The Study of the Benefits to the Poor of Millennium Challenge Corporation Financed Projects in the Water Sector

REVISED FINAL INCEPTION REPORT

SUBMITTED TO:

MILLANIUM CHALLENGE ACCOUNT
JORDAN

BY

ECO Consult

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Contents

LIST OF ABBREVIATIONS

DOS	Department of Statistics
GDP	Gross Domestic Product
GIS	Geographical Information System
GoJ	Government of Jordan
HELI	Health and Environment Linkages Initiative
JVA	Jordan Valley Authority
MCA-J	Millennium Challenge Account - Jordan
MCC	Millennium Challenge Corporation
MENA	Middle East and North Africa
MWI	Ministry of Water and Irrigation
O&M	Operation and Maintenance
PMU	Programme management Unit
RFP	Request for Proposal
SAC	Study Advisory Committee
UFW	Unaccounted for Water
UNDP	United Nations Development Programme
WAJ	Water Authority of Jordan
WHO	World Health Organization
WSAU	Water Sector Audit Unit

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1 INTRODUCTION

The Government of Jordan (GoJ) through the Millennium Challenge Account - Jordan (MCA-J) within the Prime Ministry is seeking financing from the Millennium Challenge Corporation (MCC) for investments to increase the availability of water for municipal use by lowering non-revenue water losses and freeing fresh water currently used by agriculture through the substitution of treated wastewater.

The Study of the Benefits to the Poor of Millennium Challenge Corporation Financed Projects in the Water Sector was assigned to ECO Consult in August 27th 2009 by the Government Tenders Directorate in the Ministry of Public Works & Housing. The study will provide information to GoJ and MCC to estimate by whom this newly available water is likely to be used. The study will also provide GoJ and MCC with the cost-effectiveness analysis of several possible interventions with the potential to improve the likelihood of the poor to benefit from proposed water investment projects. In phase II, the study will provide information on the most cost-effective intervention suitable for MCC financing and ready for project implementation.

This Inception Report is part of the Task 1 of the consultancy services for the ***Study of the Benefits to the Poor of Millennium Challenge Corporation Financed Projects in the Water Sector*** and provides a background and our understanding of the project assignment as well as the methodology proposed to be adopted.

1.1 LAYOUT OF THIS REPORT

This report is divided into 5 sections and is structured as follows:

Section 1 (this section): This section provides introduction to the study

Section 2: Provides background on the project, recent water sector developments, outline of the objectives and outcomes of the study, and describes the scope of work, tasks and deliverables to be undertaken by the Consultants.

Section 3: Provides brief on team mobilization and Kick-Off meeting with client, describes the geographic zone for the study and outlines the detailed methodology for the different activities. The section summarizes activities undertaken so far, proposes a methodology for the subsequent tasks, and lists data requirements and highlights key issues and any proposed recommendations on the scope of work.

Section 4:	Provides an overview of the Jordanian context of the study related to the social, institutional and regulatory contexts.
Section 5:	Annexes
Annex A:	Contains description of analysis tools to be used for the study.
Annex B:	Presents detailed work plan *vis* a *vis* the tasks and deliverables proposed for undertaking the assignment.
Annex C:	Bibliography
Annex D:	List of Participants at Kick-Off meeting
Annex E:	Outline for Diagnostic Final Report
Annex F:	Outline for Project Preparation Report

2 PROJECT BACKGROUND AND SCOPE OF WORK

2.1 BACKGROUND

In 2008, Jordan completed a constraints and sector analysis that highlighted key challenges to long-term, sustainable economic growth in Jordan. Jordan also conducted a broad, participatory consultative process that included town hall meetings in each of the country's twelve governorates. These inputs identified the availability of water as a constraint to economic growth. In July, Jordan hosted a broad stakeholder workshop to identify key problems that might be addressed by an MCC investment in the water sector.

Based on the workshop results, Jordan developed a "concept paper" that focused on reducing non-revenue water and increasing wastewater treatment and reuse and submitted it to MCC in November 2008. The proposed water delivery and wastewater projects focused on Zarqa Governorate, one of Jordan's poorest governorates and home to its second and fourth largest cities.

MCC seeks to support projects that have the most positive impact on Jordan's economic growth and poverty reduction. Therefore, in February 2009, MCA-J developed a Concept Paper assessment that proposed to the Government of Jordan four projects to achieve these objectives. MCA-J is targeting investments in the water sector to increase water availability for municipal use through lowering non-revenue water losses and freeing fresh water used by agriculture through substituting it by treated wastewater. However, it is of high importance for Government of Jordan and the Millennium Challenge Corporation (MCC) to ensure that this additional water supply will be reaching the poor (under consumers) to maximize benefits and to implement the feasible potential intervention in a cost effective manner.

A summary of the four proposed projects are listed below:

No.	Project Activity	Objective
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 capita consumption from 56 lpcd to 93 lpcd.
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%.
3	Expansion of Zarqa Governorate	To accommodate additional wastewater flows from Zarqa Governorate until the year 2025 by expanding the AS-Samra WWTP

	Wastewater treatment capacity	plus construction of conveyor lines through the negotiation with SPC/BOT company.
4	Zarqa Governorate Wells Rehabilitation	The project includes wells rehabilitation components and investment program for Zarqa and Azraq basins.

