The Hashemite Kingdom of Jordan

Millennium Challenge Account – Jordan

Country Concept Paper

17 November 2008

1. Introduction

1.1 Objective and Purpose

The Hashemite Kingdom of Jordan has and will be facing challenges in its water sector due not only to the scarce water resources, but also due to the abnormally high population growth rates and the problems associated with such growth shocks. The water sector is of the highest priority and receives special attention from the Government and the donors as it represents the backbone for integrated social and economic development of the kingdom.

Water scarcity is the single most important natural constraint to Jordan's economic growth and development. Rapid increases in population and industrial development have placed unprecedented demands on water resources. Total demand is approaching one billion cubic meters per year, which approximates the limit of Jordan's renewable and economically developable water resources. Jordan's water resources consist primarily of surface and ground water and for several years now, renewable ground water resources have been withdrawn at an unsustainable rate in order to meet the increasing demand. In addition, surface and ground water quality in some areas is deteriorating. Current water demands are not being met satisfactorily throughout the country and the costs of developing new water resources are rising rapidly.

Jordan has hosted several waves of refugees, displaced persons and returnees as a result of the prolonged conflict in the Middle East that have significantly contributed to the abnormal population increases. Population centres sprang at locations distant from both the conflict and water resources. The result has been a high cost of projects for domestic water supply and wastewater collection and disposal, as well as the associated high annual cost for their operation and maintenance. As standards of living increased, greater pressure was placed on the already stretched resources further driving the per capita water availability down and placing Jordan well within the ten poorest water nations on earth. Jordan's water problems have been further compounded by the fact that most of Jordan's surface water resources are shared with neighbouring countries, whose control has partially deprived Jordan of its fair share of water; by the low reliability of water supply due in large part to extremely erratic and internal variations of rainfall - the main source of water used for irrigation; and by the resultant increase in pollution.

The practical implications of this permanent water deficit, the only future reality facing Jordan, if no immediate measures are taken, are two-fold. On one hand, present behaviour patterns in most water dependent sectors must be adjusted toward water conservation and more efficient water use. On the other hand, Jordan will have to buy more food abroad. In the mid-long term, with a growing population and an increasing water demand, Jordan will not be able to satisfy its increasing water demands from renewable water resources without the assistance of the donors. Therefore, it is

imperative that optimal and sustainable patterns of water use be established to meet the requirements of a growing population as well as Jordan's economic development objectives and basic agricultural foodstuffs. No single action can remedy the country's water shortages; rather many actions are necessary to increase overall water availability.

The water sector strategy stresses the need for improved resource management with particular emphasis being placed on the sustainability of present and future uses. Special care is advocated for protection against pollution, quality degradation, and depletion of water resources. Furthermore, it is the Sector's aim to continually achieve the highest practical efficiency in the conveyance, distribution, application and use of our water resources with the goal of adopting a dual approach of demand and supply management. It aims to promote the integrated use of multiple resources in order to maximize usable flows and to maximize the net benefit from the use of a unit flow of water.

While progress is expanding access to safe drinking water supplies has been impressive, reaching over 98% of the population, important challenges remain. The reliability and adequacy of water supply is often low because of water shortage and under funded operation and maintenance programs. Expansion of modern sanitation systems to protect public health, and investment in wastewater collection and treatment systems to reduce pollution and increase the reuse of valuable water has lagged significantly behind the expansion of water supplies in large part because of very high investment and operating costs. Progress is increasing access to safe water and sanitation in water areas where the poor are concentrated, and in many rural areas, trails ever further behind. The solution of these supplies and capacity problems will be daunting without sustained assistance from the donor community and higher rates of economic growth and house hold incomes.

This concept paper report is a document submitted by the Millennium Challenge Account-Jordan (MCA-Jordan) to the Millennium Challenge Corporation (MCC) being an important and integral stage in the compact development process and which will assist MCC in starting the process of committing grant funds to finance projects in the water sector.

1.2 Report Overview

MCA-Jordan has prepared a concept paper report to work as a guiding document for both GoJ and MCC and satisfies the requirements of MCC. Through this report, MCA-Jordan aims to clarify, organize and prioritize investment ideas into programme logic and provide a platform for detailed discussions on the rationale, feasibility and risks of projects still at the conceptual stage and agreement on where to focus resources for further development. It also gives MCC an opportunity to provide guidance on the structure, approach, activities and other aspects of project concepts before being fully developed.

1.3 Structure of the Report

The report is set out as follows:

- Section 2 contains the executive summary;
- Section 3 provides a country background information;
- Section 4 provides a review of the water sector in Jordan which includes an analysis of the legal and institutional frameworks, strategy, policies and investment needs;
- Section 5 describes the programme, projects and activities in details; and
- Section 6 provides a thorough analysis of the implementation framework.

A copy of the monitoring and evaluation matrix is attached in Annex 7.

A copy of the Economic Model and Analysis is attached in Annex 8.

1.4 Methodology

The general approach that guided this research was a case study. The methodology adopted to achieve the aim of this research is literature and documents review. The information collected during the review is based on research and analysis of available documents and reports on the selected projects and activities. MCA-Jordan developed a list of potential projects and selected a shortlist of projects based on selection matrix which is attached in Annex (1-1). The projects have been eventually approved by the steering committee in its meeting on November 1st, 2008. In addition, valuable input from both the working and advisory groups were obtained which assisted in the formulation of the different sections in this report. MCA-Jordan would like to express its gratitude towards all who shared their know-how, experience and opinion.

This report is based on an analysis of informant interviews, water policy documents, research and consultancy reports, information published on the internet, as well as technical and financial data obtained.

2. Executive Summary

Based on the analysis and description in this report, various project activities have been selected and form the basis for the programme which is further elaborated in section 5. These project activities are summarized in table (1) below.

Table (1): Summary of the Selected Project Activities

NO	Project Activity	Objective	Estimated Cost Million US$
1	Zarqa Governorate Water System Restructuring and Rehabilitation	To convert the existing pumping supply in major areas in Zarqa government into gravity feed by separation of distribution pipes from transmission pipes, replacing aging distribution and tertiary systems up to water meters and increasing storage capacity of reservoirs which will reduce NRW from 54% to 25%, reduce pumping cost and increase per capacity consumption from 56 lpcd to 93 lpcd.	91
2	Zarqa Governorate Wastewater System Reinforcement and Expansion	To extend the coverage of the wastewater system in Zarqa Governorate to areas not currently served and increase the collection capacity of the main conveyors and trunk mains to serve until the year 2025 which will solve health and environmental problems and increase the connection rate from 72% to 90%.	55.5
3	Expansion of Zarqa Governorate wastewater treatment capacity	To accommodate additional wastewater flows from Zarqa Governorate until the year 2025 by expanding the AS-Samra WWTP plus construction of conveyor lines through the negotiation with SPC/BOT company.	162.5
4	Construction of a conveyor pipeline from king Talal Dam to irrigate North Jordan Valley	To transfer the additional treated wastewater generated out of Zarqa Governorate and to substitute freshwater used in irrigation with treated wastewater.	55

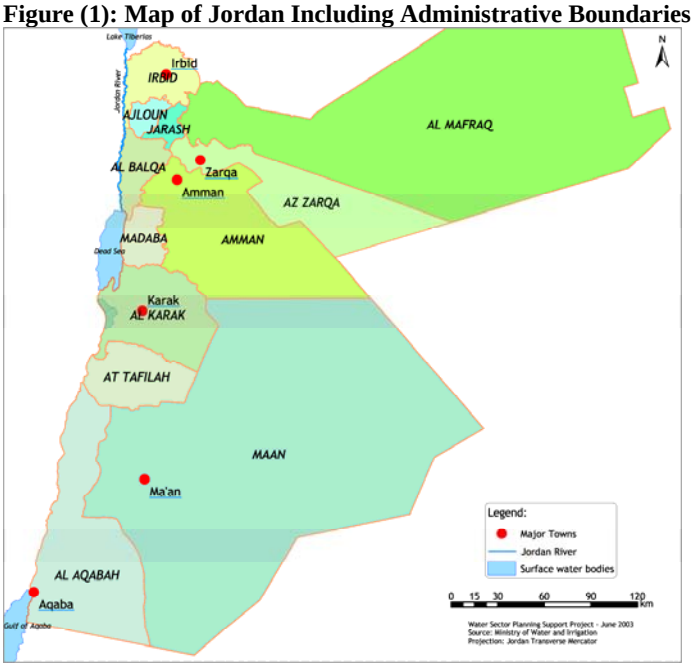
A Programme integration which is shown in Annex (2-1) has been possible since all the above mentioned activities tie up together in one cycle which satisfies both project areas, the reduction of NRW and increasing the treated wastewater which will substitute a portion of the freshwater currently being used in irrigation and can be released for uses in Amman Governorate and which improve the economic growth.

3. Country Background

3.1 Population

Jordan is a semi-desert country with a land area on the East Bank of the Jordan River of 89,206 Km^2. The population is concentrated in the North West Highlands, with altitudes averaging 800 meters and a relatively temperate climate. The land slopes gently to the desert of the East and the South East, and rainfall declines sharply. To the West the land falls steeply to the Rift Valley formed by the Jordan River and Dead Sea, with altitudes as low as 400 meters below sea level. Jordanian territory includes a 25 km stretch of coastline on which the seaport of Aqaba is situated on the Northern shores of the Red Sea as is shown in figure (1).

Figure (1): Map of Jordan Including Administrative Boundaries



Jordan is notably resource-poor, with limited agricultural land, no oil resources, and considerably scarce water. Its only natural resources are potash and phosphate. The population is urbanized at around 80%, and is one of the youngest among lower-middle income countries, with 38% under the age of 14. Although demographic growth, currently at around 2.6% per year, is slowing, total population is expected to reach almost 7 million by the year 2015. Notwithstanding the difficult regional political environment and the lack of resources, Jordan has achieved above-average development outcomes compared to other lower middle-income countries.

This favorable situation can be credited to sound development policies, recent capital inflows and to one of the world's highest levels of unilateral transfers, in the form of workers' remittances and public grants, together amounting to between 20-25% of GDP. However, Jordan has not caught up with the levels of per-capita income it had

attained in the 1980s boom, punctured by the financial crisis of 1989. The subsequent structural adjustment period of the 1990s, while restoring some positive economic growth, saw per capita incomes eroded by strong population growth. Poverty and joblessness are the most important problems to be solved.

Population size increased 9 times during the period (1952-2007), the rate of growth in population size records 2.2 percent in the 2007 against the growth of 2.3% in the last three years (2006, 2005, 2004). According to the Department of Statistics (DOS) projections the population size reach (5,723,000) at the end of 2007, where 38.8% of them reside in Amman, and 17.8% in Irbid Governorate.

3.2 Economy

Jordan new Strategy for reinvigorating economic growth focuses on shifting from currently stagnant traditional industries to new sectors with high growth potential and strong links to expanding global economy. Jordan has a wide range of inducement available for investors, beside the investment incentives offered by the Kingdom, Jordan offers a number of important advantages which in themselves are adequate reason for investing in the country.

The performance of the Jordanian economy displayed a slowdown, in real terms, for the fourth consecutive year. The rate of economic growth at constant prices recorded 6.0% in 2007 against a growth of 8.6%, 7.1% and 6.3% in 2004, 2005 and 2006, respectively. Nevertheless, the economic growth, in real terms, is still relatively within acceptable levels; a solid testimony to the ability of the national economy in absorbing the negative effects of the external shocks; particularly, the unprecedented increase in oil prices as well as the prices of food items in international markets. Owing to the growth of the GDP deflator by 6.0% in 2007 compared with 5.2% in the previous year, the GDP, at current market prices, grew by 12.3% compared with 11.8% in 2006. Moreover, when population growth rates which amounted to 2.2% in 2007 against 2.3%in 2006 is taken into account, the GDP per capita increased, in nominal terms, by 9.9%in 2007; standing at JD 1961 or US $ 2766, compared to an increase in the amount of 9.3% in 2006. Nevertheless, the GDP per capita decelerated, in real terms, from 3.9% in 2006 to 3.7% in 2007.

Surprisingly, the data issued by the Department of Statistics (DoS) indicate that inflation rate decelerate in 2007 compared with 2006; the rate of inflation, measured by the percentage change in the consumer price index (CPI), stood at 5.4% in 2007; down from 6.3% in 2006. The results of the latest "Employment and Unemployment Survey" conducted by DoS indicated that the rate of unemployment in 2007 declined by 0.9% compared with the preceding year; standing at 13.1%.

In the area of public finance, the general budget displayed poor performance in 2007 compared with preceding year; the fiscal deficit, after grants, amounted to JD 614.5 million, or 5.5 % of GDP; an increase in of JD 171.3 million, or 38.7 %, compared with JD 443.2 million, or 4.4% of GDP, in the year before. When grants are excluded, the deficit for 2007 rises by JD 210.1 million, or 28.1 %, compared with 2006 to stand at JD 957.9 million, or 8.5 % of GDP, against JD 747.8 million, or 7.5 % of GDP in 2006. Also, the trade balanced deficit expanded by JD 1054.4 million, or 23.4 % to

stand at JD 5552.2 million in 2007 compared with JD 4497.8 million in the preceding year.

Moreover, the productivity and the competitiveness of the national economy have improved; the ratio of public debt to GDP has dropped notably. Owing to the Central Bank of Jordan (CBJ) efforts in maintaining monetary stability as well as the continued positive trend in the inflows of Arab and international investments, the foreign currency reserves of the CBJ recorded their all-time high. These reserves are enough to cover more than seven months of prospective imports of goods and services. The improvement in the economic performance is mainly attributed to the economic and structural reform policies adopted by the government, which contributed to strengthening the performance of the economy and enhancing its efficiency, rescheduling the external debt, gradually removing the food and oil subsidies, widening the implementation of the privatization program and creating conducive environment for business. The aforementioned reform policies, along with the political stability in the Kingdom, contributed to increasing capital inflow.

3.3 Human Development Indictors

Jordan is considered one of the Medium Human development Countries in the Human Development Report for the year 2009, it records (0.773) in Human Development Indicator (HDI) in the year 2005 compared with (0.751) in 2000 and (0.710) in 1995. For the Human Poverty Index (HPI-1) Jordan records (6.9%) which ranked (11) out of (108) developing countries and areas in the report. Table (2) shows selected Human Development Indicators in Jordan for the year 2007/2008.

Table (2): Jordan Human Development Indicators 2007/2008

INDICATORS	RANK/ VALUE
Human Development Index (HDI) value	0.773
Life Expectancy at Birth (years)	71.9
Adult literacy Rate (% aged 15 and above)	91.1
Combined Gross Enrolment Ratio for primary, Secondary and Tertiary Education (%)	78.1
GDP per Capita (PPP US $)	5,530
Life Expectancy Index	0.782
Education Index	0.868
GDP Index	0.670
Human Poverty Index (HPI-1) value	6.9
Probability at Birth of not Surviving to Age 40(% of cohort)	6.4
Adult Illiteracy rate(% aged 15 and Older)	8.9
Population not Using an Improved Water Sources (%)	3
Population below Income Poverty Line (national poverty line %)	14.2

3.4 Poverty in Jordan

According to 2006 Income and Expenditure Household Survey the poverty line in Jordan reached (556) JD per person compared with (392) JD per person in the year 2002. Poverty rate records (13%) in the kingdom and it was the lowest rate in Amman with (9.4%) and the highest in Mafraq Governorate with (23%) as shown in table (3).

Table (3): Estimated Population of the Kingdom by Governorates and Sex in 2007

GOVERNORATE	MALE	FEMALE	TOTAL		
			No.	% Total Population	Poverty %
Amman	1142100	1078400	2220500	38.8	9.4
Balqa	199100	184300	383400	6.7	15.3
Zarqa	441200	411500	852700	14.9	14.9
Madaba	73700	69400	143100	2.5	10.0
Irbid	521700	497000	1018700	17.8	12.1
Mafraq	139400	129600	269000	4.7	23.0
Jerash	88300	83400	171700	3.0	16.7
Ajloun	67000	64600	131600	2.3	17.7
Karak	113000	110200	223200	3.9	21.7
Tafielh	40800	39300	80100	1.4	19.1
Ma'an	57000	51800	108800	1.9	12.7
Aqaba	66700	53500	120200	2.1	15.4
Total	**2950000**	**2773000**	**5723000**	**100**	**13.0**

3.5 Achievement of the Millennium Development Goals

The Government of Jordan works closely in partnership with UN agencies and other donor partners to pursue the MDG targets for Jordan. As a result of targeted interventions and the close involvement of government and civil society in promoting sustainable development, Jordan is currently on track to meet most of the goals, as can be seen in table (4).

