and supplies bulk raw water to WAJ. It was created in 1977, and was initially charged with the social and economic development in the Jordan Valley from the Yarmouk River in the north to Aqaba in the south as well as providing irrigation water within its service territory. The Eastern extension of its territory is the 300 m above sea level contour line north of the Dead Sea and the 500 m above sea level contour line south of the Dead Sea. The King Abdullah Canal is the backbone of the JVA water distribution system north of the Dead Sea.

The territory mandated to the Jordan Valley Authority by its governing law, the Jordan Valley Development Law No. 30 of 2001, is approximately 5,000 Km^2, and is home to some 300,000 people.

The JVA's task is being made increasingly difficult by a water supply/demand imbalance, particularly the massive decline in Yarmouk River flow (historically, flow was ~350 MCM/year; now it is ~60 MCM/yr). Competition between different uses causes problems for all in terms of both water quantity and quality.

BASIC STATISTICS

The total irrigated area in the Jordan Valley is about 33,000 hectares (330,000 dunums). About 8,000 more hectares of arable land remains to be irrigated north of the Dead Sea, and some 2,000 hectares south of the Dead Sea.

The total volume of water used for irrigation in the Jordan Valley in 2009 was 212 MCM, but this fell to ~170 MCM in 2010 due to water shortages and a crackdown on illegal use. As well as the ~170 MCM[36] for irrigation (~130 MCM north of the Dead Sea, ~ 40 MCM south of it), ~100 MCM was provided to WAJ for drinking water production, and ~5 MCM to industry.

The area of land in the Jordan Valley irrigated with reclaimed water in 2009 was 17,418 ha, or 52% of the total irrigated area.

The amount of reclaimed water used (treated effluent from wastewater treatment plants blended with other water sources), was ~90 MCM in 2009. The volume of treated effluent used in 2009 prior to blending was 55 MCM.

According to JVA management, in the northern Jordan Valley, 60% of the irrigated area uses drip irrigation, 20% uses surface irrigation and 20% uses tubes or sprinklers ("Pirojet"); in the middle Jordan Valley, 80% of the irrigated area uses drip irrigation and the remainder uses tubes or sprinklers; and in the Karama area, 85% of the irrigated area uses drip irrigation and the remainder tubes.

The water handled by the JVA is a mix of groundwater and surface water, which mix depends on seasonal factors.

NRW was reportedly reduced from 20% in 2009 to 13% in 2010.

[36] Note that some farmers in the Jordan Valley have water rights outside the JVA's purview, amounting about 20 MCM/year.

HISTORY OF FORMATION AND PREDECESSORS

Originally established in 1973 as the Jordan Valley Commission, the Jordan Valley Authority (JVA) was established in 1977 according to Law No. 18 of that year, amended by Law No. 19 of 1988 and later amended by Law No. 30 of 2001.

Originally, the JVA was independent of the GoJ, however from 1988 it became a GoJ department, with its budget being part of the government budget, with all revenues from its activities remitted directly to the government (JVA leadership would like the JVA to return to its original status).

GOVERNANCE

The JVA's board composition is specified in the JVA Development Law, but is anachronistic (its composition has not been updated to reflect JVA's current role, which is more limited that in the past). The PMU has recently been given oversight responsibility for JVA as well but they don't have staff for this and have done nothing regarding this responsibility to date.

MANDATES, SERVICE STANDARDS, KEY PERFORMANCE INDICATORS

Under the1977 law, the JVA acquired the prime authority to plan and implement water supply services in the Jordan Valley. Article 3 of the 1988 law mandated JVA to undertake all the works related to the development, utilization, protection and conservation of the water resources in the Jordan Valley.