2.2 *OVERVIEW OF RECENT SECTOR DEVELOPMENTS*

Ministry of Water and Irrigation has developed up to date four policies on Water Utility, Irrigation Water, Groundwater Management and Wastewater Management. 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 Water Sector Action Plan adopted by the Council of Ministers in December 2002, and which has been extended to the year 2015 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 most recent document of the Government of Jordan (GoJ) policy with respect to the water sector is the Jordan's Water Strategy for the years 2008-2022 that was prepared by the Royal Commission for Water in February 2009. The National Water Strategy presents a window of opportunity as it recognizes the challenges facing the sector, calls for legal and institutional reform, and recognizes the seriousness of over-abstraction of groundwater resources and the detrimental and irreversible impacts on the resources and the investments.

The Water Strategy for Jordan identifies future water sector plans and the actions that will be taken to ensure that water is available for people, businesses and nature. The Strategy looks at all aspects of the water cycle from rainfall to collection, treatment and discharge. The set of practical steps that will need to be taken include an effective Water Demand Management, efficient Water Supply Operations and well developed institutional reform.

2.3 *OBJECTIVES OF THE STUDY*

As per the RFP document, the Study of the Benefits to the Poor of Millennium Challenge Corporation Financed Projects in the Water Sector has three principal objectives:

Objective 1 – *Distribution of Potential Benefits*: Quantify the share of benefits arising from the MCC investments accruing to poor households and in particular to the poor on average consuming at or less than 75 liters per capita per day of water in total from network sources. Equivalently, validate the extent to which the current state of the water distribution infrastructure, its management and performance contribute to avoidable cost burdens upon the poor and to the under-consumption of water having health, medical expenditure and work-related consequences.

Objective 2 – *Cost Effectiveness and Feasibility of Potential Interventions*: Estimate the cost effectiveness of possible interventions (proposed in Table 1) that might enhance the share of benefits accruing to the poor and under-consuming households from increases in urban water supplies and provide assessments of the efficacy of each. Based on cost-effectiveness and feasibility, present a recommended course of action for the implementation of interventions possibly to complement MCC-financed investments in urban water infrastructure.

Table 1*Preliminary List of Interventions for Cost-effectiveness and Feasibility Assessment*

Interventions to improve quantity of network water available to under-consuming poor	
1. Redefine relevant governorates allocation of water **2.** Build improved information system and modelling for setting rationing schedule and setting pumping pressure **3.** Geographically target MCC financed improvements of the distribution network **4.** Constraints on high quantity consumers (meter repair, more progressive tariff, etc.)	**Listed in the RFP**
5. Improve the productivity of the existing water resources **6.** Develop new water resources **7.** Reallocate fresh agricultural water and substitute it with treated wastewater **8.** Introduce and subsidize water harvesting	**Suggested for discussion with MCA-J**
Interventions to improve under-consuming poor households' ability to utilize network water available	
9. Tariff adjustments **10.**Subsidize household water storage for the poor **11.**Improve water quality **12.**Improve the perception of water quality	**Listed in the RFP**
13. Introduce and subsidize gray water reuse system in the poor household **14.**Promote healthy habits through awareness campaigns	**Suggested for discussion with MCA-J**

Objective 3 – The preparation of an investment proposal that presents a strategy to implement one identified recommendation for enhancing the relevance of selected improvements in urban water infrastructure to poor households and that would be suitable for consideration by MCC as part of the prospective Compact with Jordan. The prepared project must have GoJ support confirmed through MCA-J. The cost-effectiveness of the project must be objectively and readily verifiable. The project should take into account gender and/or other relevant social dimensions associated with water consumption and household hygiene and sanitation. The project would also need to satisfy MCC requirements governing the suitability for investment.

It is worth noting that according to WHO, the basic need for water includes water used for personal hygiene, but defining a minimum has limited significance as the volume of water used by households depends on accessibility as determined primarily by distance and time, but also including reliability and potentially cost. Accessibility can be categorized in terms of service level.

A summary of the degree to which different levels of service will meet requirements to sustain good health and interventions required to ensure health gains are maximized, according to WHO, is shown in below table.

Table 2 Summary of requirement for water service level to promote health[1]

Service level	**Access measure**	*Needs met*	**Level of health concern**
No access (quantity collected often below 5 l/c/d)	More than 1000m or 30 minutes total collection time	Consumption – cannot be assured Hygiene – not possible (unless practised at source)	Very high
Basic access (average quantity unlikely to exceed 20 l/c/d)	Between 100 and 1000m or 5 to 30 minutes total collection time	Consumption – should be assured Hygiene – handwashing and basic food hygiene possible; laundry/ bathing difficult to assure unless carried out at source	High
Intermediate access (average quantity about 50 l/c/d)	Water delivered through one tap onplot (or within 100m or 5 minutes total collection time	Consumption – assured Hygiene – all basic personal and food hygiene assured; laundry and bathing should also be assured	Low
Optimal access (average quantity 100 l/c/d and above)	Water supplied through multiple taps continuously	Consumption – all needs met Hygiene – all needs should be met	Very low

[1] Domestic Water Quantity, Service Level and Health, World Health Organization, 2003

Table 2 indicates the likely quantity of water that will be collected at different levels of service. The estimated quantities of water at each level may reduce where water supplies are intermittent and the risks of ingress of contaminated water into domestic water supplies will increase. Where optimal access is achieved, but the supply is intermittent, a further risk to health may result from the compromised functioning of waterborne sanitation systems.
Therefore, a reasonable threshold of water under-consumption can be assumed to be 50 l/c/d instead 75 l/c/d initially proposed in the RFP.