Table (4): Jordan's MDG's Progress

PROGRESS TOWARDS THE MDG TARGETS FOR JORDAN				
	1989/92	**2005**	**2015**	**Achievement**
MDG 1: Poverty				
Families on <$1 daily	6.6	2.1	3.3	On track
Poverty gap ratio	5.3	3.3		
Underweight children	6.4	4.0	5.2	
Wasting	2.8	2.0	1.4	
Stunting	5.3	8.5	2.7	
MDG2: Education				
Net enrolment primary education	91.4	95.2	100	On track
% start Grade 1 reach grade 3	92.2	99.0	100	
Literacy rate 15 – 24 years	97.4	98.8	100	
MDG3: Gender equality				
Ratio girls to boys in primary, secondary, tertiary education	94.1	97.8	100	On track
Ratio female literates to males 15 -24	88.5	93.3	100	
Share of women in wage employment in non-agricultural sector	11	27.5	50	Maybe not on track
Proportion seats held by women in national parliament	1	7.9		Not on track
MDG 4: Reduce Child mortality				
Under 5 Mortality rate	39	24	13	On track
Infant mortality rate	34	19.0	11.3	
% 1 year old children immunized against measles	85	97.8	100	
Vaccine DPT / polio	92	99.0	100	
TB	15.8	32.1		Not on track

MDG 5: Improve Maternal Health				
Maternal mortality per 100,000 live births	48	22.2	12	Maybe not on track
% births attended by skilled health personnel	87	98.9	100	On track
MDG 6 : Combat HIV/AIDS, malaria etc				
Contraceptive prevalence rate	40.2	59.7	72	Strong
MDG 7: Environmental sustainability				
% land covered by forest	0.44	0.95		
Land area protected to maintain biological diversity	0.14	0.14		
% with access to safe drinking water	92.8	98.1		Achieved
% with access to improved sanitation	48	63.1		Potentially
% without access to secure tenure	72	77.3		

3.6 Gender

Jordanian women benefited extensively from the Government's equitable gender policies in education and health but setbacks have also occurred. Jordan has achieved 90 percent parity in literacy, full parity in primary and secondary enrollment, and increased life expectancy for both sexes.

Gender mainstreaming is preceding in the National Agenda action plans. Women have also benefited from the strong development of microfinance in Jordan over the last few years, whereby, women borrowers amounted to 57.4 percent of clients served by the 4 major local microfinance institutions in 2004. Still, female labor force participation is low and women's unemployment rates are significantly higher than men's. In addition, there is little information about access of poor and vulnerable women to public services especially in remote and rural areas. Setbacks have also occurred. In 2001, women activists, NGOs, and civil society joined together and drafted amendments to laws that were regarded as compromising to women's rights. Despite gaining government approval, the proposed temporary laws enhancing women's rights and protection were turned down in 2003 when the Lower House of Parliament voted against three of the amendments.

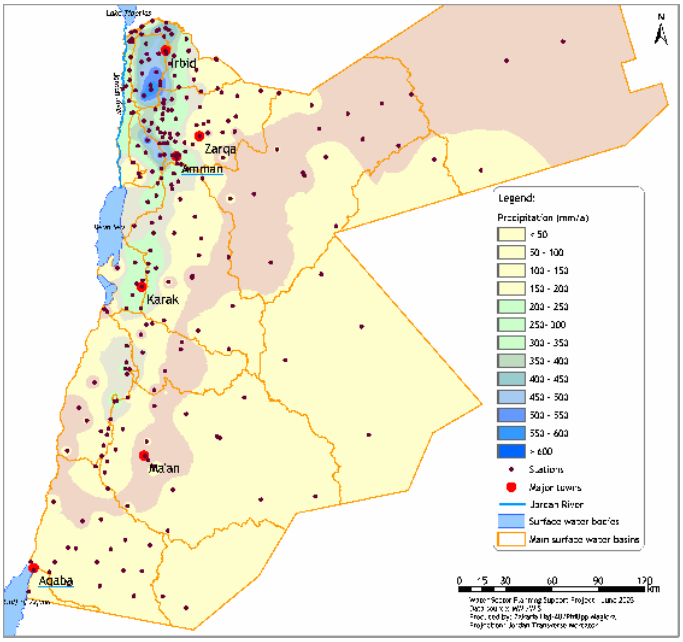
4. Water Sector Overview

4.1 Water Resources in Jordan

The climate in Jordan varies from semi-arid to arid. Summer maximum temperatures average 32°C in the Highlands, and 35°C to 38°C in the Southern Desert and the Jordan Valley. Winter maximum temperatures average 14°C to 17°C in the Highlands and Southern Desert, with minimum temperatures of 1°C to 4°C and occasional snowfalls in the Highlands. In the Jordan Valley, however, winter maximum temperatures average 21°C and minimum temperatures rarely fall below 8°C to 10°C, permitting round year cultivation.

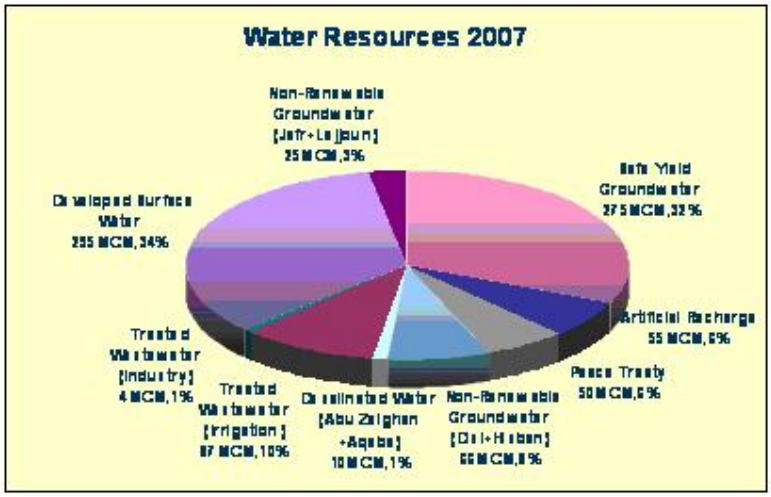
Highly variable seasonal rainfall of 8.3 billion cubic meters is the main source of water in Jordan. Significant amounts of rainfall above 200 mm/year cover only 8% of the land area in the North-Western part of the country providing limited potential for rain fed agriculture as shown in figure (2). About 5% of the rainwater infiltrates into the ground and replenishes the aquifers while 3% is transformed into direct flood flow into the Valleys. The largest share of over 90% of annual rainfall is lost to evapotranspiration.

Figure (2): Long-term Average of Annual Precipitation



Jordan's renewable natural water resources are estimated to be in the magnitude of 776 MCM/year as shown in figure (3). To date about 501 MCM/year of surface water resources have been developed. Full development has been impeded by regional political considerations and the high cost to develop and transport the remaining sources of water. Under average-year conditions, 275 MCM/year are considered sustainable groundwater abstractions. Jordan also possesses limited resources of fossil - non renewable – groundwater in the Disi aquifer in the South, with an expected yield of 125 MCM/year that can be abstracted for 50 years.

Figure (3): Water Resources in Jordan

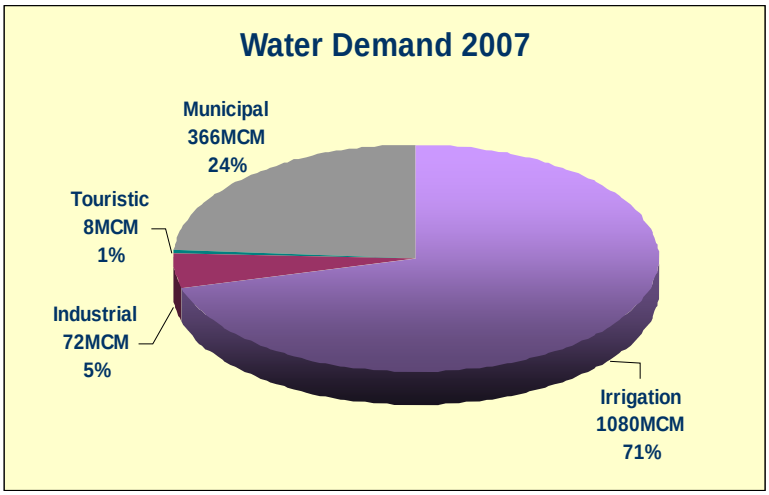


4.2 Water Demand and Supply

Jordan is considered to be one of the 10 poorest countries worldwide in water resources. The available renewable water resources are dropping drastically to an annual per capita share of less than 160 m^3 in recent years, compared to 3600 m^3/capita in 1946. Factors prompting such a decrease include, aside from the most prominent one of steep population growth, sudden influx of refugees due to political instability in the region, the semi-arid climate of Jordan. With the annual growth in demands, competition between consumers has been increasingly intensified. Increased population estimated at 5.7 Millions in 2007 and urbanization in addition to rising incomes has brought about larger Municipal and Industrial demands for water.

The country's total demand in 2007 was estimated at 1526 MCM/year as shown in figure (4) out of which only about 62% was supplied. Current deficits are being covered through mining of groundwater resources at 130 % of their safe yields, and through exploitation of non-renewable groundwater. Overexploitation of aquifers has resulted in the lowering of water tables and degradation of ground water quality and thus threatens the sustainability of such resources for future use. Overexploitation has also forced agriculture practices to contend with increasing salinity.

Figure (4): Water Demand By Sector, %



Despite the current high irrigation share of the total water uses as shown in figure (5), irrigation use during the past decade has decreased in both absolute and relative terms as is shown in figure (6). Factors contributing to such decrease include restrictions on well drilling since 1992, nationwide achievement of significant improvements in irrigation application efficiency, equipping private wells with water meters, and reduction in irrigated areas, especially in the Jordan Rift Valley, due to water shortages ensuing from the persistent drought throughout 1998-2002.

Figure (5): Water Uses By Sector, %

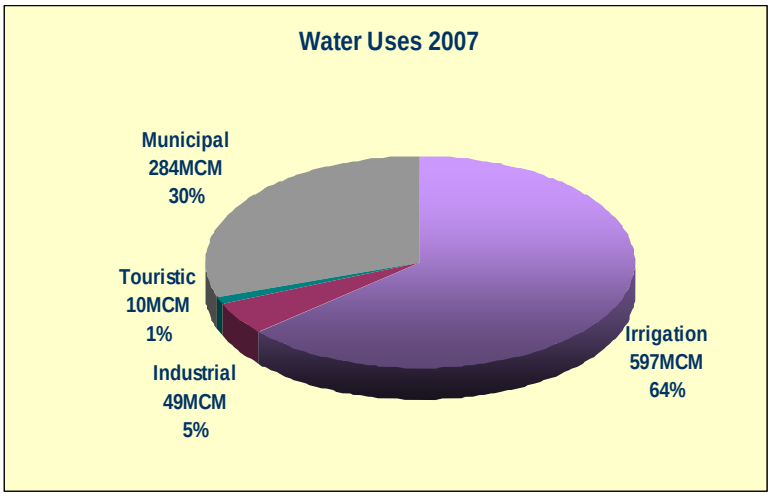
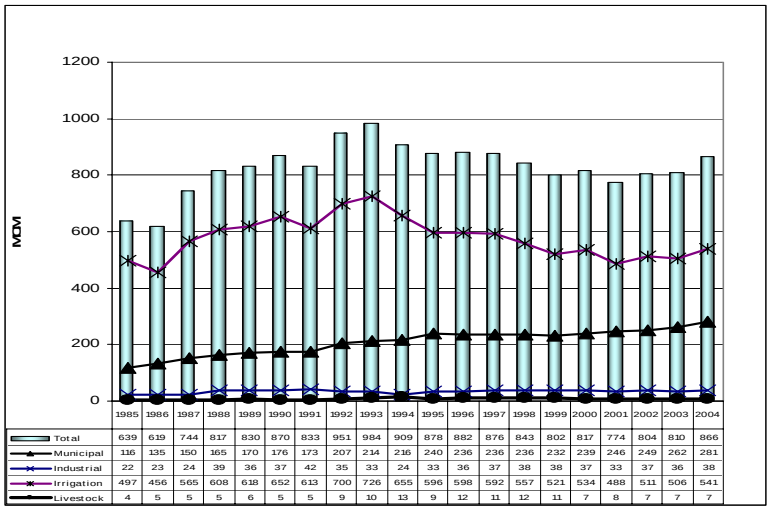


Figure (6): Historical Water Uses in Jordan



	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total	639	619	744	817	830	870	833	951	984	909	878	882	876	843	802	817	774	804	810	866
Municipal	116	135	150	165	170	176	173	207	214	216	240	236	236	236	232	239	246	249	262	281
Industrial	22	23	24	39	36	37	42	35	33	24	33	36	37	38	38	37	33	37	36	38
Irrigation	497	456	565	608	618	652	613	700	726	655	596	598	592	557	521	534	488	511	506	541
Livestock	4	5	5	5	6	5	5	9	10	13	9	12	11	12	11	7	8	7	7	7

Jordan's municipal uses witnessed significant increase during the past decades. Influx of refugees due to political instability in the region, in addition to creased income and changes in way of life have contributed to such an increase, especially in the urban areas of Greater Amman, Irbid and Aqaba.

Presently about 87 MCM/year of treated wastewater is reused in irrigation. By 2020, it is expected that around 200 MCM of treated wastewater will be available. As the additional naturally occurring fresh water becomes less available, domestic, and industrial water needs will eventually be met by desalting brackish and saline groundwater or seawater, while agriculture will be forced to use treated wastewater for a larger portion of the irrigated area.

A detailed description of the existing drinking and irrigation water bulk transfer systems in Jordan can be found in Annex (4-1).

4.3 The Role of the Water Sector in Jordan's Economy

Water may be considered as a central input for economic activity, without water there wouldn't be any. But there are differences in water productivity, which analyses the quantity of water needed for the creation of one unit of value added. There are huge differences in water productivity between the different sectors. In the industrial and services sector water productivity may be more than hundred times higher than in the agricultural sector. A detailed analysis of water productivity in the Jordanian economy can be is found in Annex (4-2).

The analysis shows that scarcity of water resources has been a shaping factor for the structure of the Jordanian economy. It has limited the development of sectors with high specific water consumption (especially agriculture) and oriented the economy towards the service sector where the water consumption per unit of value added is

very low. There is however no evidence of a negative impact on economic growth resulting from scarce water resources. On the contrary, water scarcity has favored and promoted modern sectors with high growth potential, as for example the information and telecommunication sector.

Nevertheless, the growing demand for water due to the rapid population growth and the related economic development puts increasing pressure on the institutions involved in water management to improve their efficiency so as to satisfy the basic needs of different user groups and to avoid negative impacts on the national economy. Instead of subsidizing water tariffs across the board it should be the long-term objective of water sector policy to achieve full cost recovery and direct specific subsidies to sectors with high water productivity and high innovation and growth potential.

4.4 Institutional Framework

Three institutions take responsibility for water administration in Jordan: Ministry of Water and Irrigation (MWI), Water Authority of Jordan (WAJ), and Jordan Valley Authority (JVA).

According to the *Ministries and Public Institutions and Departments Linked Organization By-Law No.16 of 1988*, which was issued pursuant to *Jordanian Constitution* Article No.120, the Ministry of Water and Irrigation, Water Authority of Jordan, and the Jordan Valley Authority are linked with the Minister of Water and Irrigation. A Secretary General is responsible to the Minister of Water and Irrigation and heads each entity.

- **Ministry of Water and Irrigation**

  The Ministry of Water and Irrigation (MWI) was established in 1988, in response to Jordan's recognition for the need of a more integrated approach to national water resources management. Since its establishment, MWI has been supported by several donor organization projects in the development of water policy and water master planning, as well as restructuring of the water sector. MWI is the official body responsible for the overall water supply and wastewater system and the related projects, planning and management, the formulation of national water strategies and policies, research and development, information systems and procurement of financial resources. Seven Directorates under the directive of the Assistant Secretary Generals for Finance and Administration and Technical Affairs as well as two Units for Legal Affairs and Project Finances directly subordinated to the Secretary General fulfill the said functions as shown in its organizational structure attached in Annex (4-3).

  Units for public relations, internal monitoring and water security and protection are directly subordinated to the Minister of Water and Irrigation with responsibilities overarching MWI, WAJ and JVA as clarified in the Ministry By-Law No. (52) Of 1992 attached in Annex (4-4).