The JVA's main responsibilities are to, within its service territory:

- Study and develop water resources (both conventional and unconventional, the latter including rain water harvesting and brackish water use), use them for different purposes, protect them;
- Provide bulk water to WAJ, and distribute water for irrigation;
- Raise the efficiency of agricultural water use;
- Study, design, implement, operate and maintain irrigation projects, all major dams in Jordan, and water harvesting;

- Develop, survey and classify lands for agricultural and residential purposes;
- Defend Jordan's rights to trans-boundary waters; and
- Conduct minor socio-economic development activities in some remote locations (this is a legacy function of the JVA's original role which had a broader remit to conduct such development.

The JVA's mandate extends from the northern border of Jordan to the northern tip of the Dead Sea in the south; the Jordan River to the west and all areas in the Yarmouk and Zarqa basins that lie below the 300m contour line to the east; and the territory lying between the northern tip of the Dead Sea in the north and the northern border of the Aqaba Municipality in the south; and from the 500m contour line to the east and the Kingdom's border to the west.

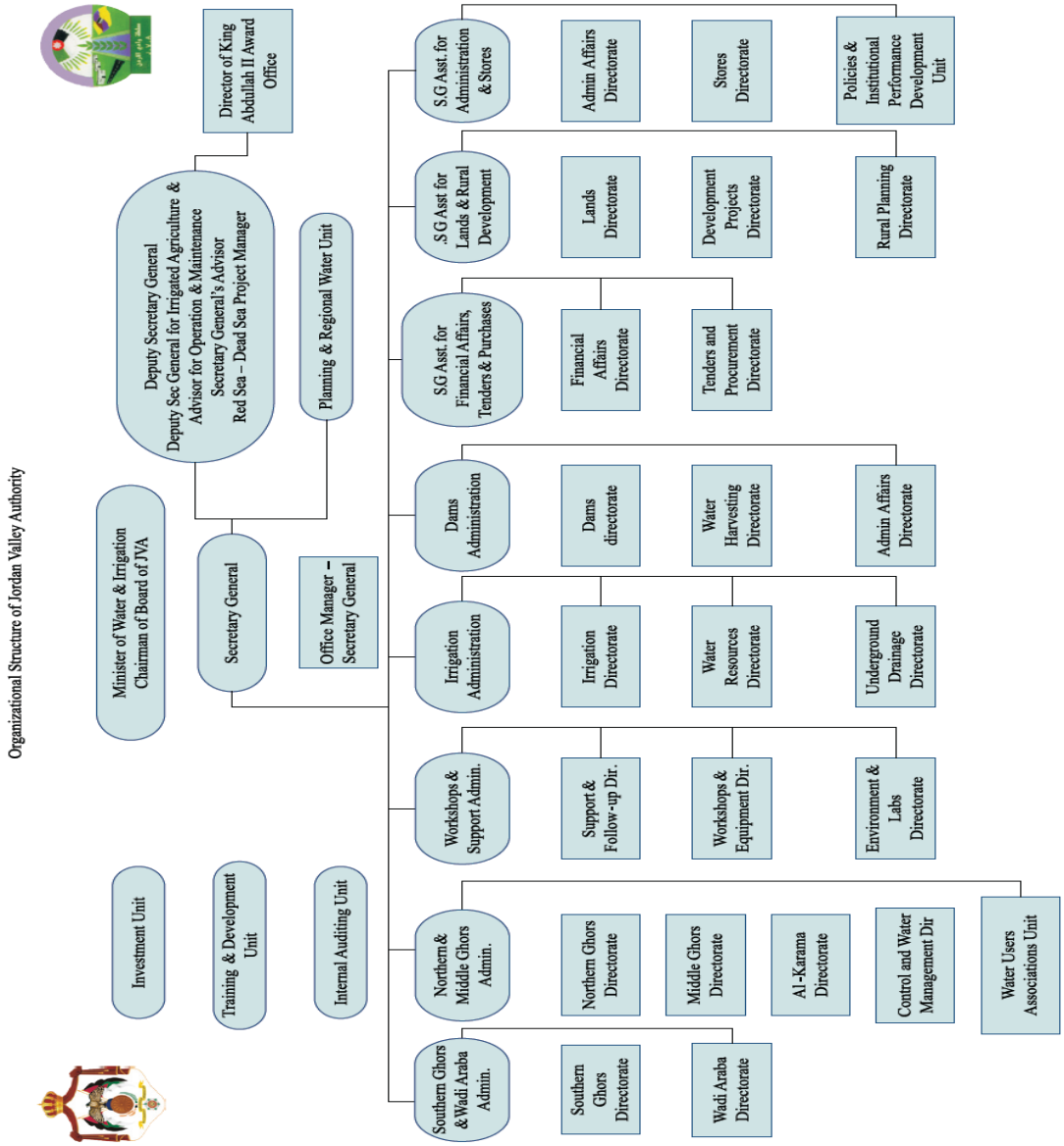
Guidance pertaining to the JVA's role contained in the 2007 National Water Strategy includes:

- Establish more efficient bulk water distribution systems;
- Having one service provider for irrigation water for the whole country, with the retail function for irrigation water privatized and/or handled by empowered farmers' associations;
- Over time, redefining the role of the "new institution" responsible for irrigation in the Jordan Valley to focus on regulation and supervision of services, gradually phasing-out of the business of irrigation water distribution;
- Having water tariffs and incentives to promote water efficiency in irrigation and higher economic returns for irrigated agricultural products, and controlling planting of perennial crops;
- Using alternative technologies such as rainwater harvesting for enhancing irrigation water supply;
- Using treated wastewater for irrigation whenever safely possible;
- Limiting the use of brackish water in irrigation in order to minimize soil salinity and to conserve brackish water for other uses;
- Monitoring abstraction from all groundwater wells to assure conformity with abstraction permits;

- Implementing Bylaw 85/2002 to close down any water wells which extract water from a deteriorating and depleted aquifer;
- Implement the bylaw to close down all illegal wells;
- Encouraging automation of irrigation networks and electronic monitoring of irrigation networks to reduce losses through leakage and breaks.

ORGANIZATION CHART

Twenty-one Directorates and/or Departments subordinated to six Assistant Secretary Generals (Ghor Operation and Maintenance, Land and Development, Planning and Information, Administration and Financial Affairs, Irrigation and Drainage Affairs, Dams Affairs) together with five units directly subordinated to the Secretary General fulfill the abovementioned tasks as is shown in its organizational chart below.



STAFF NUMBERS

Total staff was 1500 full time and about 100 part time workers in 2010.

INTERFACES WITH OTHER WATER ORGANIZATIONS, PROVIDER/CUSTOMER RELATIONSHIPS

As mentioned earlier, the JVA supplies bulk water to WAJ and fits within the wider ambit of the MWI. Legal responsibilities with regard to national water resources management exist for all of the MWI, WAJ and JVA. However, according to the National Water Strategy of 2007, "communication among the three entities is limited with each functioning in near isolation from the other", there are "conflicts of interest in the present set-up of the water sector among MWI, WAJ and JVA", and "there exists an overlap of responsibilities with other ministries".

BASIC FINANCIAL STATEMENTS

The JVA does not have financial statements such as a balance sheet or profit/loss, since its budget is part of the GoJ budget and all revenues are remitted directly to the treasury. Such financial data that exists is summarized in the next section.

CURRENT BUDGET

The JVA's operating budget was ~7 million JD in 2009 and ~9 million JD in 2010. The low budget (for an organization with 1500~1600 staff) reflects low salaries according to the civil service scale.

Revenue raised from the JVA's activities was ~5.5 million JD in 2009 and ~7 million JD in 2010.

The JVA's capital budget depends on allocations from the Ministry of Finance. In 2009 this was ~35 million JD and the estimate for 2010 was ~20 million JD. Typical capital allocations are 20~30 million JD/year, which are spent on projects such as dam and irrigation infrastructure construction, and the preparation of land for irrigation projects, such as road construction.

The table below shows the available cost breakdown, both operating and capital, for 2009, the latest such figures available.