2.4 TASKS AND DELIVERABLES

The main tasks and deliverables of this Study are summarized in the following table:

Table 3 *Tasks and Deliverables*

TASK	DELIVERABLE
Task 1: Preparatory Work	Inception report including: • Detailed methodology and approach • Detailed workplan • milestones/deliverables • Data requirements and availability • Outline of diagnostic report • Overview of secondary literature review (social, institutional and regulatory contexts). *(9 weeks after mobilization, November 11th, 2009)*
Task 2: Analysis of Network Water Under-Consumption	Study Note 1 *(10 weeks after mobilization, November 22nd, , 2009)*
Task 3: Assessment of Intervention Options	*Diagnostic Report (will include initial project costing and definition)* *(6.25 months after mobilization, March 1st, 2010)* *Initial findings presentation to Study Stakeholders*
Task 4: Preparatory Work for Project Preparation	*Inception Report Revision* *April 28th, 2010)*
Task 5: Project Preparation	*Consultant Diaries* *May 16th, 2010)* *Project Preparation Final Report* *May 18th, 2010)*

3 APPROACH AND METHODOLOGY

This section briefly describes the approach and methodology that is proposed for the project.

3.1 TEAM MOBILISATION

The project team from ECO Consult was mobilised on the 9th of September 2009. A team briefing meeting was held on the 14th of September with MCA-J at ECO Consult premises which was attended by the Project Director and Project Coordinator from ECO Consult. The project team discussed the scope and objectives of the assignment, confirmed team members for the study, reviewed data requirements and timeframe, and the approach and methodology to be adopted.

Continuous meetings between team members have taken place on regular basis as the project team moved along the process of conducting interviews and gathering information and data during the project's preparatory phase in which gaps in available data were identified along with sources of information.

3.2 KICK OFF MEETING

An official Kick- Off meeting with the Client was held on the 1st of October, 2009 at ECO Consult premises. The meeting was attended by Dr. Khaled Al Hmoud, Mr. Paul Pleva, and Mr. Barry Deren from MCA-J and by key project team members from ECO Consult. The Team members introduced themselves from both sides, followed by a brief explanation on members' roles and responsibilities. The meeting included presentation of scope and objectives, approach, discussion of data availability and gaps, workplan and milestones, study outcomes, foreseen challenges and constraints, and required support from MCA-J.

3.3 GEOGRAPHIC ZONE

It was agreed with MCA-J that the focus of the project will be Zarqa governorate for all data analysis related to:

- Under-Consumption of Water analysis
- Priority investment zones
- Cost Effectiveness and Feasibility of Potential Interventions
- Benefits arising from MCC investments in Zarqa to the under-consuming poor

However, the project team will look at the macro level at the Middle Governorates in order to assess if the water network system interconnectivity between Middle Governorates might affect distribution of benefits to the poor living in these Governorates. This will be done through a global assessment of drinking water allocation explained further in the next section.

In addition, a high level assessment of benefits arising from MCC investment indirectly to the middle governorates will be completed based on the aggregate benefits estimated for Zarqa governorates (see next section for further details).

3.4 DETAILED METHODOLOGY FOR ACTIVITIES

The overall framework for the analysis is illustrated in Figure 1. A bottom top approach in the five tasks mentioned below is adapted to carry out this study. The project builds upon existing data (bottom) which will be synthesized to derive new knowledge about the systemic interconnections of the water system, and its inherent dynamics. The outcome (top) will be information that provides interventions recommendations for enhancing the water infrastructure to poor households that would also be suitable for consideration by MCC. Using specific study tools, each accomplished task will help achieve the study's specific objectives. Tools will include:

- knowledge exchange between the project team and relevant stakeholders;
- GIS;
- advanced statistical packages;
- consultation with relevant stakeholders;
- feasibility assessments and economic return of return (ERR) on investment; and
- MCC's guidelines.

In order to achieve the study's objectives, the Project Team developed the methodology framework to carrying out different stages of the study including including data requirements and management, system analysis and understanding complexity, defining and developing intervention options, integrating knowledge created during the study execution and drawing the map for implementation of the proposed intervention.

Task 2 (Analysis of Network Water Under-Consumption) is a core task in the study and can be divided into 4 assessments. Table 3 summarizes these 4 assessments related to Task 2, describes the approach for accomplishment, and lists data sets' requirements to complete the analysis, in addition to describing major issue/s that may be faced during the analysis process.

Table 4 Summary approach for completing Task 2 assessments

No.	Assessment	Approach for Completion	Data set requirements	Key Issue
Task 2 Analysis of Network Water Under-Consumption				
I.	**Global assessment of domestic water allocation**	Analysis of historical correlation between water supply and residential water	Historical water supply, residential consumption, non-residential consumption, UFW,	The effect of many other factors on water allocation among middle governorates

		consumption. The stated water allocation schemes will be taken into consideration	income level and population for middle governorates	
II.	**Analysis of Water Under-Consumption**	Correlation between consumption rate and potential causal factors	Consumption data by household; Socioeconomic [including household income or similar indicators], perception and preference and attitude data by household	The inability to link the 2008 customers' socio-economic survey results with their water consumption resulted in the need to carry out a targeted socio-economic survey that will ensure customer identification
III.	**Priority investment zones**	Zones for socio-economic conditions, water consumption zones, water & WW network conditions	GIS layers for this data (socio-economic indicators, water consumption zones, water and WW network conditions)	Inability to obtain DOS socio-economic data at the required detailed level
IV.	**Benefits arising from MCC investments to the under-consuming poor**	Evaluate cost savings and benefits to the poor	Water consumption and socio-economic data	Evaluation of health benefits and productivity improvements for poor households