- **Water Authority of Jordan**

  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 named the Water Authority, it was directly linked with the Prime Minister. 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 Article 23 of the said law the Water Authority was responsible for the public water supply and wastewater services, as well as for the 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 said law. According to Article 3, WAJ was established as an autonomous corporate body, with financial and administrative independence linked with Minister of Water and Irrigation. WAJ became responsible for the public water supply and wastewater services as well as for the overall water resources planning and monitoring, construction, operations and maintenance. The responsibilities of WAJ are defined in the said law which is attached in Annex (4-5).

  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 fulfil the said functions. WAJ's Programme Management Unit (PMU) regulates water supply and wastewater utilities under private management.

  The organizational structure of the Authority is strictly centralized. The regional branches of WAJ in the Governorates are fully dependant on WAJ headquarters with respect to human resources management, workshop services and billing as is shown in its organizational structure attached in Annex (4-6).

- **The Jordan Valley Authority**

  Originally established in 1973 as the Jordan Valley Commission, it was renamed Jordan Valley Authority in 1977, after Jordan Valley Development Law No. (18) Of 1977. This Law was subsequently modified by the Jordan Valley Development Law No.(19) of 1988 attached in Annex (4-7). The area of JVA's responsibility extends from the Yarmouk River in the North to the Red Sea in the South. The Eastern extension of the area is limited by the 300 m above mean sea level (a.m.s.l.) contour line north of the Dead Sea and the 500 m a.m.s.l. contour line south of the Dead Sea.

  The Jordan Valley Authority is a governmental organization responsible for the social and economic development of the Jordan Rift Valley, including the development, utilization, protection and conservation of water resources. The

King Abdullah Canal represents the backbone of the JVA water distribution system north of the Dead Sea and is used to irrigate farm units as shown in Annex (4-8).

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 fulfil the above-mentioned tasks as is shown in its organizational structure attached in Annex (4-9).

4.5 The Legal and Regulatory Frameworks

With due consideration of the provisions of the Water Authority Law, the Jordan Valley Development Law and any other amending or substituting laws thereof, MWI assumes full responsibility for water and public sewage in the Kingdom as well as for the projects pertaining thereto. MWI participates in licensing and the preparation of programs aiming to increase the sufficiency of water supply and water resources and prepares the National Water Master Plan. Policy formulation is the singular task of MWI.

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 incoherent developments not in line with the national water strategy. The establishment of a water resources monitoring service supported by a comprehensive computer aided water information system as well as the National Water Master Plan Directorate and Water Demand Management Unit underline the proceeding integration of all national water resources management functions in MWI.

Legal responsibilities with regard to national water resources management exist for MWI, WAJ and JVA. According to Article 23 of the Water Authority Law No.(18) Of 1988, WAJ should set up plans and programmes to implement approved water policies related to domestic and municipal waters and sanitation, and to develop water resources in the Kingdom and exploit them for domestic and municipal purposes. Furthermore, WAJ should augment the potential of water resources and improve and protect their quality. Article 3 of the Jordan Valley Development Law No.(19) Of 1988 testifies JVA to undertake all the works related to the development, utilization, protection and conservation of the water resources in the Jordan Valley.

Particular shortcomings exist with regard to groundwater protection and land use planning. Although the recently adopted Underground Water Control By-Law No.(85) Of 2002 (amended through the Regulation for the Amendment of Groundwater Control By-Law No.79 of 2003) attached in Annex (4-10) generally allows to restrict groundwater abstractions, the administrative procedures to achieve sustainable abstractions per basin remain unclear and no legislation in force addresses specific preventative measures against groundwater pollution. Therefore the Ministry launched a project to elaborate a technical guideline for the delineation of groundwater protection zones and to prepare the legal basis for the enforcement of

groundwater protection measures. Groundwater protection zones are thought to protect vulnerable groundwater resources against inappropriate land use and/or pollution.

Pollution control 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, while the Public Health Law No.(54) Of 2002 attached in Annex (4-11) covers the protection of public health. Article 41 of the said Law provides that 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. Article 53 of the said Law provides that the Ministry of Health should be responsible for the provision of preventive and curative health care and should be entitled to supervise all wastewater networks in order to preserve public heath. Furthermore the Environment Protection Law No. (1) of 2003 covers the protection of water resources from pollution. According to Article 11 it is prohibited to dispose or accumulate any harmful substances in the water resources, whether they are solid, liquid, gaseous, radioactive or thermal. In addition, Article 23 of the said law provides that the Council of Ministers will issue water protection regulations.

The Jordanian Institute of Standards and Meteorology 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. According to Article 4 of the Environment Protection Law No.(1) Of 2003 attached in Annex (4-12), the Ministry of Environment became responsible to prepare the standard specifications and norms for water.

Currently the Royal Water Committee is developing a new Water Strategy that includes the enactment and enforcement of a new Water Law that will define the new responsibilities of MWI, WAJ and JVA.

4.6 Development Approach of the Water Sector

To date 4 policies on Water Utility, Irrigation Water, Groundwater Management and Wastewater Management have been developed attached in (Annex 4-13). The policies clearly emphasize the sustainable use of the country's scarce natural water resources, in line with a continuous improvement in living conditions for the country's population, as the outstanding development goal for the water sector of Jordan. It expresses the need to reinforce the role of the different water actors and stakeholders in water conservation, and increase private sector participation in providing services for infrastructure development in order to make the water sector in Jordan more dynamic, allow access to new source of financing, and assist in realizing water projects without constraining Jordan's borrowing capacity.

Topics such as low cost water and wastewater treatment technologies, reuse of reclaimed water in irrigation, improved irrigation technologies, use of brackish water are among the primary target for development activities in Jordan. Recovery of O&M cost to become a standard practice and linking capital cost recovery to per capita share of GDP and cost of living, capacity building, including human resources development

and training are also on top of Jordan's agenda in order to maximize the water sector efficiency.

The most recent statement of Government of Jordan (GoJ) policy with respect to the water sector is the Water Sector Action Plan adopted by the Council of Ministers in December 2002, and which has been extended to the year 2015. The Action Plan sets out specific steps for the water sector in terms of institutional and legal issues; agricultural water use; groundwater resources management; the expansion in the use of non conventional water resources; cost recovery; private sector participation; information systems and adoption of international conventions on biodiversity and desertification.

The Water Sector Action Plan has been formulated in the context of the GoJ long term strategic goals for the water and wastewater sector, which are set out in Jordan's Water Strategy, adopted by the Council of Ministers in April 1997. This strategy is supported by a series of policy documents that seek to set out medium term actions that are aimed at contributing towards the achievement of the long term strategy.

4.7 Private Sector Participation

4.7.1 Objectives

WAJ has been suffering from operating under civil service constraints and lack of financial autonomy for many years. This has resulted in a serious lack of financial resources, low cash flow levels and insufficient funding for upgrading and replacement of the infrastructure. Operation and maintenance of the drinking water supply and wastewater disposal systems are often inefficient and do not satisfy customer demands in qualitative and quantitative terms. Water losses (administrative and technical) are still high (up to 50% NRW).

Therefore, the Government of Jordan took up the challenge to increase efficiency and improve operations management through the introduction of commercial management and higher private sector participation. PSP options have been implemented or are on their way of implementation in Jordan – ranging from Micro PSP, Public Company, BOT to Management Contracts. The major objectives are efficiency gains and to ensure the operational sustainability.

The involvement of the private sector has the aim first of all to bring about an improvement in the efficiency of utilities through the introduction of private sector management methods. This can result in substantial improvements e.g. concerning the collection of outstanding debts or the reduction in technical losses, allowing the financial situation of the utilities to stabilize and in some cases even to generate resources for minor investments to be made. In addition, a PSP can also entail the direct mobilization of resources from the private partner in order to finance the construction, repair or expansion of infrastructure.

4.7.2 Experience with Private Sector Participation and Lessons Learned

Table (5) below summarizes the critical success factors, the impact of an effective provision for these factors and a (rough) assessment of five Jordanian PSP projects with regard to these factors[1].

Obviously, this rating has to be seen as subjective and indicative and also rather as a comparative analysis between the five approaches. However, it can be seen that while the Management Contract process in Amman scores relatively low in many of these factors, the As Samra BOT and the Aqaba Water Company achieve relatively good scores. This might also indicate that the perceived lower-than-expected performance is at least partly rooted in failures to provide for the success factors, and not only the failure of the performance of the operator.

[1] The rating of the assessment is as follows: VL: very low provision for this factor; L: low, M: medium: H: high; VH: very high; n.a.: not applicable.

Table (5): Critical Success Factors and Assessment of the Five PSP Projects

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**

4.7.3 Regulatory Strategy for Private Sector Participation

Currently possible responsibilities that could be conferred on a new water sector regulatory unit or agency in Jordan are being studied and two alternatives are emerging as follows:

- First, the possible responsibilities/functions which might be conferred on the regulatory agency with respect to the Amman and Aqaba water corporations and the rest of WAJ; and
- Second, the possible responsibilities/functions which might be conferred on the regulatory agency with respect to the PSP contracts that are currently foreseen in the Jordanian water sector (Service Contracts, Management Contracts, and BOT's).

Within each of these two parts, different functions that might be addressed by the regulatory agency are identified (e.g. customer service levels, water quality, tariff setting). For each function a set of tasks of increasing complexity or responsibility that could be delegated to the regulatory agency are being identified. There are four possible levels of responsibility a water sector regulatory agency could have. The Government could choose to establish a water sector regulatory agency with any one of these four levels of responsibility. Furthermore, it could decide that the agency should have one level of responsibility with respect to the Amman and Aqaba water corporations, the rest of WAJ and other PSP contracts.

Through identifying the possible different levels of responsibility that could be conferred on a water sector regulatory agency with respect to each function, a matrix of regulatory functions and levels of responsibility with respect to each function is generated. This matrix is provided in table (6) below.

Using this matrix, possible models for the responsibilities of a water sector regulatory unit or agency in Jordan can be identified by selecting a level of responsibility for each regulatory function.

Table (6): Matrix of Possible Activities for a Water Sector Regulatory Agency In Jordan

Possible regulatory agency activities for Amman water corporation, Aqaba water corporation and Rest of WAJ					
	Possible Functions	**Task Level I**	**Task Level II**	**Task Level III**	**Task Level IV**
SERVICE QUALITY AND PERFORMANCE	Customer service levels (e.g. water pressure, supply interruptions)	No responsibilities	Set customer service performance targets which utilities should meet; monitor performance against targets;	Set customer service standards which utilities are obliged to meet; monitor performance against required standards; advise government on actions when standards are not met	Impose remedies on service providers for not meeting service performance standards
	Water quality	No responsibilities	Receive reports from operator or DWQ regulator on compliance with drinking water quality standards	Publicly disseminate information concerning drinking water quality	Define and impose penalties for DWQ breaches
	Environmental quality	No responsibilities	Receive reports from Ministry for Environment on compliance	Publicly disseminate information concerning environmental compliance	Define and impose penalties for environmental breaches
	Asset management	No responsibilities	Require an asset management plan and systems; monitor implementation	Set operational performance targets arising from Asset Management Plans; Monitor operational performance against targets; provide analysis to Minister	Set operational performance standards arising from Asset Management Plans; monitor performance; impose penalties for breaching standards
	Customer complaints	No responsibilities	Monitor customer complaint numbers; and/or Approval of utility customer complaint management procedures	Arbitrate on customer complaints not resolved by service providers	

Possible regulatory agency activities for Amman water corporation, Aqaba water corporation and Rest of WAJ

	Possible Functions	Task Level I	Task Level II	Task Level III	Task Level IV
	Customer rights and obligations	No responsibilities	Approve customer service contracts	Develop model customer service contract	
	Benchmarking	No responsibilities	Define performance indicators, benchmark utility performance against indicators; provide analysis to Minister	Publicly disseminate benchmarking information	Use benchmarking information as an input into tariff setting
TARIFFS	Tariff setting	No responsibilities	Define principles for measuring cost recovery and consequently setting the level and structure of tariffs; measure levels of cost recovery against these principles; provide analysis to Minister	Review proposals for tariff adjustments from service providers and make recommendations to the Government	Decision making authority concerning tariff proposals made by service providers
TARIFFS	Tariff monitoring and enforcement	No responsibilities	Monitor tariff levels for compliance with tariff determinations and report non-compliance to government	Take action to enforce tariff determinations and impose sanctions where these have been breached	
OTHER	Public consultation	No responsibilities	Customer forums and surveys to measure customer opinion and satisfaction	Customer consultation on regulatory decisions	
OTHER	Performance contracts [a]	No responsibilities	Monitor performance against contract targets; providing analysis to Shareholder	Decision making authority in relation to rewards to management and employees under performance contracts	

[a] The *Performance contracts* function would set out the goals and incentives for management and staff of the corporatised entity and would be designed to provide incentives for managers to operate as efficiently as possible.

Table (6): Matrix of Possible Activities for a Water Sector Regulatory Agency In Jordan (Cont.)

Possible regulatory activities for PSP contracts (Management Contracts, As Samra BOT, Disi-Amman BOT)					
Possible Functions		**Task Level I**	**Task Level II**	**Task Level III**	**Task Level IV**
Service quality and performance		Requirements in relation to service quality and performance would be set in the PSP contract. The regulatory agency might only have monitoring responsibilities with respect to the standards included in the PSP contract (see *Contract monitoring and performance incentives* below)			
Tariffs	Mangmnt. Contracts	No responsibilities. Tariffs would be set in accordance with the arrangements adopted for Rest of WAJ.			
	BOT contracts [b]	No responsibilities	Advice on cost recovery tariffs	Re-determination of endogenous elements i.e. take account of unanticipated changes in variables	Determination of prices to ensure financial viability
Contract monitoring and performance incentives		No responsibilities	Monitor contract performance (directly or through independent experts), advise public contracting authority on findings	Make recommendations to public contracting authority on performance related incentive payments/sanctions; Make recommendations to public contracting authority in relation to other contract breaches	Decision making authority in relation to performance related incentives
Dispute resolution		No responsibilities	Expert opinions, advice to contracting parties	Mediation on disputes	Intermediate or final arbitration on contract disputes

[b] Charging arrangements for the BOT would be set within the contracts. However, these charging arrangements may become inoperable due to unforeseen exogenous changes in the operating environment. A range of advisory or decision making responsibilities could potentially be delegated to the water sector regulatory agency, within the PSP contract, in this event.

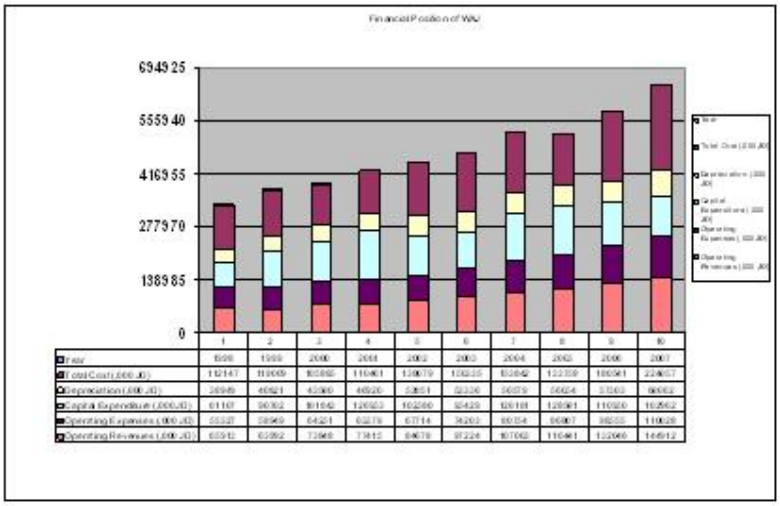
4.7.4 Contract Performance Monitoring

In relation to PSP contracts, the PMU acts as the public counterpart for the technical and financial auditors of PSP contracts and have delegated authority in relation to contract performance issues. This means that it would take key decisions in relation to, for example, performance incentive compensation payments. This approach, however, has been formulated based on the provisions of the different PSP contracts and there needs to be an examination of these contracts to fully develop the proposed role of the PMU under this model and to ensure that the proposed approach under this model is both useful and feasible.

4.8 The Financial Sources and Position of the Water Sector

Figure (7) below shows the financial position of WAJ Since 1998, specifically the operating revenues, operating expenses, capital expenses, depreciation, and total costs progression from the year 1998 to the year 2007. It is clear that the operating revenues covered the operating costs for the whole said period and in 2007, the operating cost recovery was around 131%.

Figure (7): Financial Position of WAJ 1998– 2007



However, looking at the total expenses and comparing with the operating revenues, it is very clear that WAJ has been in deficit since 1998 (when the Council of Minister's decided to capitalize the local loans and to consider that amount as a debt on the government after writing them off from the Water Authority records), and currently WAJ carries a total debt amount of more than JD 400 million.