Program	Current Costs	Capital Investment	Total
Management and Support	1.2	0.3	1.4
Land and Rural Development	0.3	1.3	1.6
Irrigation	0.2	18.3	18.5
O&M	3.9	5.1	9.0
Dams	0.7	8.1	8.9
Southern Ghors and Wadi Araba	0.6	1.7	2.3
Totals	6.9	34.8	41.6

(Source: JVA)

FINANCIAL PROJECTIONS AND TRENDS AND SUBSIDIES

Revenue has reduced somewhat from the situation up to 2 years ago with the formation of an independent commission for the development of the eastern bank of the Dead Sea (hotel development mainly). This resulted in less revenue from land development for the JVA. Prior to this, the revenue raised by the JVA was increasing each year because of this development. Revenue has also declined with declining potash production associated with the global financial crisis.

Water sold to industrial users is sold for 530 fils/ m^3, compared to an average ~30 fils/ m^3 for irrigation. Because of this price differential, water sold to industry (~2% of the total supplied) accounts for ~40% of the revenue raised by the JVA.

The 100 MCM/year provided to WAJ is provided free of charge, however the return flow from treated wastewater is also provided to the JVA free of charge.

The JVA sells ~300,000 JD worth of electricity generated from a hydro-electric plant associated with the King Talal Dam (no hydro-power is generated from the 9 other main dams).

KEY ISSUES AND CONSTRAINTS

The issues and constraints immediately below were mentioned in or derived from the National Water Strategy.

- **Water laws need harmonizing between the MWI, WAJ and JVA.** While this is not only an issue for the JVA, as long as responsibilities are assigned to all three administrative entities without a clear legally defined lead in water sector planning and project implementation there remains a risk of overlaps and confusion. The National Water Strategy called for a new, clarifying, water law for Jordan, to:
    - Define the structure and function of the institutions governing and managing the water sector;
    - Clarify the responsibilities of the different ministries involved in the water sector;
    - Define "legal issues" related to water;
    - "Balance traditional rights with State rights while moving towards market-based allocation mechanisms".

Overlaps of responsibilities include:

- Pollution control, which is subject to Article 6 paragraph 5 and Article 30 of the Water Authority Law No.(18) of 1988, and Article 38 of the Jordan Valley Development Law No.(19) of 1988;

- The Public Health Law No.(54) of 2002, which covers the protection of public health. It provides that the Ministry of Health is authorized to monitor drinking water resources and networks in order to assure that they are not exposed to pollution. This law also provides that the Ministry of Health should be entitled to supervise all wastewater networks in order to preserve public health.

- The Environment Protection Law No. (1) of 2003, which covers the protection of water resources from pollution. This law prohibits the disposal or accumulation of any harmful substances in water resources, and provides that the Council of Ministers will issue water protection regulations;

- The Jordanian Institute of Standards and Meteorology, which is charged with issuing standard specifications according to Article 5 of the Standards and Specifications Law No.22 of 2000. Representatives of MWI, WAJ and JVA and/or the Ministry of Health participate in the preparation of standard specifications for the water sector;

A consequence of this lack of role clarity is that inter-segment water reallocation rules are weak. At present, there is no water resources law that governs the allocation and management of both groundwater and surface water resources. So, Amman and other Jordanian urban areas suffer from water rationing while irrigation water is subsidized and a large share of that water is used inefficiently by farmers to irrigate water-intensive crops. The objective behind this allocation policy is to attain a degree of food self-sufficiency, a major concern in any nation, and especially in an unstable political environment such as the Middle East.

First steps to remedy this situation were taken by declaring water resources to be state-owned property, in this way making it possible to control water abstraction, and, secondly, by banning water-intensive crops, which has occurred in the past two years. But the actual implementation of these policies is questionable. It is clear that intersectional water redistribution needs to be reconsidered with a view to human needs and in terms of economic returns[37].

To understand the full scope of accountability overlaps within the water sector and with other sectors is beyond the scope of this profile, but the issue is intended to be tackled as part of the ISSP.