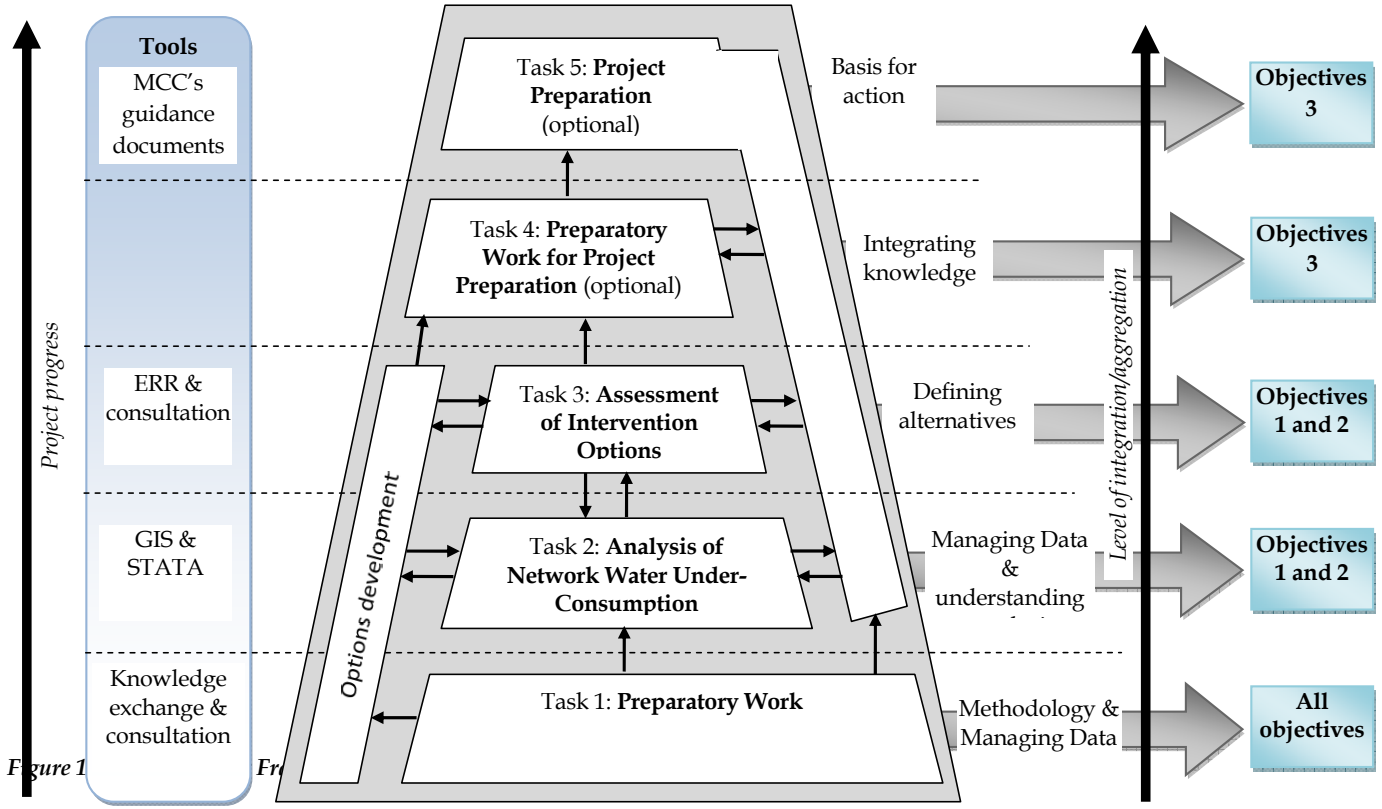

Tools
MCC's guidance documents
ERR & consultation
GIS & STATA
Knowledge exchange & consultation
Project progress
Task 5: Project Preparation (optional)
Task 4: Preparatory Work for Project Preparation (optional)
Task 3: Assessment of Intervention Options
Task 2: Analysis of Network Water Under-Consumption
Task 1: Preparatory Work
Options development
Basis for action
Integrating knowledge
Defining alternatives
Managing Data & understanding
Methodology & Managing Data
Level of integration/aggregation
Objectives 3
Objectives 3
Objectives 1 and 2
Objectives 1 and 2
All objectives

Figure 1 Fr

Below is a detailed description of the different tasks and activities that will take place under different phases for the project.

3.4.1 Phase 1

Task 1: Preparatory Work

This Inception Report covers all work completed under Task 1 "Preparatory Work" and addresses the following:

- Detailed methodology of the study
- Data requirements, availability, gaps, and sources for missing data
- Key issues and proposed modification on scope and work plan
- Detailed outline for Diagnostic Final report

The project team carried out a fast round of data collection activities from MCA-J, the Zarqa Governorate Water Authority (ZGWA) and the Department of Statistics (DOS). A good part of the required data for the study has been collected. The project team will work on filling up remaining data gaps with support from MCA-J. Further details on data requirements, availability, gaps and key issues are described in sections 3.5 and 3.6.

Based on the conducted preliminary interviews and data collection activities, , the project team presented to MCA-J on October 1st and discussed during the Kick-off meeting the overall approach to completing the project, data requirements and availability, gaps, key issues, and foreseen challenges and constraints.