During the period from 1998 to 2007, WAJ's operating costs increased by approximately 50% in nominal terms. Electricity costs, which represented nearly 50% of operating costs in 2007 (up from 42% in 1998), accounted for the largest increase during this period (about 55%).

As for the capital expenses, its main sources of finance are governmental contributions, international contributions and grants, and concessional loans estimated at interest rates of 2.4% per annum. Between the years 1998 and 2007 the contributions from Government was an important source of financing for capital expenses totalling JD 478 million representing 47% from the total, as for the international contributions and grants, the total amount was JD 321 million representing 32%, and the remainder amount of JD 220 million represents the share of concessional loans of 21%.

4.9 Donor Interventions in the Water Sector

Jordan's population is likely to double within a generation resulting in a future water demand by far exceeding the available natural resources of the country. In addition to the pressure on the country's water resources caused by a high population growth, present groundwater abstractions have to be limited to the safe yield level, thus raising the need for a restrictive demand management and the development of alternative resources. The development of even limited quantities of new resources is very expensive. Estimates indicate that it will cost Jordan approximately JD 3.5 billion (US $5 billion) over a 13 year period to realize an increase in the annual water supply of only 400 MCM/a. In the light of the limited financial resources of Jordan it becomes obvious, that the continuous assistance of international donors is needed for the foreseeable future. The emphasis of the present donor support lies on increasing the water use efficiency through improved planning and management capacities in the sector, including private sector participation, wastewater treatment and reuse, and the rehabilitation of water supply systems. Details are shown in table (7) below.

Table (7): Donor Support to the Jordanian Water Sector Development

Country	Agency	Focal Areas of Support
USA	USAID	1. Strengthening Water Sector Institutions 2. Water Use Efficiency 3. Improvement of Water Supply Systems 4. Water Resources Management 5. Wastewater Treatment and Collection
Japan	JICA	1. UFW-Reduction and Improvement of Water Supply Systems 2. Water Resources Management
Germany	GTZ / KfW	1. Improvement of Water Supply Systems and Services/ Private Sector Participation 2. Use of Marginal Water Resources and Reuse of Wastewater 3. Wastewater Treatment and Collection 4. Strategic Planning and Information Management
France	N/A	1. Upgrading of Wastewater Treatment 2. Improvement of Water Supply Systems 3. Water Use Efficiency
Italy	N/A	1. Improvement of Water Supply Systems 2. Wastewater Treatment and Collection (Social Productivity Program)
N/A	World Bank	1. Water Resources Management and Environment 2. Private Sector Participation 3. Improvement of Water Supply
European Union	EIB	1. Private Sector Participation /PMU 2. Improvement of Water Supply Systems and Services

A detailed list of ongoing projects is attached in Annex (4-14).

4.10 Water Sector Investment Programme

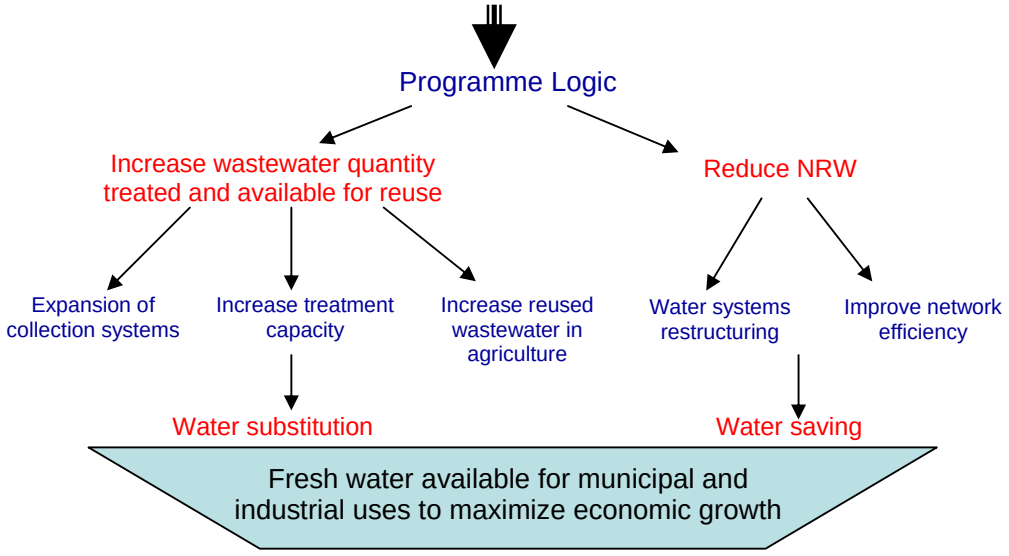
MWI compiled in 2002 the Water Sector Planning and Associated Investment Program 2002 – 2011 which recognizes the needs for both immediate and long term solutions to bridge the gap between demand and supply with a total investment amount reaching US$ 2.5 billion. The investment projects target several aspects such as technical assistance, private sector participation, bulk water projects, wastewater projects, rehabilitation projects, and water loss reduction projects. Recently this plan was updated by MWI and re-launched as the Water Sector Investment Project 2006 – 2015.

5. Programme Description

5.1 Programme Logic

As is shown in figure (8), the Programme logic aims to optimize the use of existing water resources and to help achieve a complementary form of water management and to defuse the competition over water use between domestic and agricultural sectors. Given that water is a scarce resource, it is aimed at managing water resources according to the principle of saving water and reducing losses. The primary concern in the field of water supply is to reduce technical and administrative losses. In wastewater management, it is to rehabilitate and expand wastewater collection, transportation and treatment facilities and to increase connections to the existing sewage system. In addition the practice of reusing treated wastewater must expand in particular. This is because the use of treated wastewater is of vital importance for reducing freshwater consumption in agriculture as greater use is to be made of treated wastewater to substitute fresh water that can be further used for domestic purposes and therefore contribute to economic growth.

Figure (8): Programme Logic



5.2 Project Area 1: Reduction of Non Revenue Water (NRW)

5.2.1 Project Development Objective

The overall objective for the reduction of NRW is to affect a substantial improvement in the existing level of service for the population in Zarqa Governorate. The objectives for the reduction of NRW are primarily to improve the availability of potable water to the population in the Governorate as the present supply is

intermittent, restructure the water supply system into zones and introduce supply through gravity to eliminate direct pumping into the system, improve the quality of the tertiary distribution networks and house connections up to the house meter; and reduce the high level of NRW which is currently is in the range of 54%.

5.2.2 Rationale

The NRW in the Zarqa Governorate is estimated and reported to be 54% which is one of the highest in Jordan. There are also a high number of reported leaks being far above 10,000 per year. The present water supply is intermittent with customers being supplied with water for only 2 or 3 days per week. The present primary and secondary distribution system is not properly structured into zones while the existing tertiary distribution system is in a very poor condition with extensive lengths of tertiary pipes and large numbers of house connections being laid above ground. The existing wells and pump stations are generally in poor condition and need replacement or refurbishment in many cases, and in many instances the pump selection is incorrect. Among other problems this can lead to excessive power consumption.

Experience with water supply systems in Jordan has shown that by simply investing in transmission, primary and secondary distribution systems significant decreases in NRW do not necessarily occur. Approximately 80% of the real (physical) losses occur in the tertiary pipelines and the house connections. To achieve a significant reduction in it, a substantial Programme of replacement and repair of tertiary pipelines and house connections will be necessary. To support any such major replacement Programme, the proper restructuring of the network into pressure zones and District Metering Areas (DMA) should be done. Experience has also shown that in general a greater security of supply can be achieved by the use of gravity fed systems from reservoirs rather from direct pumping into the network. This has already been commenced through JICA funding but the redesign and restructuring of the primary and secondary distribution pipes will be necessary to complete the transition. This experience, described above, has led to the development of the project activity outlined below.

5.2.3 Description of Project Activities

The project activities consist of the Zarqa Governorate Water Systems Restructuring and Rehabilitation. This is described as Activity 1 in the following sections. Please refer to Annex (5-1) for a map layout of the Zarqa Governorate water network.

5.2.4 Activity 1: Zarqa Governorate Water Systems Restructuring and Rehabilitation

5.2.4.1 Description of Activity Components

The major activity components are described below. There are two major components which are Water supply and Water resources.

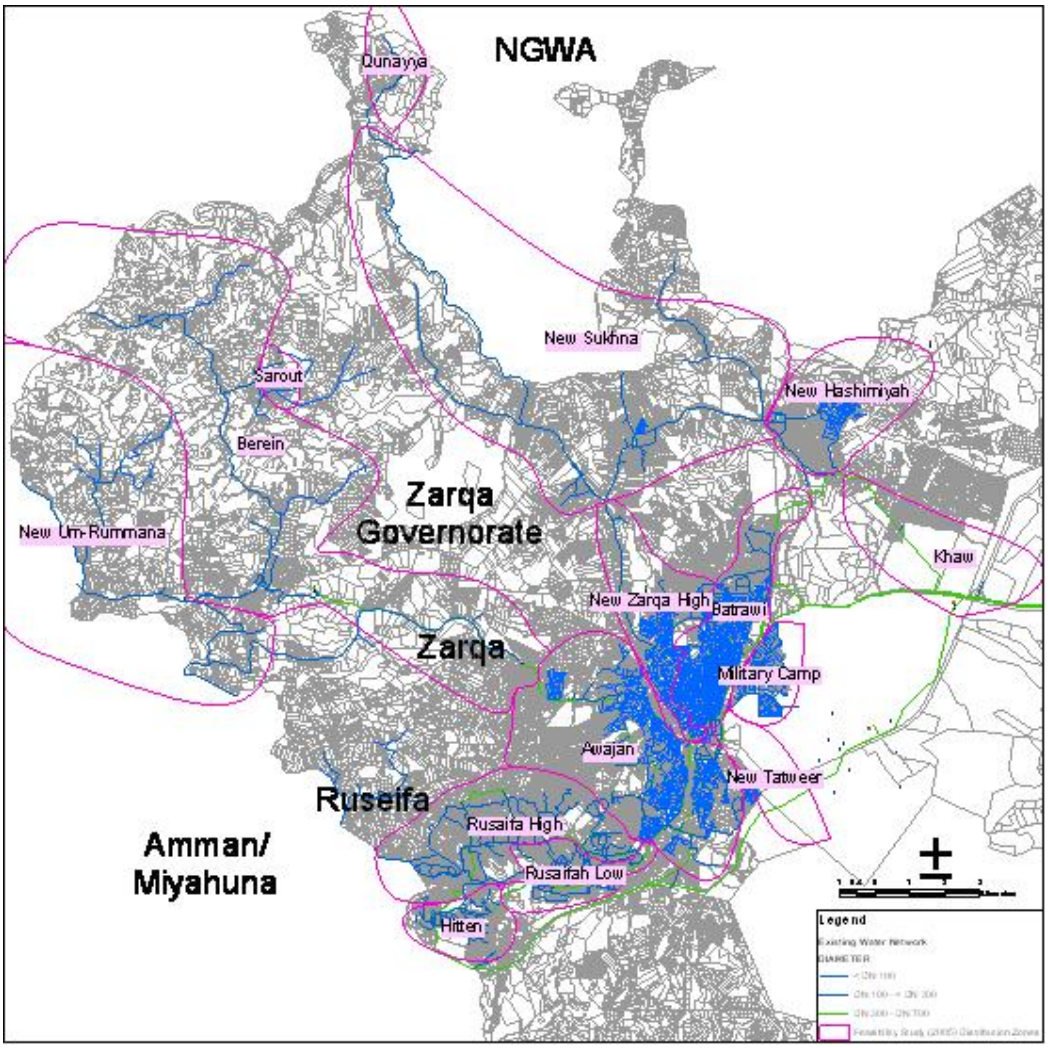
The basis of the proposed activity is the Technical and Feasibility Study and Final Design of the Upgrading and Expansion of water Facilities in Central Governorates" prepared by Engicon in 2005. The study separates Zarqa Governorate water supply system into two which are: Zarqa and Russaifah water supply systems. The study of Engicon is based on a previous study undertaken by JICA in 2000.

The preferred scenario for the Zarqa and Russaifah water supply systems was to convert the existing pumping supply to a gravity feed, as far as possible by doing the following interventions:

- Introducing new zoning system by utilizing existing reservoirs and adding new distribution reservoirs and disconnecting distribution networks at zone boundaries;
- Stop direct pumping into the network;
- Separate distribution pipes from transmission pipes;
- Optimization of pumping stations including boosters and reservoirs to cope with the demand and pressure needs until the year 2025;
- Adding Pressure Reducing Valves (PRV) to provide more control of pressure inside distribution reservoirs;
- Reinforcement of the existing system to provide a good level of service for each demand condition until the year 2025; and
- Increasing the storage capacity of reservoirs to meet the criteria of 12 hour storage until the year 2025.

The gravity scenario was designed to separate the transmission and distribution systems, with reservoirs being fed by the transmission system and feeding in turn by gravity into the distribution system. Flow rates within the distribution system vary with time according to the variation of demand during the day. The details of the proposed restructuring of the distribution systems are described below for Zarqa and Russaifah systems. An overview of the proposed activity is shown is figure (9).

Figure (9): Overview of the Proposed Activity 1



Since the completion of the feasibility study, there have been both completed and ongoing JICA and WAJ projects in Zarqa and Russaifah water supply areas. These projects have constructed various elements of the infrastructure as proposed in the feasibility study. This is shown in table (8) below.

Table (8): Completed and Ongoing Projects in Zarqa Governorate

System	Transmission, Primary & Secondary Pipes		Reservoir Capacity	Pump Stations	Status
	diameter (DN)	length (m)	m3		
Russaifah High / Low	200	3500			Completed
	300	1500			Completed
	400	4500			Completed
	500	1700			Completed
			6300		Completed
			1800		Completed
Awajan High /Low	200	1300			Completed
	400	1500			Completed
	600	1800			Completed
			6300		Completed
			1800		Completed
Zarqa High	300	4500			Completed
			2500		Completed
Sukneh	300	8300			Ongoing
			1000		Ongoing
Hashmeyeh	300	7500			Ongoing
			1500		Ongoing

Zarqa Water Supply System

The proposed distribution zones in the ***Zarqa water supply system*** are as follows:

- **Azraq Distribution Zone:** The existing distribution reservoir bottom elevation is 563 a.m.s.l. The reservoir will be fed from Azraq wells. This distribution reservoir supplies by gravity Azraq and feeds Khaw pumping station.

- **Halabat Reservoir:** The existing distribution reservoir bottom elevation is 621 a.m.s.l. The reservoir will be fed from Halabat wells. This distribution reservoir supplies by pumping Khaw reservoir and proposed Dlail reservoir.

- **Dlail Distribution Zone:** The proposed distribution reservoir bottom elevation is 696 a.m.s.l. The reservoir will be fed from Halabat pumping station. This distribution reservoir supplies by gravity Dlail, Halabat east and west and by pumping proposed Tafeh reservoir. As an alternative, Dlail reservoir could be fed also by a new booster pump at Carridoor Khaw 600 mm pipeline.

- **Tafeh Distribution Zone:** The proposed distribution reservoir bottom elevation is 750 a.m.s.l. The reservoir will be fed from Dlail pumping station. This distribution reservoir supplies by gravity Tafeh.

- **Khaw Distribution Zone:** The existing distribution reservoir bottom elevation is 616 a.m.s.l. The reservoir will be fed from Zatry, Caradoor and Azraq pumping stations. This distribution reservoir supplies by gravity Zarqa reservoir for blending with Zarqa wells, Khaw and by pumping Batrawi and Hashimiyeh for blending with Hashimiyeh existing wells.

- **Military Camps Distribution Zone:** The existing distribution tower bottom elevation 650 a.m.s.l. The reservoir will be fed from Zarqa pumping station. This distribution reservoir supplies by gravity the Military Camps.
- **Tatweer Distribution Zone:** The proposed distribution reservoir bottom elevation is 680 a.m.s.l. The tower will be fed from Tamween wells. This distribution reservoir supplies by gravity Tatweer Housing Projects.

- **Batrawi Distribution Zone:** The existing distribution reservoir bottom elevation is 651 a.m.s.l. The reservoir will be fed from Khaw and Zarqa pumping stations. This distribution reservoir supplies by gravity Zarqa low zone (most of Zarqa City), proposed Hashimiyeh reservoir. And by pumping to Zarqa High Reservoir.

- **Zarqa High Distribution Zone:** The proposed distribution reservoir bottom elevation is 715 a.m.s.l. The reservoir will be fed by pumping from Batrawi reservoir. This distribution reservoir supplies by gravity the high zone in Zarqa city.