- **There exists overstaffing of MWI, WAJ and JVA and an exodus of talent to the private sector.** While this statement may seem to contradict itself, it seems that the talented staff often leave, leaving overstaffed but inadequate organizations including the JVA. In such an important function as water in Jordan, it is important that competent and qualified people are managing the key sector agencies;

[37] This issue will be tackled in the Water Valuation Study that is part of the ISSP and was also covered by the 2030 Water Resources Group (McKinsey) report of April 2011.

- **The low JVA tariff leads to waste of water and provides no incentive for efficient irrigation.** Water to agriculture is heavily subsidized[38], sending the message to users that water is plentiful and not valuable. The low cost of water in agriculture provides little incentive for farmers to improve efficiencies or migrate to higher value crops.

  In contrast, the National Water Strategy stated that:
  - Profitable undertakings in industry, tourism, commerce and agriculture shall be made to pay the full costs incurred to supply water to them;
  - Differential prices for water will be set based on water quality, the end users, and the social and economic impact of prices on the various economic sectors and regions of the country;
  - Water tariffs will be used as a tool to drive more efficient use of water;
  - Treated effluent will be sold at a price covering at least the operation and maintenance costs.

In addition, the issues and constraints discussed below were highlighted in discussions with JVA management.

- **Not all water is metered, and NRW is still 13% despite recent improvements,** contributing to Jordan's water scarcity;
- **JVA is not financially independent from the GoJ,** which means that it has to compete for funds as part of the central government budgeting process, rather than having a budget based on the JVA's specific needs. The JVA would like to return to its initial independent agency status, with operational autonomy. JVA leadership feels that it is too inefficient being part of the GoJ and that the civil service salaries are too low to retain good engineers[39]. They also want to be able to apply for direct grants and not be subject to MoPIC's centralized handling of foreign grants;
- **There is a backlog of rehabilitation work needed for the water distribution networks,** which leads to significant water losses and poor control of water distribution. Many of the pipes are 30 years old, are leaky, some are undersized, and they suffer from

[38] The first 2500 m3 is sold at 8 fils/m3, the next 1000 m3 at 15 fils/m3, the next 1000 m3 at 20 fils/m3, and above this the price is 35 fils/m3. These prices are to each farm unit. A farm unit is 3~4 ha.

[39] The current GoJ trend is towards centralization however.

blockages and need flushing. Hydraulic modeling is needed initially to define the needed improvements;

- **There is substantial evaporation from dams,** estimated at 130,000 MCM/day (50 MCM/year) in total from the 10 dams under the JVA's control. This further contributes to water scarcity in Jordan;
- **The JVA lacks legal advisors for trans-boundary water negotiations.** As the lead agency within the Government of Jordan for trans-boundary water matters, including contractual elements, the JVA lacks sufficient legal expertise to discharge its role effectively.

CURRENT AND PAST INSTITUTIONAL REFORM EFFORTS, SUCCESSES AND FAILURES

As mentioned above, the JVA has progressively lost its non water-related roles and lost its independent agency status over 20 years ago.

With regard to the latter change, the JVA feels that this was a failure; that it was much more effective under its original mode of operation.

CROP STATISTICS FOR THE JORDAN VALLEY

Table 3-18: Irrigated area for various crops in the Jordan Valley

Year	Irrigated Area (Dunums)						
	Fruit Trees	Citrus	Olives	Grapes	Vegetables	Winter Cereals	Total
2008	30,996	60,556	4,088	1,452	222,431	13,696	333,219
2009	31,217	60,200	3,922	1,275	215,235	21,476	333,325

Source: Ministry of Agriculture Annual Reports (2008 and 2009)

Table 3-19: Irrigated areas of various fruit trees and respective production in Jordan Valley for 2009