One of the key highlighted issues during this Task was the inability to link the subscribers' and household data from the *Socio-economic Baseline Survey in the Water Supply and Sanitation Sector* conducted by GFA Consulting Group, August, 2008 with their water consumption and the need to conduct a new household survey for Zarqa Governorate. More details are included below on the requirement of a new household survey.

Task 2: Analysis of Network Water Under-Consumption

As described in Table 3 above, task 2 is divided into 4 assessments. The first three assessments can run in parallel, however finalizing the third and fourth assessments is dependent on the results of the first two assessments. The team will preliminary do some work related to the third and fourth assessments during the survey implementation in order to try to gain time. After completion of the new survey and review of the raw data, the project team will finalize work related to the third and fourth assessments.

The methodology of carrying out these assessments is explained below.

I. Global assessment of domestic water allocation

This assessment will be a rapid examination at governorate level that aims to understand how additional water supply has been historically allocated among middle governorates. Therefore, the historical water supply within the past 5 to 10 years in the four middle governorates will be analyzed in order to understand the allocation base in the water supply system along the years. The historical change in per capita of water supply and residential water consumption (billed) will also be analyzed. If data is available, planned historical water demand will be compared to actual water supply. Factors affecting the decision on how to allocate water supply among middle governorates will be also identified through conducting interviews with senior water officials. Additionally, stated water allocation schemes will be taken into consideration. The water share per capita will be linked with information on income levels in each governorate in order to understand, if, and how the poverty levels affect the water allocation among governorates. However, there are many other factors that affect how water is allocated among middle governorates, and these may include:

- political decisions;
- infrastructure constraints;
- availability of other water resources;
- the level of over abstraction of water resources close to domestic communities;
- the level of water consumption by non-residential customers;
- the political influence of the community voice; and
- the levels of Un-accounted for Water (UFW).

In essence, the objective of this assessment is to determine if water allocations among and within the middle governorates are affected most significantly by endogenous variables (such as expected demands) or exogenous variables (such as political considerations).

In order to do this analysis, historical water supply, residential demand and consumption, non-residential consumption (billed water), UFW, income levels and population for each middle governorate is needed for the last 5 to 10 years.

II. Under-Consumption of Water analysis

The objective of this analysis is to identify households who consume less than 50 liters per capita per day (l/pc/d) of water in order to understand what factors lead to that "under-consumption," and to assess possible cost-effective institutional and structural changes that could influence household consumption, and to assess benefits that might arise from the MCC project, particularly to households that under-consume and poor consumers (those with incomes below the current Jordanian poverty level). Note that "under-consumption" is a function of total water consumption by households, where sources other than the public supply, including bottled water, water from water treatment shops, and water from tankers, are significant (according to the Socio-economic Baseline survey data for household consumption). In order to accomplish the task's objectives, statistical analyses of existing water consumption data sets will be completed.

As mentioned above, and during Task 1 "the preparatory phase for the project", the project team and MCC-J concluded that the requested household-level econometric analyses of under-

consumption and demand functions cannot be accomplished using the available existing data sets. A new survey of households, focused on the data needed for the under-consumption and poor households, will be undertaken by MCC-J and DOS. It is estimated that this new household survey will be completed by End of December 2009.

The specific steps for the analysis are described below, of which 1-3 have been completed:

1. *Assess the data in the Socio-economic Baseline Survey in the Water Supply and Sanitation Sector (GFA Consulting Group, August, 2008).* It was determined that the following data were lacking:

    a. Household income or expenditure data
    b. Household water consumption from the public water system (provided from WAJ [CIS/billing system] based on time series meter readings)
    c. Household water consumption from tankers

    The inability to link the surveyed customers with their consumption rates with the survey results is a major obstacle in accomplishing an adequate analysis, discussed in Section 3.6, Data requirements, and Section 3.8, Key issues, Limitations, and proposed Modifications on scope.

2. *Assess the available data from the Comprehensive Consumer Survey carried out by the WAJ.* These data do include a time series of consumption data for meters, and some limited socioeconomic data, including size of household, size of house or apartment, and condition of meters. However, this data set lacks:

    a. Socioeconomic data on income, expenditures, preferences and attitudes and other variables
    b. Household consumption of water from other sources (bottled water, water treatment shops, and water tankers).

3. *Assess the available data from the Department of Statistics (DOS) relative to its compatibility and consistency with the Socio-economic Baseline Survey and/or the Comprehensive Customer Survey.* Of particular interest, is the degree to which the socio-economic variables available from the DOS can be used in an econometric analysis of consumption. Because the DOS data will not be available at the customer (household) level, and, in particular, for the households surveyed in the Baseline Study, it cannot be used with the Socio-economic Baseline survey data. However, alternative approaches tying the "block"-based DOS data to CIS consumption levels within the "block" could provide some useful information. Reviewing and assessing the available data resulted in identifying the missing socio-economic data that are required to fulfil the analysis objective. The inability to obtain household level data from the DOS data set prevent a household analysis that would provide results that would meet MCC needs. As a result, a new household survey, focused on MCC and econometric needs, was recommended as described previously to collect these data.

4. *Assess the steps necessary to provide sufficient data for the requested household consumption analyses.* As mentioned, after an in-depth data assessment, it was recommended that a new household survey be implemented, focused on the needs of MCC, in particular the proposed interventions found in Table 4, and of the desired econometric analyses. The questionnaire will be based on the template of the Socioeconomic Baseline survey, but modified to include missing data to facilitate the analyses. The questionnaire has been developed by the project team with the assistance of DOS and MCA-J. Data collection and entry is predicted to be completed no later than the end of December, 2009.