- **Hashimiyeh Distribution Zone:** The proposed distribution reservoir bottom elevation is 600 a.m.s.l. The reservoir will be fed by gravity from Batrawi reservoir, from Hashimiyeh wells and by pumping from Khaw. This distribution reservoir supplies by gravity Hashimiyeh and by pumping the proposed Sukhna reservoir.

- **Sukhna Distribution Zone:** The proposed distribution reservoir bottom elevation is 630 a.m.s.l. The reservoir will be fed by pumping from Hashimiyeh reservoir and could be supplied by gravity from Batrawi reservoir. This distribution reservoir supplies by gravity Sukhna, Abu Zeeghan, Dougara, Gneyah collection tank and via booster station Al Gareesah.

- **Gneyah Distribution Zone:** The existing distribution reservoir bottom elevation is 588 a.m.s.l. The reservoir will be fed by gravity from Sukhna reservoir and from Gnayeh spring. This distribution reservoir supplies by gravity Gnayeh.

The proposed reservoirs, pump stations, and distribution pipelines originally required to restructure the Zarqa water supply system are shown in the following tables, where these facilities have subsequently been constructed this is indicated. The proposed additional reservoirs from the feasibility study, compared with what has been constructed to date, are shown in the table (9) below.

Table (9): Proposed Reservoirs in Zarqa Water Supply System

Reservoir Name	Proposed Volume (m^3)	Status
Batrawi Tank	5,000 due to site limitation	Not constructed
Gnayya Collection Tank	300	Not constructed
New Zarka High Tank-JICA Project Stage 3	4,000 due to the availability of land	2,500 m^3 Built by JICA
New Hashmiya JICA Tank	4,000	1,500 m^3 built by JICA
New Sukhna Tank by JICA	2,500	1,000 m^3 built by JICA
New Dlail Tank	4,000	Not constructed
New Tafeh Tank	500	Not constructed
New Tatweer Tank	3,000	Not constructed

The proposed additional pump stations, compared with what has been constructed to date, are shown in the table (10) below.

Table (10): Proposed Pumping Stations in Zarqa Water Supply System

Pumping Station	Discharge (m^3/hr)	Head (m)	Status
Khaw Pumping Station to Batrawi – 6 pumps	800	120	Not const'd
Hallabat Pumping Station to city – 2 pumps	25	40	Not const'd
Qnayya Pumping Station – 2 pumps	20	60	Not const'd
Batrawi Pumping Station to Zarka High tank – 3 pumps	650	80	Not const'd
Hallabat Pumping Station to Dlail Tank – 2 pumps	380	185	Not const'd
Dlail pumping station to Tafeh tank – 2 pumps	45	85	Not const'd
Hashmiya pumping station to Sukhna tank – 2 pumps	240	50	Not const'd
Zarka pumping station to military camp – 2 pumps	250	85	Not const'd
New Al Ghareesah pumping station – 2 pumps	10	100	Not const'd
Zarka pumping station to Batrawi tank – 4 pumps	500	97	Not const'd

The proposed additional transmission pipelines and primary and secondary distribution lines, compared with what has been constructed to date, are shown in table (11) below.

Table (11): Proposed Transmission and Distribution Pipelines in Zarqa Water Supply System

Diameter (mm)	Material	Proposed Length (m)	Already Constructed Length (m)	Revised Length (m)
100	PE	15 000	0	15 000
150	PE	21 000	0	21 000
200	DI	16 000	1 300	14 700
250	DI	3 000	0	3 000
300	DI	28 000	20 300	7 700
400	DI	13 500	1 500	12 000
500	DI	4 000	0	4 000
600	DI	2 200	1 800	400
300	DI	14 000	0	14 000
500	DI	1 100	0	1 100
Total		**117 800**	**24 900**	**92 900**

Russaifah Water Supply System

The proposed distribution zones in the ***Russaifah water supply system*** are as follows:

- **Hiteen Reservoir Distribution Zone:** The existing distribution reservoir bottom elevation is 776 a.m.s.l. The reservoir will be fed from Kharabsheh Resevoir as proposed by JICA study or from Basateen pumping station. This distribution reservoir supplies by gravity Hiteen refugee camp and by pumping Hiteen tower.

- **Hiteen Tower Distribution Zone:** The existing distribution Tower bottom elevation is 800 a.m.s.l. The tower will be fed from Hiteen pumping station. This distribution reservoir supplies by gravity Hiteen refugee camp.

- **Russeifeh High Distribution Zone:** The existing distribution reservoir bottom elevation is 807 a.m.s.l. The reservoir will be fed from Kharabsheh reservoir as proposed by JICA study. This distribution reservoir supplies by gravity Russaifah high zone.

- **Russeifeh Low Distribution Zone:** The existing distribution reservoir bottom elevation is 750 a.m.s.l. The reservoir will be fed from Russaifah High reservoir. This distribution reservoir supplies by gravity Russaifah low zone.

- **Awajan Distribution Zone:** The existing distribution reservoir bottom elevation is 695 a.m.s.l. The reservoir will be fed from Kharabsheh reservoir as proposed by JICA, Awajan wells or from Zarqa pumping station. This distribution reservoir supplies by gravity Awajan, Merheb Tank and by pumping Awajan high zone.

- **Merheb Distribution Zone:** The existing distribution reservoir bottom elevation 625 a.m.s.l. The reservoir will be fed from Awajan reservoir. This reservoir supplies by pumping Beerain reservoir.

- **Beerain Distribution Zone:** The existing distribution reservoir bottom elevation is 850 a.m.s.l. The reservoir will be fed from Merheb pumping station. This distribution reservoir supplies by gravity Merheb, Riyad, Saber, Saroot reservoir, Masarra, Jubeh, Um Khushaibeh, Makhadat, Um Rumaneh reservoir and Kheleh.

- **New Um Rumaneh Distribution Zone:** The proposed distribution reservoir bottom elevation is 1045 a.m.s.l. The reservoir will be fed by pumping from proposed Um Rumaneh pumping station at Um Rumaneh existing reservoir site. This distribution reservoir supplies by gravity Rujum Elshuk, Um Rumaneh, Maqam Essa, Abu Hamed, Salhoob, Marsa', Kamsheh. Mekman, Meedan and Beerain.

- **Saroot Distribution Zone:** The existing distribution reservoir bottom elevation is 730 a.m.s.l. The reservoir will be fed by gravity from Beerain reservoir and from Saroot wells. This distribution reservoir supplies by gravity Saroot.

The proposed reservoirs, pump stations, and distribution pipelines originally required to restructure the Russaifah water supply system are shown in the following tables, where these facilities have subsequently been constructed this is indicated. The proposed additional reservoirs from the feasibility study, compared with what has been constructed to date, are shown in the table (12) below.

Table (12): Proposed Reservoirs in Russaifah Water Supply System

Reservoir Name	Proposed Volume (m^3)	Status
Berain Tank	3,000	Not constructed
New Um Rumana Tank	1,500	Not constructed

The proposed additional pump stations, compared with what has been constructed to date, are shown in the table (13) below.

Table (13): Proposed Pumping Station in Russaifah Water Supply System

Pumping Station	Discharge (m^3/hr)	Head (m)	Status
Bireen Pump – 2 pumps	370.00	300.00	Not constructed
To New Um Rommaneh – 2 pumps	200.00	260.00	Not constructed
to Berin – 2 pumps	15.00	45.00	Not constructed

The proposed additional transmission pipelines and primary and secondary distribution lines, compared with what has been constructed to date, are shown in table (14) below.

Table (14): Proposed Transmission and Distribution Pipelines in Russaifah Water Supply System

Diameter (mm)	Material	Length (m)	Already Constructed Length (m)	Revised Length (m)
100	PE	25 000	0	25 000
150	PE	20 000	0	20 000
200	DI	10 000	3 500	6 500
250	DI	6 500	0	6 500
300	DI	6 000	1 500	4 500
400	DI	9 000	4 500	4 500
600	DI	8 000	1 700	6 300
Total		**84 500**		**73 300**

In addition to the transmission and distribution pipelines which have been included in the feasibility study, the amount of ***additional tertiary pipe network and house connections*** has been calculated based on the replacement of a certain percentage of the existing tertiary network and house connections within a particular area. It is based on standard lengths of tertiary network and numbers of house connections per hectare. It is estimated that there is on average within the built-up areas of Zarqa and Russaifah the following (3,59 m tertiary pipe per 1 m secondary pipe, 449 m pipe per ha, 98 m pipe ≥ DN 100 per ha, and 351 m pipe < DN 100 per ha).

The network in Zarqa and Russaifah is then estimated. Based on measuring the built up areas from the GIS, the following pipe lengths have been estimated (326,413 m of pipe ≥ DN 100; and 1,171,297 m of pipe < DN 100 i.e. the tertiary network). Inspections in Zarqa indicate that, due to its poor condition, it would be necessary to replace approximately 80% of the existing tertiary network. This would give approximately a total of 940,000 m of tertiary pipe replacement, with the sizes ranging from DN 20 to DN 80. This is for both Zarqa and Russaifah. Also, around 100,000 ***water meters*** are expected to be replaced in the two areas with the replacement of house connections.

Finally, there is also a need to upgrade the existing water resources infrastructure within the Zarqa Governorate. This applies particularly to the well fields, for the wells themselves, the well pumps and the associated pumping stations in the transmission system. Annex (5-2) gives an overview of the Zarqa Governorate water resources.

The number of wells and pumping stations to be upgraded is shown in table (15).

Table (15): Wells and Pumping Station at the Resources

Description	Number of Wells/PS
Wells	99
Pumping Stations	
large	5
medium/small	12
Total	**116**

5.2.4.2 Key Environmental and Social Considerations

In accordance with the Jordanian Applicable Environmental Laws and Regulations, and under the MCC guidelines of "Environmental and Social Impact Assessment" (ESIA), an initial environmental and social baseline screening as attached in Annex (5-3) has been conducted and has been carried out through field visits to the projects area, consultation with involved governmental and nongovernmental agencies, and thorough review of existing studies.

The objectives of the screening are to determine the major environmental and social components that might be affected directly and indirectly (negative/positive impact) by the activities during the construction and operation phases; categorization of the ESIA under the Jordanian EIA by-law Regulation No.37, for the year 2005 and the MCC Guidelines; and to assist in preparing the ToR for further ESIA's.

The main environmental impacts are considered to be mostly positive and can be summarized as follows:

- Reduction in pressure on available raw water sources due to the significant reduction in the level of NRW;
- Reduction in energy consumed due to the reduction in the level of NRW;
- Reduction in energy consumed due to the move to a gravity rather than a pumped water supply system;
- Reduction in energy consumption due to the installation of properly sized pumps;
- Reduction in localized pollution due to the reduction or elimination of sewage overflows within Zarqa;

- Reduction in localized pollution from septic tanks and cesspits in areas to be connected to the piped sewer network;
- Reduction in pollution in the Wadis downstream from Zarqa due to extension of the piped sewerage area and the increased WWTP capacity;
- Collection of a higher percentage of the wastewater due to extension of the piped sewers and expansion of WWTP allowing for potential reuse of a greater volume of treated effluent; and
- A significant reduction in the production of greenhouse gas emissions due to the significant overall reduction in energy use.

The expected negative environmental impacts can be summarized as:

During Construction

- Transport of building machinery and materials (cement, aggregates, additive mixtures, steel bars, paints, water, and heavy machinery fuels);
- Loading and unloading of construction material at different sites;
- Storage of construction materials;
- Temporary dirt site and dirt access roads;
- Temporary drains and diversion works;
- Transport of employees and workers;
- Construction and erection of project equipment and facilities;
- Transport and installation of equipment;
- Demolition and dismantling some of the old structures;
- Generated domestic wastewater from construction workers and employees;
- Solid waste generation (domestic, debris, and metal work remains);
- Filling activity; and
- Disposal of unsuitable material from sieving activities.

During Operation

- Supply of spare parts and consumables;
- Maintenance including cleaning the valves, pipes and screens;
- Utility operations like domestic wastewater treatment and domestic solid waste management;

As for the social issues which have to be considered they can be summarized as follows:

- Local residents should be given fair job opportunities during all construction activities. Also local sub-contractors should be given fair opportunity to participate in the construction.

- Roads may be negatively affected as result of increasing transportation activities during construction. The improper disposal of debris and leaving pits open would cause a negative visual impact that affects people negatively. Care has to be taken that at the end of the construction any scars in the landscape are mended and restoration of vegetation is executed were appropriate.
- While there are positive economic impacts due to the availability of additional quantities of water for domestic purposes, the present system of landownership is detrimental to a large-scale improvement quality of life. The income situation of local population is also will be improved by connecting them to the sewers system.

Major issues of environmental concern are related to drinking water supply and sewers network capacity. Water system of the Zarqa Governorate is considerably worn-out and significant part of the existing equipment and facilities are in need of urgent modernization. Corrosion of the network pipes leads to high level of leaks and water losses as well as to significant capital expenditure to maintain drinking water quality and stable water supply.

The environmental investigations showed that the project would result in significant environmental, health and safety improvements, and that any adverse environmental impacts would be limited. Implementation of the activities will provide a number of benefits including increased reliability of water supply services, increased capacity of sewers to ensure stable wastewater services.

There are no adverse impacts associated with the implementation of the projects. Construction-related impacts are likely to be localized, short term in nature and they will be efficiently prevented or mitigated by applying international construction practice and planning. Any negative impacts and risks revealed can be fully mitigated thorough implementation of an Environmental and Social Action Plan.

In conclusion, there will be a requirement to prepare a preliminary Environmental and Social Assessment study (Category B in accordance with the Jordanian and MCC/ EIA regulations and Guidelines) prior to design.

5.2.4.3 Costs and Sources of Finance

The cost estimate for the activity is based on the costs prepared in the "Technical and Feasibility Study and final Design of the Upgrading and Expansion of Water Facilities in Central Governorates", prepared by Engicon in 2005. The original costs have been also updated to reflect 2008 prices. This has been done using an escalation factor of 20%. The costs of any of the works proposed in the original feasibility study which have already been constructed have been removed from our cost estimate. The parts of the system serving Zarqa and Russaifah are shown separately. In addition the estimated cost of tertiary network and house connection replacement including water

meters has been added. It is considered to be essential to include significant replacement of the tertiary pipe network if water losses are to be reduced. The entire cost estimate is in JOD for 2008.

Zarqa Water Supply System

The cost estimate for reservoirs in Zarqa is shown in the table (16).

Table (16): Cost Estimate of Reservoirs in Zarqa Water Supply System

Reservoir Name	Cost Estimate 2005 (JOD)			Revised Cost 2005 (JOD)	Cost Estimate 2008 (JOD)
	Elect-mech	Civil	Total	Total	Total
Batrawi Tank	70 000	300 000	370 000	370 000	444 000
Gnayya collection tank	20 000	35 000	55 000	55 000	66 000
New Zarka High Tank-JICA Project Stage 3	70 000	250 000	320 000	120 000	144 000
New Hashmiya JICA Tank	70 000	250 000	320 000	200 000	240 000
New Sukhna Tank by JICA	70 000	200 000	270 000	270 000	324 000
New Dlail Tank	70 000	250 000	320 000	192 000	230 400
New Tafeh Tank	35 000	50 000	85 000	85 000	102 000
New Tatweer Tank	70 000	180 000	250 000	250 000	300 000
Total	**475 000**	**1 515 000**	**1 990 000**	**1 542 000**	**1 850 400**

The cost estimate for pump stations in Zarqa is shown in the table (17).

Table (17): Cost Estimate of Pump Stations in Zarqa Water Supply System

Pump Description	Cost Estimate 2005 (JOD)			Revised Cost 2005 (JOD)	Cost Estimate 2008 (JOD)
	Elect-mech	Civil	Total	Total	Total
Khaw PS to Batrawi	650 000	0	650 000	650 000	780 000
Hallabat PS to City	30 000	0	30 000	30 000	36 000
Qnayya PS	40 000	0	40 000	40 000	48 000
Batrawi PS to Zarka High Tank	250 000	50 000	300 000	300 000	360 000
Hallabat PS to Dlail Tank	240 000	0	240 000	240 000	288 000
Dlail PS to Tafeh Tank	70 000	35 000	105 000	105 000	126 000
Hashmiya PS to Sukhna tank	190 000	50 000	240 000	240 000	288 000
Zarka PS to Military Camp	180 000	0	180 000	180 000	216 000
New Al ghareesah PS	20 000	15 000	35 000	35 000	42 000
Zarka PS to Batrawi Tank	350 000	0	350 000	350 000	420 000
Total	**2 020 000**	**150 000**	**2 170 000**	**2 170 000**	**2 604 000**

The cost estimate for new transmission lines, primary and secondary distribution pipelines in Zarqa is shown in table (18).