Crop	Area with Fruits (Dunums)	Area without Fruits (Dunums)	Total Irrigated Area (Dunums)	Production (Tonnes)	Price/Kg (JD)	Total (JD)
Figs	15	0	15	15	0.469	7,035
Pomegranates	280	0	280	560	0.524	293,440
Guava	712	0	0	1,322	0.752	994,144
Dates	8,881	4984	13,865	9,129	0.397	3,624,213
Banana	16,317	0	16,317	45,651	0.548	25,016,748
Other Fruits	28	0	28	28	0.538	15,064
Total	26,233	4984	31,217	56,705		

Source: Ministry of Agriculture Annual Report (2009)

Table 3-20: Irrigated areas of citrus and respective production in Jordan Valley for 2009

Crop	Area with fruits (Dunums)	Area without fruits (Dunums)	Total Irrigated Area (Dunums)	Production (Tonnes)	Price/Kg (JD)	Total (JD)
Orange	17,454	0	17,454	50,432	0.358	18,054,656
Lemon	17,444	0	17,444	52,833	0.390	20,604,870
Clementines	12,640	0	12,640	27,502	0.226	6,215,452
Mandarin	6,726	0	6,726	15,072	0.160	2,411,520
Pomelos	2,547	0	2,547	7,315	0.246	1,799,490
Grape Fruit	2,359	0	2,359	7,077	0.177	1,252,629
Other Citrus	1,016	14	1,030	2,032	0.26	527,304
Total	60,186	14	60,200	162,263		

Source: Ministry of Agriculture Annual Report (2009)

Table 3-21: Irrigated areas of grapes and respective production in Jordan Valley for 2009

Crop	Area (Dunums)	Production (Tonnes)	Price/Kg (JD)	Total (JD)
Grapes	1275	2000.5	0.484	968,242

Source: Ministry of Agriculture Annual Report (2009)

Table 3-22: Irrigated areas of olives and respective production in Jordan Valley for 2009

Crop	Area (Dunums)	Production (Tonnes)	Price/Kg (JD)	Total (JD)
Olives	3,922	8,696	0.503	4,374,088

Source: Ministry of Agriculture Annual Report (2009)

Total (JD)	Price/Kg (JD)	Production (Tonnes)	Area (Dunums)	Crop
90,168	0.289	312	312	Fakkous
482,307	0.119	4,053	2,102	Muloukhia
4,928,800	0.505	9,760	6,033	Flava Green Beans
256,620	0.156	1,645	843	Spinach
270,900	0.430	630	630	Green Peas
1,485,582	0.186	7,987	3,479	Carrots
931,840	0.182	5,120	1,072	Turnip
447,104	0.112	3,992	998	Radish
3,877,439	0.29	13,315	3,750	Other
		878,385	215,235	Total

Source: Ministry of Agriculture Annual Report (2009)

Table 3-23: Irrigated areas of vegetables and respective production in Jordan Valley for 2009

Total (JD)	Price/Kg (JD)	Production (Tonnes)	Area (Dunums)	Crop
50,053,908	0.167	299,724	60,519	Tomatoes
15,206,048	0.143	106,336	24,954	Eggplant
14,414,177	0.251	57,427	20,937	Squash
25,819,176	0.228	113,242	12,068	Cucumber
10,516,999	0.289	36,391	12,426	Pepper
2,744,824	0.586	4,684	3,386	Green Beans
3,483,600	0.200	17,418	5,293	Cauliflower
2,218,566	0.101	21,966	6,444	Cabbage
3,987,984	0.182	21,912	7,938	Onions
30,064,000	0.250	120,256	28,852	Potatoes
2,316,816	0.144	16,089	4,048	Water melon
1,080,295	0.235	4,597	1,889	Melons
2,749,640	0.265	10,376	5,972	Lettuce
60,368	0.686	88	59	Garlic
947,850	0.890	1,065	1,233	Okra

Table 3-24: Irrigated areas of winter cereals and respective production in Jordan Valley for 2009

Crop	Area (Dunums)	Production (Tonnes)
Wheat	12,054	3,511
Barley	9,422	2,618
Total	21,476	6,129

Source: Ministry of Agriculture Annual Report (2009)

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