5. *Develop analytical models consistent with both the objectives of the study and the available data from the Socio-economic Baseline study and CIS/billing*. These models will conform to normal "demand" relationships, examining both household characteristics (for example, household income, household size, household structure, household storage capacity, and others) and supply characteristics (such as price, quality, distribution condition, reliability, and others) as they relate to household consumption. A focus on under-consuming and poor households will be included. These models will be applied to specific locations, based on the information from the GIS system and data available. For each location, the procedure is expected to be:

   a. A hurdle model will be developed that will statistically identify the statistically significant variables (characteristics households, price(s), supply conditions including water quality and distribution condition and reliability) leading to the consumption of less than 50 lpcd. These models are generally probit or logit models, depending on the distribution of the error term, and the results are measures of the probability that a given observation (household) will fall into one or the other category of water consumption (above or below 50 lpcd).

   b. In order to complete this analysis, it will be necessary to develop an aggregate measure of water consumption (that is, water consumed from the public system, water tankers, bottled water providers, water treatment centers, and other sources). The data from the new household survey divides household consumption into non-network and network drinking water. These data will be aggregated, although they may be qualitatively different and sources may vary considerably across the categories of use, requiring careful aggregation procedures. It may be more reasonable to determine an alternative "threshold" of under-consumption, or to estimate continuous consumption demands depending on the distribution of consumption across households, particularly in the 50 lpcd range, The income, or expenditure, variable in the new survey should permit the identification of the impact of poverty on under-consumption, although it may be necessary to use a qualitative variable for the poverty level. The model specification is:

      Probability ($Qi<50$ l/c/d) = f(HH characteristics$_i$, price, supply characteristics)

Where i is the observed household, and f is a probit or logit specification.[1]

The relevant household and supply characteristics that may be used in the regressions will at least include household income and/or expenditure, number and age of persons in the household, size and characteristics of dwelling, household assets such as cell phones and cars, number of water storage tanks, and similar characteristics that are being asked in the new household survey questionnaire implemented by DOS. Supply characteristics will include the hours and/or days of water delivery from the network system, number of breaks in the system that delivers water to the specific household, quality parameters (if available) of the water delivered to the household, and/or household perception of the system efficiency and quality.

There are different factors that may contribute to the quality and accuracy of the new survey data, such as:

- Fieldwork-related factors during survey data collection activities (ex. missing or incomplete data, inaccurate answers, and non-responses..etc). We cannot have control over this type of data deficiency.

- Sharing meters between more than one household. One option that could be considered for this problem is proportioning of joint meters by household size.

- Illegal water use and administrative NRW. Current administrative and physical/illegal losses in Zarqa Governorate are estimated to be around 50% (as learned from our discussions with WAJ and Zarqa WAJ Director and staff). Administrative and illegal water losses are consumed by subscribers, and these are not included in the billed water quantity obtained from the CIS/billing system. This issue will need to be taken into consideration and discussed after completing the analysis.

- Problems that may be present in water meters and that affect their reading accuracy. In so far as those problems can be identified and quantified, modifications to the observations for those meters can be made.

c. Models analysing the water consumption patterns of those households that fall into the "under-consumption" category will be developed. There are several factors that may influence the type of models used for these estimations, including problems in aggregating quantities and prices for use in a simple regression, and issues related to the exogeniety or endogeniety of some of the variables. **First,** households purchase varying water quantities from different sources at different prices (public water, bottled water, water from treatment centers and tanker water are the most common sources). A simple aggregration of quantity as the dependent variable will require developing a price variable that is consistent across consumption levels. Treating each

[1] In non-log format, the probit specification is Probability $(Q_i=1)= \int_{\infty}^{\beta' x}(1/2\Pi)e^{-(-tsquared/2)}dt$ and the logit specification is Probability $(Q_i = 1) = e^{\beta' x}/(1-e^{\beta' x})$, where "1" indicates that the consumption is more than 75 lpcd (the binary dependent variable would normally be coded "0" if $Q_i < 75$ lcpd, and "1" otherwise).

different source as a dependent variable implies a simultaneous system, because, at least at the margin, the household chooses among those sources.

Second, the price of public water is based on increasing block rates, so that the household chooses both the quantity of water purchased and the price it pays. Thus, both variables are endogenous.

A similar problem can be identified in the number of tanks (if any) a household possesses. Households will purchase tanks based on both price and the stability of water supply; thus, the number of tanks purchased and maintained may also be endogenous.

There have been several approaches identified to solve these various econometric problems. One solution that has been used for the endogeniety of block pricing is to use a price vector calculated from the ratio of marginal prices to average prices (Taylor, McKean and Young, 2004; Shin, 1985). Other econometric solutions to the simultaneous nature of block prices (and to multiple demand systems) are 2 and 3 Stage Least Squares, Instrumental Variables, and Discrete/Continuous choice models (a Heckman [1979] model, for example) (Salman, et al., 2008). Multiple demand systems have also been modelled using the Almost Ideal Demand System (AIDS) (Deaton and Muellbauer, 1980). In part, the choice of the econometric approach depends on the data set and the error distributions. The choices will be reviewed once the data are available and appropriate methods adopted.[1] The general simultaneous equation model configuration is:

$\sum_j Q_{i,j} = \sum_j g_i(\text{HH characteristics}_{ij}, \text{price}_j, \text{supply characteristics}_j)$