Table (18): Cost Estimate of Transmission Lines and Distribution Pipelines in Zarqa Water Supply System

Diameter (mm)	Length (m)	Unit price (JOD/m)	Cost Estimate 2005 (JOD)	Already Constructed Length (m)	Revised Length (m)	Cost Estimate 2008 (JOD)
100	15 000	35	525 000	0	15 000	630 000
150	21 000	43	903 000	0	21 000	1 083 600
200	16 000	60	960 000	1 300	14 700	1 058 400
250	3 000	70	210 000	0	3 000	252 000
300	28 000	82	2 296 000	20 300	7 700	757 680
400	13 500	95	1 282 500	1 500	12 000	1 368 000
500	4 000	120	480 000	0	4 000	576 000
600	2 200	165	363 000	1 800	400	79 200
300	14 000	82	1 148 000	0	14 000	1 377 600
500	1 100	120	132 000	0	1 100	158 400
Total	**117 800**		**8 299 500**	**24 900**	**92 900**	**7 340 880**

Russaifah Water Supply System

The cost estimate for reservoirs in Russaifah is shown in table (19).

Table (19): Cost Estimate of Reservoirs in Russaifah Water Supply System

Reservoir Name	Cost Estimate			Revised Cost 2005 (JOD)	Cost Estimate 2008 (JOD)
	Elect-mech	Civil	Total	Total	Total
Berain Tank	70 000	180 000	250 000	250 000	300 000
New Um Rumana Tank	60 000	135 000	195 000	195 000	234 000
Total	**130 000**	**315 000**	**445 000**	**445 000**	**534 000**

The cost estimate for pump stations in Russaifah is shown in table (20).

Table (20): Cost Estimate of Pumping Stations in Russaifah Water Supply System

Pump Description	Cost Estimate (JOD)			Revised Cost 2005 (JOD)	Cost Estimate 2008 (JOD)
	Elect-mech	Civil	Total	Total	Total
Bireen Pump	260 000	50 000	310 000	310 000	372 000
To New Um Rommaneh	210 000	50 000	260 000	260 000	312 000
to Berin	25 000	20 000	45 000	45 000	54 000
Total	**495 000**	**120 000**	**615 000**	**615 000**	**738 000**

The cost estimate for new transmission lines, primary and secondary distribution pipelines in Russaifah is shown in table (21).

Table (21): Cost Estimate of Transmission Lines and Distribution Pipelines in Russaifah Water Supply System

Diameter (mm)	Length (m)	Unit price (JOD/m)	Cost Estimate 2005 (JOD)	Already Constructed Length (m)	Revised Length (m)	Cost Estimate 2008 (JOD)
100	25 000	35	875 000	0	25 000	1 050 000
150	20 000	43	860 000	0	20 000	1 032 000
200	10 000	60	600 000	3 500	6 500	468 000
250	6 500	70	455 000	0	6 500	546 000
300	6 000	82	492 000	1 500	4 500	442 800
400	9 000	95	855 000	4 500	4 500	513 000
600	8 000	165	1 320 000	1 700	6 300	1 247 400
Total	**84 500**		**5 457 000**		**73 300**	**5 299 200**

The cost estimate for replacement of the tertiary distribution pipelines and house connections including water meters within both Zarqa and Russaifah is shown in table (22).

Table (22): Cost Estimate Tertiary Pipeline Replacement and Water Meters in Zarqa and Russeifeh Water Supply Systems

Location	Tertiary Pipe DN 20 to DN 80 (m)	Unit Cost Pipe (JOD/km)	Cost Pipe 2008 (JOD)
Zarqa and Russeifeh	940 000	35	32 900 000
Zarqa and Russeifeh	**Water Meters**	**Unit Cost (JOD/meter)**	**Meter Cost 2008 (JOD)**
	100 000	35	3 500 000
Total	**930 000**		**36 400 000**

The cost estimate for water resources including the repair, upgrading and replacement of the existing well pumps, well heads, and pump houses is given in table (23).

Table (23): Cost Estimate Wells Rehabilitation in Zarqa and Russeifeh

Description	Number of Wells/PS	Unit Cost 2008 (JOD)	Cost Estimate 2008 (JOD)
Wells	99	40 000	3 960 000
Pumping Stations			
large	5	750 000	3 750 000
medium/small	12	150 000	1 800 000
Total	**116**		**9 510 000**

In summary, table (24) summarizes the total cost expected for this activity.

Table (24): Cost Estimate for Activity 1

ITEM	Cost (JOD)	Cost (US$)
Reservoir	2 384 400	
Pumping stations	3 342 000	
Transmission and distribution pipelines	12 640 080	
Tertiary pipeline replacement including water meters	36 400 000	
Water resources	9 510 000	
Total	64 276 480	**91 000 000**

5.2.4.4 Existing Inventory Work

Refer to Annex (5-4) for full details of all existing inventory work.

5.2.4.5 Economic Benefits and Target Population

The main expected economic benefits come from savings in the operation and maintenance of the water supply system resulting from the implementation of the activity. These are as follows: Savings associated with the reduction of NRW in Zarqa and Russeifah from approximately 54% down to 25% (provided the customer management improves in parallel); Reduction in energy costs due to replacement of existing pumps with more suitable pumps; Reduction in pump and pipe maintenance due to moving to a gravity system; and Reduction in maintenance costs due to improvements in the tertiary pipe network.

For the water supply the target population and hence beneficiaries would include the entire population of Zarqa Governorate who are presently served by piped water as well as the future population considering the design horizon of 2025. The reduction in the level of NRW which is anticipated to occur as a result of the activity should make it possible to improve the level of service of potable water. In particular the situation of intermittent supply whereby water is available in average for only one or two days a week should be greatly improved.

Improvements in the tertiary network should provide reduced disruption to individual consumers due to supply disruption, pipe repairs, etc... The change of the system from pumping to a gravity feed should also provide a greater level of security against disruption of supply. These improvements should reduce the cost to the target population of purchasing expensive water from tankers when there is no or insufficient piped supply. There should be a financial benefit to the Zarqa Water Governorate from the: reduction of the level of NRW; reduction in pumping costs through moving to a gravity system; and reduction in energy costs through better sizing of pumps. This benefit may be passed on to consumers.

5.2.4.6 Legal and Regulatory Requirements

It is not anticipated that there will be any significant legal or regulatory requirements which would significantly delay or impact negatively the implementation of the activity. These requirements are as follows:

- The new reservoirs required for the change to the gravity system have been constructed in some cases and in other cases will be on existing sites. There may however be some land acquisition issues relating to acquiring some of the reservoir sites;
- The works proposed for pumping stations are at existing sites and should not raise any legal or regulatory issues;
- The pipes to be laid are generally in public roads and in many cases replace existing pipes which should not raise any legal or regulatory issues; and
- There may be some regulatory requirements to be implemented and enforced in relation to the location of the household water meter inside properties.

Overall, it is anticipated that there will be no major requirements as the works to be implemented is this activity are all for facilities of a similar nature to those presently operated by Zarqa Water Governorate.

5.2.4.7 Activity Operation and Capacities

The Zarqa Water Governorate should have the capacity to operate and maintain the restructuring of the existing water system with some expansion of their organizational structure, staffing and resources. This is not considered to represent a major problem.

To switch to a gravity system away from direct pumping into the network should make it easier to manage the overall system. The restructuring of the primary and secondary distribution networks into pressure zones and DMA's should also facilitate the closing off water supply to areas for maintenance works and should not increase the operational burden of Zarqa Water Governorate. The replacement of much of the existing tertiary pipelines and house connections in addition to the water meters should not pose a problem to the existing operational capacity of Zarqa Water Governorate. On the contrary, it should reduce the number of complaints in these areas and significantly reduce the need for repairs thereby freeing resources for deployment to other operation and maintenance activities.

5.2.4.8 Sustainability of the Activity

It is considered that the activity would be sustainable with respect to both the financial and the institutional aspects. Both of these aspects would however have to be strengthened. These are both detailed in the following.

5.2.4.8.1 Financial

The 2007 Profit and Loss (PL) Statement is the first report on the financial position of the Zarqa Water Governorate as a separate entity. It applies cash basis accounting according to the governmental accounting regulations. The financial analysis is based on four profit centres, water, sewerage, water tankers, and desert wells. This PL Statement is based on operation and maintenance cost excluding depreciation, interest and extraordinary costs.

Total operational and non-operational revenues of Zarqa Water Governorate are about JD 10.7 million, whereas total expenses add up to about JD 14.5 million. These financial figures result in overall losses for the financial year 2007 of approximately 3.75 million JOD. Almost 25% of total expenses are not covered by revenues. Annex (5-5) shows the overall financial position of Zarqa Water Governorate.

Zarqa Water Governorate could not cover its total variable costs by revenues produced. With a total operating recovery ratio of 74%, a break-even point could not be reached in the financial year of 2007. This is an indication that more efforts need to be undertaken in order to achieve a stable financial position of Zarqa Water Governorate and an overall profit within each of the profit centers. Main reasons for

the high expenses can be seen in the considerable share associated with wastewater treatment (26%), water imports (26%), electricity costs (22%), and the extensive amount of NRW.

As for the NRW problem with 54% of the total supply, it is important to further improve the billing and collection activities and also address the physical loss reduction however; this huge amount of NRW cannot be further broken down and differentiated. It is therefore crucial to install a reliable metering system allowing to meter the inflow to different supply zones and establish DMA's in addition to differentiate between transmission and distribution systems in order to reduce this percentage and improve substantially the financial position of Zarqa Water Governorate.

The socio-economic baseline survey which was implemented in 2008 showed that there is a substantial potential to increase the tariff in parallel with service improvement if a threshold of 7% of the total household expenditure is defined as an acceptable level of water and wastewater expenditure.

5.2.4.8.2 Institutional

An institutional restructuring option report for Zarqa Water Governorate has been adopted by WAJ in 2007 and endorsed by the Council of Ministers. This option is detailed as follows:

- A Performance-Based Management Contract of at least 5 years duration will be implemented in the said Governorate (in addition to Balqa Water Governorate) which will aim at realizing the efficiency gains and introducing modern management systems and operating procedures; and
- WAJ will delegate all the authority, powers, responsibility and accountability to the appointed Management Contractor under the terms of the contract including development, management and administration of an associated capital investment programme. In addition the Management Contractor will be required to establish a Limited Liability Public Company (Public Company) during the contract period when the conditions are appropriate. This will allow the optimal operation of the new investments and safeguard the assets through the introduction of operating procedures and the introduction of modern maintenance techniques.

5.2.4.9 Linkages with Other Projects

There are a number of existing ongoing projects in Zarqa Governorate in relation to water supply as is shown in Annex (5-6) which shows the location of the proposed, ongoing and completed projects. These projects are funded by both the GoJ and by foreign donors and are summarized as follows:

- Operations Management Support (OMS) to the Middle Governorates funded by GTZ;

- Water Management Middle Governorates funded by KfW;
- Improvement of the Water Supply System for Zarqa Governorate funded by JICA;
- Water Supply Project in Russaifah funded by the Chinese Government;
- Water Loss Reduction Small Scale Projects funded by GoJ (Bani Hashem, Dogara, Al-Gwairheyah villages); and
- Poverty Reduction Projects funded by WAJ (Ghareesa, As-Sukhneh, Al-Hashmeyah, Arnous areas).

Care has to be taken in preparing the details of the activity to avoid overlapping with other projects implementing similar works. Where possible the activity aims to utilize investments to the maximum extent possible and optimize their use. This is particular the case with the investments already implemented through the JICA project.

The linkage with the OMS to the Middle Governorates and the Water Management Middle Governorates will be particularly important to strengthen the management, operation and maintenance capacities of the Zarqa Water Governorate. This should enhance their capacity to effectively manage the new investments.

5.2.4.10 Project Implementation

It is understood that there is a time of 5 years for the disbursement of all funds under projects financed through the MCC. This time restriction represents a significant constraint.

5.2.4.10.1 Implementation Arrangements

The start of the preparation of Terms of Reference (ToR) for the engineering consultant firm(s) that will be selected to update the feasibility studies, review, design, tender and supervise the works implementation. It is expected that the Accountable Entity would lead the project management responsibilities of the activity at a later stage.

5.2.4.10.2 Project Delivery Strategy

The key elements of the project delivery strategy are as follows:

- Maximize the amount of preliminary work completed before the formal start of the compact 5 year implementation period. It is important to define the activity elements and costs to the greatest extent possible before funds are committed;
- Determine the contract packaging for the consulting work if possible before formal start of the compact 5 year implementation period. In order to minimize interface issues it is recommended that both water and sewer networks in a given area are awarded to the same consultant and the number of such contracts be kept to an absolute minimum;

- Package the review and planning with the detailed design, tendering, construction supervision phases in the same consultancy contract. This avoids delays in the award and mobilization of consultants for the different phases of the work; and
- The consultant and the implementing agency are to determine the works contracts packaging. Water and sewer networks are to be packaged in the same areas, several contracts to be awarded, but not so many so as not to make overall project management difficult. Consideration shall be given to some small scale contracts to implement the tertiary network replacement.

5.2.4.11 Key Risks/Issues

The key risks/issues are as follows:

- Completion of construction is delayed beyond the 5 year period for implementation; and
- Zarqa Water Governorate does not have the institutional capacity to manage the new facilities constructed through the Project.

5.3 Project Area 2: Increased Wastewater Treatment Capacity

5.3.1 Project Development Objective

The overall objective of this project is to effect a substantial improvement in the existing level of service for the population of Zarqa Governorate and to secure additional freshwater volumes to Amman Governorates. This includes the extension of the coverage of piped sewerage within Zarqa Governorate to areas that are not presently connected, expansion of the trunk sewer system to better cope with present and future demand, reduce the number of blockages and sewage overflows through the upgrading of the trunk sewers, increase the amount of wastewater being collected and treated by expanding As Samra Wastewater Treatment Plant; and convey the additional treated wastewater from King Talal Dam up to North Jordan Valley to allow for transferring substituted freshwater to Amman Governorate.

5.3.2 Rationale

The present deficiencies in the sewer system in Zarqa Governorate are such that they represent a danger to public health. In particular blocked sewers and the resulting spill of raw sewage into the streets are not acceptable. This is due to deficiencies in the sewer network with undersized pipes, the poor condition of some pipes and manholes, and the maintenance of the sewer system with the amount of flushing not being adequate to remove blockages and sediments. The other major problem with the existing sewer system in Zarqa Governorate is its extent. As of 2007 there were

124,281 total subscribers to the water supply system, who were billed for a total of 20,277,246 m^3 of water, of these only 89,091 i.e. 72% were connected to the sewerage system.

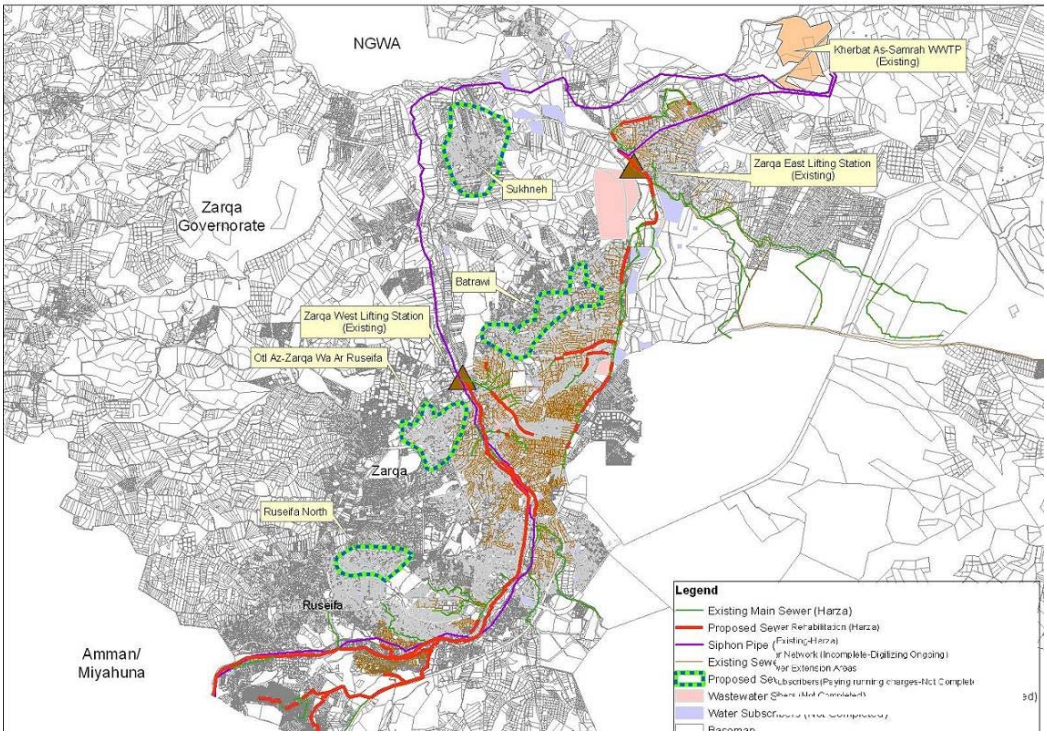
5.3.3 Description of Project Activities

5.3.4 Activity 1: Zarqa Governorate Wastewater System Reinforcement and Expansion

5.3.4.1 Description of Activity Components

The components are based on the recommendations from the "Master Plan and Feasibility Study for Rehabilitation, Expansion and Development of Existing Wastewater Systems in Amman-Zarqa River Basin Area, Plan Year 2025" prepared by Harza, dated 1997, in addition an estimate of the potential areas for extension of the piped sewer system has been made by WAJ as shown in figure (10).