Where i is the observed household and j is the supply source.

d. Once the consumption and demand relationships are determined, the statistically-significant variables related to consumption (both household and supply characteristics) can be identified. Changes in the supply characteristics are directly linked to the MCC projects, and their effects on consumption and expenditures for water can be directly estimated. For example, increasing water availability from the public system may have a significant negative effect on the use of alternative, higher cost sources of water, and thus result in cost savings to households. Moreover, results may indicate that consumption levels would increase as well. Thus, using these equations, estimates of benefits (resulting from both reduced costs of water and increasing water consumption) accruing to alternative actions to provide improved water supplies to households may be estimated. Although consumers' surplus measures are not to be used in the ERR or other metrics, the models could be used for those determinations as well. In order to compare the portion of benefits accruing to the poor, model results for those consuming less than or more than 50 lpcd will indicate how expected increases in water use may be distributed. In fact, benefit

[1] These econometric approaches would apply to the entire data set,, including households consuming more than 75 lpcd. An analysis of the entire data set will be performed and results compared to those of the "under-consuming" households.

distribution based on income levels could be modelled and used in the same fashion using estimations from the entire data set.

e. Finally, the costs of the various alternative actions can be compared both across the actions and spatially to determine which interventions are most cost effective and where they are most productive.

6. *Recommendations with respect to interventions within the project will be made based on these results* (tempered, of course, with other analyses and conditions as might be identified).

III. Priority investment zones

The main objective of this assessment is to identify the priority zones for MCC investments in water and sewerage networks in Zarqa Governorate. The core activity of this assessment is to categorize the Zarqa Governorate into different geographical zones based on water consumption levels, social-economic variables, and water and sewerage infrastructure conditions through using GIS and some correlation analysis. ***If able to acquire***, neighbourhood geographical zone will be adapted for the priority investment zones analysis.

Different GIS layers will be compiled to create different geographical zones based on the following suggested preliminary criteria:

- ***Income level/poverty***: depending on the data provided by DOS, zones will be categorized based on the poverty level data available on the neighbourhood scale for Zarqa district and based on the economic activities data available on block level for the remaining districts. Alternatively, if data on the average annual income of household or percent distribution of households by household expenditure group is obtained from DOS on the neighbourhood level (currently, this is available at sub-district level), then it can be used A second alternative, which is less preferable, is to use the percentages of households at or below the poverty level and those households that under-consume, taken from the new survey could be used as input.

- ***Network population density***: the population number for each sub-district will be divided by the lengths of network once for water and once more for sewerage to calculate the population density for water and sewerage network respectively. These densities will then be mapped on GIS layer.

- ***Density of water network breaks***: The GIS complaints report will show the breaks and complaints about the water network which then can be used to calculate the density of these breaks and complaints through dividing their number by the water network lengths in each neighbourhood zone.

- ***Density of sewerage blockages and overflows***: similar to the previous one, this density will be calculated for each sub-district based on the GIS complaints report.

- ***Average water consumption***: The average annual water consumption per capita will be estimated through dividing the annual billed water by the number of population for the neighbourhood zone.

- ***Average network age***: if able to get the information from WAJ and Zarqa WAJ, the weighted average age of network will be calculated through multiplying the pipeline age by its length then dividing the summation of this multiplication by the total pipelines length for each sub-district. This will be estimated separately for water and sewerage network.

- ***Non Revenue Water (if possible)***: if able to get the NRW for the Zarqa Governorate supply zones through subtracting the billed water from the supplied water, we will include NRW into the correlation analysis. We are informed by WAJ Zarqa that the supplied water at less than the sub-district level is not available.

In addition to the GIS mapping, above information will be correlated for at least two previous years (existing information on network leaks/breaks) in order to be able to estimate a correlation coefficient between poor network quality and under consumption based on historical available information. The GIS work will allow a data base to be constructed that includes all variables required for the regression and will provide a visual tool for decision making. Below is a summary table that shows criteria for the correlation analysis:

Zarqa Governorate Zones	Income level/poverty	Network population density	Density of water network breaks	Average billing/capita	Average network age	NRW (if possible)
1						
2						
3						
-						
-						
etc						

It is important not to extend and complicate the criteria so as it can easily categorize the geographical zones into high and low priority zones for investment. The criterion will be then grouped into high, moderate and low as shown in tables below. Then priority investment for each category will be determined from the first priority zones to the lowest priority zones.

Table 5 Criteria for categorizing investment zones for water network

Category Name	Socio-economic		Infrastructure			Priority investment
	Income level/poverty	Network population density	Density of water network breaks	Average network age	NRW (if possible)	
Category 1	Low	High	High	High	High	1
Category 2 (in between)						
Category 3	Moderate	Moderate	Moderate	Moderate	Moderate	3
Category 4 (in between)						
Category 5	High	Low	Low	Low	Low	5

Table 6 Criteria for categorizing investment zones for sewerage network

Category Name	Socio-economic		Infrastructure		Priority investment
	Income level/poverty	Network population density	Density of sewerage network blockages & overflows	Average network age	
Category 1	Low	High	High	High	1
Category 2 (in between)					
Category 3	Moderate	Moderate	Moderate	Moderate	3
Category 4 (in between)					
Category 5	High	Low	Low	Low	5

IV. Benefits arising from MCC investments to the under-consuming poor

MCC investments will generate benefits to the poor through improving the level of service, increasing the water supply and improving their health and social conditions. By improving the level of service and increasing the water supply, the cost of obtaining water from sources other than the municipal water network will be eliminated or reduced for the poor. Better health condition will result in increasing the productivity of poor households and reducing their medical expenditure.