Figure (10): Overview of Activity 2



An overview of the proposed activity is also shown in the Annex (5-7).

Hydraulic modeling undertaken by the Master Plan indicated that nearly 85 km of existing trunk sewers in both Amman and Zarqa Governorate would become overloaded in the next five to fifteen years (i.e. starting from 1997). The Master Plan proposed a Phase I for collection system capacity additions which should be completed before 2015. The proposal was subdivided into Amman and Zarqa

Governorates, only the proposal for Zarqa Governorate is referred to here. The proposal to 2015, as they relate to the sewage collection network, i.e. Phase I are considered to be suitable as a basis to be financed and have not been implemented to date. The Master Plan was only to expand the sewer collection system (trunk sewers only) excluding house connections and smaller lateral sewers. A summary of the proposed sewer improvements for only Zarqa (i.e. excluding Amman but including Russaifah) is shown in the table (25).

Table (25): Summary of the Proposed Wastewater Improvements in Zarqa Governorate

Proposed Diameter Range (by Period)	Length (km)
Phase I: Sub-Phase 1 (1997-2005)	
less than 800 mm	0.05
800 mm to 1000 mm	7.44
greater than 1000 mm	6.96
Sub-Total	14.5
Phase I: Sub-Phase 2 (2006-2010)	
less than 800 mm	4.82
800 mm to 1000 mm	0.00
greater than 1000 mm	2.27
Sub-Total	7.10
Phase I: Sub-Phase 3 (2011-2015)	
less than 800 mm	4.89
800 mm to 1000 mm	0.66
greater than 1000 mm	0.38
Sub-Total	5.93
TOTAL	27.5

The available mapping of the Zarqa sewerage system was reviewed in particular the locations of customers served by water only and those served by both sewer and water. This when compared with the existing elevations gives the areas where the sewer collection network i.e. the laterals and house connections, could be extended. The lateral sewers in this case are assumed to be of the minimum diameter of DN 200. Sewer extensions to the specific areas indicated have been estimated. The results are shown in the table (26).

Table (26): Additional Zarqa Governorate Expected Sewer Extension

Location	Area (ha)	Pipe Density (m/ha)	Lateral Sewer DN 200 (m)	House Connections (No.)
Batrawi	219	293	64 167	16350
Sukhneh	283	293	82 919	4 700
Otl Az Zarqa Wa Ar Russaifa	166	293	48 638	1 000
Ruseifa North	115	293	33 695	650
Total	**783**		**229419**	**22500**

The estimated population benefiting from the extension of the sewer network is 130,000. This could possibly further increase during more detailed investigation upon completion of the ongoing Comprehensive Subscriber Survey being implemented by the GTZ OMS project.

5.3.4.2 Key Environmental and Social Considerations

Refer to Section 5.2.4.2 for full details of all Environmental and Social Considerations.

5.3.4.3 Costs and Sources of Finance

The cost estimates are primarily based on wastewater feasibility studies with some additional estimates. The costs have been updated to 2008 prices.

The cost of the Phase I components as clarified above is shown in the following table (27). All costs are in JD and date from 1997 with an escalation to 2008 as shown. The cost estimates have been updated by applying a factor of 300% to allow for the price escalation between 1997 and 2008.

Table (27): Cost Estimates for phase I Components in Zarqa Governorate

Proposed Diameter Range (by period)	Length (km)	Cost 1997 (JOD)	Cost 2008 (JOD)
Phase I : Sub-Phase 1 (1997-2005)			
less than 800 mm	0,05	7 000	21 000
800 mm to 1000 mm	7,44	1 700 000	5 100 000
greater than 1000 mm	6,96	3 300 000	9 900 000
sub-total	**14,45**	**5 007 000**	**15 021 000**
Phase I : Sub-Phase 2 (2006-2010)			
less than 800 mm	4,82	500 000	1 500 000
800 mm to 1000 mm	-	-	-
greater than 1000 mm	2,27	1 300 000	3 900 000
sub-total	**7,09**	**1 800 000**	**5 400 000**
Phase I : Sub-Phase 3 (2011-2015)			
less than 800 mm	4,89	700 000	2 100 000
800 mm to 1000 mm	0,66	120 000	360 000
greater than 1000 mm	0,38	100 000	300 000
sub-total	**5,93**	**920 000**	**2 760 000**
TOTAL	**27,47**	**7 727 000**	**23 181 000**

An estimate of the areas where the sewer collection network i.e. the laterals and house connections could be extended has been made. The lateral sewers in this case are assumed to be the minimum diameter of DN 200. The quantities, unit rates and costs are shown in table (28).

Table (28): Cost Estimates for Sewer Collection System Extension in Zarqa Governorate

Location	Lateral Sewer DN 200 (m)	House Connections (No.)	Unit Cost Pipe (JOD/m)	Unit Cost HC (JOD/No.)	Cost Estimate 2008 (JOD)
Batrawi	64 167	850	60	350	4 147 520
Sukhneh	82 919	4 700	60	350	6 620 140
Otl Az Zarqa Wa Ar Russaifa	48 638	1 000	60	350	3 268 280
Ruseifa North	33 695	650	60	350	2 249 200
Total	**229419**	**7200**			**16 285 140**

In summary, table (29) summarizes the total cost expected for this activity.

Table (29): Cost Estimate for Activity 2

ITEM	COST (JOD)	COST (US$)
Reinforcement of existing wastewater system	23 181 000	
Sewer Collection System Extension	16 285 140	
Total	**39 466 140**	**55 500 000**

5.3.4.4 Existing Inventory Work

Refer to Annex (5-4) for full details of all existing inventory work.

5.3.4.5 Economic Benefits and Target Population

There should be a significant general benefit to entire population of Zarqa due to the decrease or elimination of sewage overflows and the resulting health risks and costs. There will be specific benefit to that part of the population who are presently served only be water and not be sewer when the piped sewerage system is extended.

There should be a benefit to people living downstream from Zarqa, near the Wadis, due to reduced pollution resulting from the extension of the piped sewerage coverage and the increase in WWTP capacity.

5.3.4.6 Legal and Regulatory Requirements

It is not anticipated that there will be any significant legal or regulatory requirements which would significantly delay or impact negatively on the implementation of the Project. These requirements are as follows:

- The sewers to be laid are generally in public roads and in many cases replace existing pipes these should not present any legal or regulatory issues; and
- There may be some regulatory requirements to be implemented and enforced in relation to forcing property owners to connect to the piped sewer system.

5.3.4.7 Activity Operation and Capacities

The extension to the existing piped sewerage system is intended to be purely gravity systems. There maybe a limited requirement for some manhole pumping stations to avoid excessive excavation depths in some places but if possible this will be avoided. The Zarqa Water Governorate should have the capacity to operate and maintain these extensions to the existing sewer system with some expansion of their existing organizational structure, staffing and resources. This is not considered to represent a major problem.

In the case of the replacement of the existing trunk sewers where these are undersized, this should not pose a problem to the existing operational capacity of the Zarqa Water Governorate. On the contrary it should reduce the number of blockages in these areas and significantly reduce the need for flushing and cleaning sewers thereby freeing resources for deployment to other operation and maintenance activities.

5.3.4.8 Sustainability of the Activity

5.3.4.8.1 Financial

Refer to Section 5.2.4.8.1 for full details of financial sustainability.

5.3.4.8.2 Institutional

Refer to Section 5.2.4.8.2 for full details of institutional sustainability.

5.3.4.9 Linkages with Other Projects

Unlike the water supply systems, there are relatively few existing ongoing projects in the Zarqa Governorate, relating to the sewerage network. Please refer to Annex (5-6) which shows the location of proposed, ongoing and completed projects in Zarqa Governorate, these are however almost exclusively water supply projects. The few projects relating, at least in part, to sewerage/wastewater are summarized as follows:

- Operations Management Support to Middle Governorates, funded by GTZ, although primarily focused on water supply this project also includes sewerage; and
- Water Management Middle Governorates, funded by KfW, again although primarily focused on water supply this project also includes sewerage.

The linkage with the Operations Management Support to Middle Governorates, funded by GTZ; and the Water Management Middle Governorates, funded by KfW will be particularly important to strengthen the management, operation and maintenance capacities of the sewerage part of the Zarqa Water Governorate. This should enhance their capacity to effective manage the new facilities.

5.3.4.10 Project Implementation

5.3.4.10.1 Implementation Arrangements

Refer to Section 5.2.4.10.1 for full details of implementation arrangements.

5.3.4.10.2 Project Delivery Strategy

Refer to Section 5.2.4.10.2 for full details of implementation arrangements.

5.3.4.11 Key Risks/Issues

Refer to Section 5.2.4.11 for full details of the key risks/issues.

5.3.5 Activity 2: Expansion of Zarqa Governorate Wastewater Treatment Capacity

The purpose of this section is to give an overview of the consequences brought by the expansion of the new As Samra WWTP/BOT and with a pre-treatment facility/Pumping station at Suknah to treat projected flows from the entire study area.

It is recommended to maintain the Hashemiyyeh pumping station and keep the pumping station in operation instead of transferring the wastewater to the new pre-treatment facility

The basis for the considerations is constituted by the report prepared by Harza "Amman- Zarqa River Basin Area Wastewater Master Plan Update, June 2006".

Contractually the option can easily be implemented by negotiating amendment to the existing contracts of consultancy services of SWECO and the BOT contract of SPC (SUEZ/Degremont/Morganti).

5.3.5.1 Description of Activity Components

The activity includes extension of As Samra WWTP, a new pre-treatment at Suknah and 2 new transmission lines, one from Zarqa pumping station to the new pre-treatment and one from the new pre-treatment to As Samra WWTP.

The extension of As Samra has to have a design flow of 159 000 m3/day. This is an increase with 60% of the present design flow. The assumption is that the extension of the water line should consist of two new lines; one H2S removal tank, two primary settling tanks, four aeration tanks, four final clarifiers and one disinfection tank. It must be one more outfall turbine and a new pipe to it. These two new water lines have to have 10% higher capacity when comparing it with the design capacity of the existing lines.

The sludge line should be with two DFA,s , two primary thickeners (or mechanical pre dewatering equipment, three digesters and one bio filter to reduce the H2S concentration in the produce bio gas. Three more co-generators are needed.

Today all sludge is dried in the solar drying beds but it is preferable to install sludge dewatering centrifuges for the extended plant. Hashemiyyeh pumping station is at present in good condition regarding installed equipment. The pressure pipe from the station to As Samra is in good condition and does not need to be refurbished at present. The new investment needed for Hashemiyyeh pumping station is a more sufficient pre-treatment of the waste water, screens etc...

If Hashemiyyeh pumping station should be retired another transmission pipeline from the pumping station to the new pre-treatment would be needed.

5.3.5.2 Key Environmental and Social Considerations

The key environmental and social considerations are described in the "Environmental assessment report of As-Samra WWTP" as attached in Annex (5-8). This report has to be updated and has also to include the pre-treatment and the transmission lines. The environmental impact will be limited. The report also has to be updated in order to fully adapt to MCC regulations and standards. The social impact will be very positive in respect of working environment on the pre-treatment compared with the condition on the existing Zarqa pumping station. The power consumption will decrease if the waste water is better pre-treated before the pumps then it will be possible to install pumps with higher efficiency in the new pre-treatment and pumping station compared with the existing pumps in Zarqa pumping station.

5.3.5.3 Costs and Sources of Finance

The expected investment cost according to the calculations in the Harza report 2006 was approximated to US$ 130 million. This cost is based on a new plant with a design capacity of 146 000 m^3/day and located besides the existing WWTP in As Samra. The investment cost for an extension of As Samra WWTP with the same capacity as mentioned above is expected to be 10% cheaper equal an investment cost, US$ 117 million.

In 2008 the cost has increased because of indexations. The average increase of different indexes (during the two last years) is roughly estimated to be 15%.

In the Harza report the costs for design, engineering and supervision are not included. The assumption is that approximately 15% should be added for these works. The investment cost according to above is at present estimated to be around US$ 155 million (117+ 15% = 134.55, 134.55+15%= 154.732).

Under section "Benefits and Target Population", it is mentioned that approximate 13 000 m^3/day additional waste water should be treated. To treat this extra amount of

wastewater, it is assumed that the investment cost will increase with about 5%. The investment costs needed for the sewer network is not included in the estimated investment cost. According to the above, the total investment cost is estimated to be around **US$ 162.5 million** (134.55+5%=141.278, 141.278+15%=162.469). It is proposed to try to finance the investment similar to As Samra WWTP BOT Project. It was financed with 50% as grant, 15% equity and 35% debt.

5.3.5.4 Existing Inventory Work

Refer to Annex (5-4) for full details of all existing inventory work.

5.3.5.5 Economic Benefits and Target Population

The needed extension of As Samra is to meet the future amount of wastewater produced in the areas of Amman, Russafiah and Zarqa and to treat the waste water so it can be reused for irrigation mainly in the Jordan Valley. Reuse of treated wastewater is an essential element of the Jordanian water strategy and has major health, environmental and agricultural requirements according to the wastewater policy.

The effluent quality will have additional benefit of freeing up drinking water by decreasing agricultural use of freshwater. The produced and digested sludge will be used for agriculture purposes. The wastewater flow to be treated in the extended plant is 146 000 m^3/day. This amount together with the design flow to As Samra WWTP (267 000 m^3/h) will cover 85% of the area studied in the Harza report 2006. However, the additional 18% of the area inside the boundary is expected to be connected to the sewer network and produce approximately 13 000 m^3/day. According to above it is recommended to also add the 13 000 m^3/day to the extended capacity. In total the capacity of the extension should be 159 000 m^3/day.

5.3.5.6 Legal and Regulatory Requirements

The existing Project Agreement (Especially Section 10 New Investments) will form the basis for the new agreements. Some modifications will however be necessary in order to cover the new facilities and services required. The Project Agreement is attached in Annex (5-9)

5.3.5.7 Activity Operation and Capacities

It is recommended that the existing SPC is taking care of the operation and maintenance of the extension of the waste water treatment plant and also the operation and maintenance of the new pre-treatment, pumping station and the new pressure pipe. At present the numbers of employees in SPC is approximately 190. When they take care of the operation of the extended part of the waste water treatment plant and the new pre-treatment with pumping station and the pressure pipe it is expected that the crew must be increased with about 30-40 employees.

5.3.5.8 Sustainability of the Activity

The main goal of the WWTP is to produce an effluent of such quality to allow for its beneficial reuse particularly for irrigation. The existing philosophy of the plant design in order to reduce energy needs by recovering biogas from the digesters and hydropower generation will be fully implemented in the suggested expansions as described in above.

5.3.5.8.1 Financial

The present treatment charge to be paid by MWI per treated cubic meter of wastewater is approximate JD 0.12. The investment cost of the extension is higher in respect of USD/capacity of the plant; this is mainly because of the increased indexes. It will be an additional cost for the operation of the extended plant due to lower energy recovery. The reason is that it will not be possible to use inlet turbines in the extended part of the plant. With an extension the number of additional employees needed to operate and maintain the extend part of the plant will be rather low. The salary costs per m^3 treated water will be less then today. This is also one of the advantages to make an extension and not a separated plant. According to above the treatment charge per treated m^3 waste water will be higher when compared with the existing plant and it is mainly because of the higher investment cost in respect of USD/capacity of the plant. It can be expected that the treatment charge will increase with about 20-30%. MWI intend to increase the wastewater part of the tariff charged to the consumer to cover part of the increase.

5.3.5.8.2 Institutional

MWI has during the ongoing project established the institutional framework as shown in Annex (5-10) and resources required for management in technical, financial and regulatory aspects in relation to the Project Agreement. Formal training, as well as on the job training, has been executed regarding both the construction and operational period. The existing management organization has to some extent been trained in order to deal with the new facilities and services.

5.3.5.9 Linkages with Other Projects

It is also very important to mention the "Disi" project. The "Disi" project consist of pumping drinking water from deep wells in Disi (area south of Jordan close to Saudi Arabian border) and then transfer it to Amman Governorate. The possible amount of drinking water to be transferred is up to 300 000 m^3/day. This project is expected to be finalized in year 2013. The long term influence of the Disi project regarding the waste water capacity in Amman Governorate has to be reflected in the extension of As Samra WWTP.

5.3.5.10 Project implementation

5.3.5.10.1 Implementation arrangements

The existing Project Agreement of the As Samra WWTP BOT project is to be updated "lesson learnt" and then the contract should be amended to the existing contract with SPC. The new parts as the pre treatment, pumping station in Sukhnah, new sewer, pressure pipe to As Samra and upgrading of Hashemiyyeh pumping station could be a separate contract; however operation of the facilities should be the obligation of SPC. It is expected that the Accountable Entity would lead the project management responsibilities of the activity at a later stage.

5.3.5.10.2 Project delivery strategy

It is very urgent to find the capital to finance the extension needed and to reach an agreement with SPC. The target should be to have finalized the extension before the end of year 2015.

5.3.5.11 Key risks/issues

The two major key risks are to find the capital (granters and private/public investors) and then to reach an agreement with SPC as soon as possible. It is very urgent to finalize the two above mentioned issues to meet the future demands of treating the wastewater.

5.3.6 Activity 3: Construction of a Conveyor Pipeline from King Talal Dam to Irrigate North Jordan Valley

5.3.6.1 Description of Activity Components

The components in this activity are primarily the construction of a conveyor pipeline from Telal ElDahab (Hawarat) area at the downstream of KTD to irrigate the Development Areas (DA) in North Jordan Valley (NJV) through the irrigation system scheme currently in use as shown in Annex (5-11), which includes a pumping station, and connecting the proposed conveyor with the existing distribution system in NJV and the Control Centre (CC) in KAC, details of which are shown in Annex (5-12). There might be a need to construct a regulating reservoir in Telal ElDahab (Hawarat) area.

However a feasibility and design study has recently started for the proposed Activity and it is envisaged that it will clearly define the details of all the components. The proposed conveyor would allow benefiting from the additional treated wastewater volumes generated from Zarqa Governorate and flowing to KTD, for irrigation purposes in NJV without extending the areas of irrigated land. This will allow for the transfer of freshwater from KAC, through the existing Deir-Alla-Zai-Dabouq System to Amman Governorate, taking into consideration that it is operated currently half capacity i.e. transferring approximately 47 MCM from a total design capacity of 90 MCM.

5.3.6.2 Key Environmental and Social Considerations

Initial environmental and social screening has been carried out for the purpose of the project implementation. The initial findings indicate that the project is categorized as "B" under the MCC's ESIA guidelines and Preliminary Environmental Impact Assessment under Jordan's EIA by-law for the year 2005. Therefore, JVA has prepared the ToR for feasibility and design for construction of the pipeline including a ESIA report. The consultant has been selected under the Jordan Local Tendering Procedures. The ToR will have to be subject to amendment to incorporate the MCC guidelines and requirement for ESIA particularly to assess the involuntary resettlement and/or land acquisition which will affect the financing cost of the project.

Initially, the environmental and social concerns need to be addressed during the ESIA include water resources, soil characteristics, ecology / biodiversity, agricultural production, public and occupational health and safety, socio-economic conditions and Archaeology, perception of farmers to use the treated wastewater as an alternative to freshwater.

While issues related to involuntary resettlement have to be considered as well as the land acquisition which must be avoided wherever possible during the design stage. Moreover, generating an additional wastewater volume of 12 MCM/year and conveying it from KTD to NJV will be important to increase the economic growth since it will allow the transfer of more quantities of freshwater to Amman Governorate allowing for more economic growth, health and environmental benefits.

5.3.6.3 Costs and Sources of Finance

The estimated cost for this activity is US$ 55 million to cover the cost of the conveyor pipeline, pumping station and the regulating reservoir.

5.3.6.4 Existing Inventory Work

Refer to Annex (5-4) for full details of all existing inventory work.

5.3.6.5 Economic Benefits and Target Population

The proposal to provide farmers with treated wastewater and to replace valuable fresh water resources allows realizing a number of different benefits. There are two major types of benefits which are the nutrient replacement value of the treated waste water, and the value of the replaced freshwater resources.

The quality of the waste water (nutrient content) represents direct benefits to the farmers, as it allows reducing fertilizer application rates and thus the related agricultural production cost.

The additional wastewater quantities allow replacing a certain amount of freshwater resources which are valued at their opportunity cost to the national economy. The valuation of the replaced freshwater quantities is based on the opportunity cost to supply freshwater from alternative water sources.

5.3.6.6 Legal and Regulatory Requirements

The Reclaimed Domestic Wastewater Standard No.(893) of 2002 attached in Annex (5-13) delineate the physical, chemical and biological characteristics of reclaimed domestic water permissible for Wadi discharge, reuse in irrigation and groundwater recharge and sets the allowable limits for each. The wastewater effluent of the treatment plants is monitored by WAJ, MoE and MoH. Basically, the process of introducing irrigation by treated wastewater would not seem to imply legal or regulatory changes. The supply of treated wastewater resources into the existing piped distribution system does not require particular technical preparations however acceptance by farmers and community is the aspect of first concern.

5.3.6.7 Activity Operation and Capacities

Currently, JVA has the capacity to operate and maintain the KAC and KTD and all distribution systems in the Jordan valley and manages and operates all the water resources in the Jordan Valley through its CC.

JVA has delegated in 2004 the distribution role inside farms to Water Users Associations (WUA). It has shown good results however, if the WUA's are to play a concrete role in water management in the future, then it is an absolute necessity to empower these associations' abilities for irrigation modernisation and for them to assume their new functions. Adapted and well-oriented capacity building programmes will need to be provided to the WUA's to enable them to serve their core function: accomplish equity of water distribution to all the users. Furthermore, constant focus on policy efficiency should be provided and a periodical evaluation by an independent body will be required.

5.3.6.8 Sustainability of the Activity

5.3.6.8.1 Financial

Farmers pay water fees according to readings taken at flow meters near the hydrant (JD 0.015/m^3) regardless the source of water. Therefore, MWI should propose that irrigation tariffs be increased only for sale of freshwater supplies and that current irrigation tariffs for lesser quality mixed freshwater/effluent, effluent, and high salinity supplies remain the same or are reduced. Increasing the price for these lesser quality supplies would have only a small effect upon JVA’s financial performance and would not be sufficiently sensitive to the effects of poorer water quality on farmers.

5.3.6.8.2 Institutional

JVA developed a strategic plan for the years 2003 - 2008 which covers four goal areas. One of the goals is related to organizational performance improvement and development which stipulates that JVA should be developed and reorganized to enable it to better achieve its mission and improve its performance and effectiveness in providing quality service to its stakeholders. The objectives being to enable JVA to assume its mission by developing a new legal and institutional frameworks, to improve JVA's efficiency and effectiveness by adopting modern technical, managerial and financial methods and systems, and to improve JVA's human resources management policies to increase job satisfaction and enhance staff efficiency and performance. In addition the strategy states that marginal water shall be used in irrigation, wherever possible, and for that purpose guidelines have been produced that reflect best practices of reclaimed wastewater usage in farms. The above mentioned strategy is attached in Annex (5-14).

5.3.6.9 Linkages with Other Projects

KfW is financing a project in NJV which will allow to substitute a share of the freshwater currently used for irrigation with treated wastewater generated from the treatment plants in Irbid Governorate which has the same objective to the activity under consideration.

Currently GTZ is supporting JVA in a project aimed at the enhancement of irrigation management to through support for the increased use of marginal water resources (development of an operation plan for the environmentally sound use of treated wastewater, introduction of sustainable irrigation and cultivation techniques, increasing acceptance), assistance in enhancing the efficiency of the use of irrigation water at farm level, transfer of information on more water efficient agricultural practices and products , support for existing local water committees and those to be established in the future, for associations and NGO's, with a particular focus on the participation of women and representation of their interests and support in the establishment of private consumer organizations.

In addition AFD is supporting JVA in the implementation of an irrigation optimization project in NJV aiming to repair water pipe pressure, in order to prevent unequal distribution of water to farmers, and rehabilitate pumping stations.

5.3.6.10 Project implementation

5.3.6.10.1 Implementation Arrangements

Management of the feasibility, ESIA and design study that has been awarded to the engineering consultant firm Engicon recently and issuing an addendum to the consultants' contract to allow for the addition of tasks that have to satisfy MCC

guidelines. It is expected that the Accountable Entity would lead the project management responsibilities of the activity at a later stage.

5.3.6.10.2 Project Delivery Strategy

- Maximize the amount of preliminary work completed before the formal start of the compact 5 year implementation period. It is important to define the activity elements and costs to the greatest extent possible before funds are committed; and
- Package the review and planning with the detailed design, tendering, construction supervision phases in the same consultancy contract. This avoids delays in the award and mobilization of consultants for the different phases of the work.

5.3.6.11 Key Risks/Issues

The farmers' attitude regarding effluent reuse is not definite. Obviously, farmers are eager to receive additional irrigation water supply, even in the form of treated wastewater. Nevertheless, they are afraid of the ambivalent acceptance by the public – and consequently the markets. So they seem to prefer the use of treated wastewater on a non-institutionalized level and expect the responsible government authorities to control and to verify the quality standards by means of a reliable monitoring system.

The almost desperate state of the citrus plantations in Northern Jordan Valley might represent a risk regarding a future use of treated wastewater; at the same time it is a unique chance to demonstrate the acceptable or even superior quality of the agricultural produce that can be achieved through irrigation with treated wastewater. This implies that planning and programming activities introducing the irrigation techniques in a participatory approach need to be backed by appropriate support measures; they shall aim at a substantial improvement of the nutritional status of the crops and at an upgrading of current crop-husbandry practices.

Another major risk to this activity is the non existence of an implementation agreement which clarifies the details of freshwater substitution with treated wastewater and hence this could impact the future sustainability of this activity.

6. Implementation Framework

6.1 Review of Implementation of Similar Experiences in the Water Sector

The existing Programme Management Unit (PMU) was established in 1997 by the Minister of Water and Irrigation to act on behalf of the WAJ as the principal, semi-autonomous entity in providing professional, technical, and administrative services and support to manage the implementation of the Greater Amman Water Sector Improvement Program (GAWSIP) in an effective and efficient way. This program consists of three main components:

- The administration of the Management Contract for operation of the water and wastewater services in Greater Amman that was signed between WAJ and the private operator LEMA;
- The multi-donor financed restructuring program for the water supply system of Greater Amman; and
- Transfer of knowledge gained within the scope of above listed activities - the lessons learnt - to other areas of the country, in particular with regard to the involvement of the private sector in the provision of public services.

PMU operates under the control of an Executive Management Board (EMB) headed by the Minister of Water and Irrigation. The EMB provides guidance to and supervises the PMU. The EC Delegation acts in an advisory capacity to the EMB.

Since the end of the year 2000, PMU has developed in a well-respected unit with a focus on getting things done. PMU has also been exposed to a rapidly changing environment and has shown the ability to adapt to new circumstances. Consequently PMU was granted additional responsibilities. In 2000, the direct responsibility for WAJ's NRW was handed over to PMU. In September 2002, PMU was entrusted with the administration and management of the BOT contract for the construction and operation of a new wastewater treatment plant in As Samra. In April 2003, a SCADA Department was established in PMU primarily to integrate SCADA components of the fifteen contracts of the Amman water supply system restructuring program and to manage the design and implementation of an umbrella SCADA system for water services in Greater Amman.

On March 10, 2004, the GoJ and the EC signed Addendum No. 1 to the Specific Financing Agreement in support of PMU. An additional EUR 2 million of Community financing was allocated to the PMU Support Project on top of the EUR 5 million that were granted earlier (April 4, 2000).

As result of the signature of Addendum No. 1, the specific objectives, expected results, and activities of PMU were changed, constituting a significant broadening of PMU's mandate. For instance, PMU was assigned the tasks to monitor the performance of the Aqaba Water Company (AWC), establish performance indices

and benchmarks for water and wastewater operations in Jordan, explore the possibilities and limitations of private sector involvement, eventually leading to the establishment of a strategy for PSP in the water sector, and investigate the needs of (and establish) a regulatory scheme under which a commercially run water sector can be managed.

PMU is the only experience in the water sector for a full-fledged Programme management approach of individual projects.

6.2 Preferred Implementation Option

Rather than splitting the workload into task groups (as it is presently realized in both WAJ and JVA with design, tendering and supervision) it is more advantageous to keep all actions performed under one Programme in one hand. By following this approach continuity from Programme outlining until completion is provided either within a Programme Management Unit (PMU), and maybe more important, towards MCC. Follow up of actions is not disturbed by shifting of responsibilities to other task groups during the progress of activities.

6.3 Roles and Responsibilities of the Implementing Agency

During the different phases of the Programme implementation, the roles and responsibilities of the implementing agency comprise the following:

During the Grant Preparation

- Compiling documentation as required by GoJ and MCC;
- Preparation of the ToR for engineering services;
- During the Design Period;
- Monitoring the design activities of the consultant;
- Ensure proper fulfillment of the ToR by the consultant;
- Review, comment and bring-to-decision of consultants' submittals;
- Providing the link between consultant and other authorities of Jordan;
- Forwarding of prepared documents to MCC for approval;
- Ensuring consistent quality of tender documents; and
- Review and approval of consultants' payments.

During Tender Periods

- Compilation of tender and pre-qualification documents;
- Execution of pre-qualification for bidders according to GoJ and MCC requirements;
- Achieving of approvals for tendering from MCC;

- Planning of tender schedules in cooperation with special tender committees;
- Publication of invitation for bid according to GoJ and MCC requirements;
- Keeping track of the schedule;
- Participation in pre-bid meetings and issuance of related addenda;
- Answering queries from bidders;
- Participation in tender opening and tender evaluation including issuance of clarification requests towards the tenderers;
- Participation in preparation of the evaluation reports and award proposal;
- Forwarding of prepared documents to MCC for approval;
- Initiation for issuance of letter of award;
- Participation in contract negotiations;
- Initiation of contract signing; and
- Handing-over of site and issuance of notice to proceed.

During the Implementation of Works

- Acting on all submittals of the supervision consultant, e.g. shop drawings of contractors, material proposals, etc…;
- Regular inspection of quality and timely execution of the works;
- Liaison with other authorities, such as municipalities, Electricity Company, etc…;
- Liaison with other specialists, such as the mechanical or electrical engineers
- Witnessing of tests;
- Participation in acceptance and handing-over procedures;
- Initiation of Variation Orders and time extensions, including achieving the necessary approval from MCC;
- Updating of contract databases and implementation schedules;
- Approval of contractors' and consultants' invoices;
- Initiation and follow-up of payment procedures;
- Compilation of progress status reports towards GoJ and MCC;
- Answering all queries from MCC; and
- Preparation of project documentation/completion reports.

6.4 Human Resources and Capacity Building

The PMU will have a director who will be managing all matters to the activities. In order to provide individual persons, who are familiar with the respective MCC guidelines for procurement and other particularities, one project engineer will be appointed to handle one activity in the mentioned Programme.

Each project engineer will be responsible for all activities under his activity. Design and site supervision will be executed through consultants. The engineer will prepare, accompany, monitor, supervise, verify and accept any of the contract activities, It is his obligation to communicate with the consultants and contractors in a way to ensure that he is informed on the activities, problems and the timely completion within the allocated budgets of the measures. He will be responsible for verification and approval of invoices to be passed to the financial department for further processing.

Each project engineer will receive and review all reports associated with his contracts and prepare quarterly progress reports to be submitted to MCC, GoJ and other stakeholders involved. It will be the engineer's responsibility to update time and cash flow schedules at least on a quarterly basis.

Since reporting and monitoring form an essential part of the engineers' duties, he must dispose fluency in English, the necessary computing skills, such as word processing, spreadsheet calculations, database applications and time scheduling.

In addition, a financial controller need to be appointed and will be responsible for grant monitoring according to international best practices and the appropriate utilization of budgets for procurement and running costs. The duties of the financial controller comprise also the preparation of the supporting documents for budget requests/allocation and financial status reporting to MCC.

6.5 Implementation Timeline

Annex (6-1) shows the implementation timeline for the projects activities. It showed be noted that it was prepared jointly between MCA-Jordan and MCC.