Identification of the benefits will be based on the results of the under-consumption of water analysis and investment zones assessments. The social and gender dimension will be addressed as explained in the methodology for social assessment Section 3.4.3. The social

assessment will quantify social and gender benefits to be incorporated in the benefits assessment to the under-consuming poor.

In fact, although MCC investments are focused in Zarqa Governorate but middle governorates will also benefit from these investments indirectly through reducing the UFW and substituting fresh water used for irrigation by the additional reclaimed water that will be treated in As Samra wastewater treatment plant. This will release incremental water to supply middle governorates. Therefore, the benefits of MCC projects will be estimated at two levels:

1. Zarqa Governorate: these are the benefits received directly and indirectly by Zarqa's households and in particular to the poor households.

2. Middle governorates: these include the additional benefits received indirectly by the poor households in the middle governorates through the additional water that can be available to the other middle governorates as a result of the MCC investment in Zarqa. In this case, a high level assessment of the benefits will be made based on the aggregate benefits estimated for Zarqa governorate. It is proposed that the estimated benefits to the poor households in Zarqa can be extended to the poor households in other middle governorates. Definitely, the whole water system in the middle governorates will benefit from MCC investment where for example the farmers in the Jordan Valley might receive additional water for irrigation through increasing the treated wastewater quantities. However, such benefits and others to non-poor households will not be assessed in this study.

Task 3: Assessment of Intervention Options

Subtask 3.1*: Initial screening of potential interventions and their feasibility*

Based on the detailed analysis and preliminary findings conducted under Task 2, potential interventions proposed in the RFP and the technical proposal will be revised and modified. A brief summary of each intervention will be developed that describes its major components and how it will achieve the overall MCC objectives. This list of interventions summarized in Table 1 and listed below again in Table 7 with their categories (policy, institutional/management, infrastructure and household) will be screened based on a set of criteria that address their feasibility.

Table 7List of interventions and their categories

No.	Intervention	Category			
		Policy	Institutional/ management	Infrastructure	Household
1	Redefine relevant governorates allocation of water	✓			
2	Build improved information system and modelling for setting rationing schedule and setting pumping pressure		✓		
3	Geographically target MCC financed improvements of the distribution network			✓	
4	Constraints on high quantity consumers (meter repair, etc.)		✓		
5	Tariff adjustments	✓			
6	Improve the productivity of the existing water resources		✓	✓	
7	Develop new water resources		✓	✓	
8	Reallocate fresh agricultural water and substitute it with treated wastewater	✓		✓	
9	Introduce and subsidize water harvesting	✓			✓
10	Subsidize household water storage for the poor	✓			✓
11	Improve water quality		✓	✓	
12	Improve the perception of water quality		✓		
13	Introduce and subsidize gray water reuse system in the poor household	✓	✓		✓
14	Promote healthy habits through awareness campaigns		✓		

The screening criteria will include the following which will be discussed and verified with MCA-J and Study Advisory Committee (SAC):

- ✓ Social constraints
- ✓ Political constraints
- ✓ Technical constraints
- ✓ Intervention complexity
- ✓ Implementation duration
- ✓ Laws and Regulations constraints

- ✓ Related other ongoing or planned projects
- ✓ Geographical level influenced by the intervention
- ✓ Effectiveness in raising water consumption of poor households

The interventions will be weighted based on multi criteria group decision analysis exercise, and ranked accordingly. Each potential intervention will be marked against these criteria in a scale of 1 to 5 where 1 represents that this criterion is not in favour of the intervention while 5 represents that this criterion is in favour of the intervention. Different weight for each criterion and a weighted average can be used as will be agreed with MCA-J and SAC. Based on the multi criteria analysis results the first 5 interventions will be selected as the most feasible interventions to carry out the cost effectiveness analysis.

The institutional/management and policy criteria screening is initiated before the completion of the new household survey.

Subtask 3.2: *Interventions costs estimation*

Once the most appropriate and effective interventions are identified (as described above) the next step will be to estimate the cost associated with each recommended intervention. This will cover design, construction, and operation and maintenance costs.

Preliminary intervention components and actions will be needed to be developed to allow estimating their costs. Consultation exercise with water officials will be made for better estimation of costs.

Subtask 3.3*: Intervention cost benefit and cost-effectiveness analysis*

Initially, the expected benefits from implementing recommended interventions will be identified. A detailed cost benefit analysis for the recommended interventions, which is based on economic return rate, will be conducted for this purpose. It will cover the analysis of the benefits associated with increased water consumption, measured as the estimated expenditures for that increased consumption (from the demand estimations), cost saving due to reduced consumption of water tankers and bottled water, cost saving of reduced storage needed, etc., and cost/saving of indirect benefits such as improvement in health and quality of life of poor areas and the associated cost saving for medical expenditure, increases in the productivity of poor households, etc. These analyses will be based in part on the econometric results of Task 2.

MCC investments in Zarqa Governorates will lead to an increase in water consumption in poor areas which will result also in an increase in the treated wastewater quantity. Eventually, these investments will produce benefits to the poor. Additionally, the recommended interventions will produce further benefits or increase the benefits of the MCC investments. Therefore, the incremental benefits as a result of implementing the recommended interventions will be estimated and analyzed. The analysis will be made in consultation with water officials and other key stakeholders to make sure that benefits estimates are reasonable.

The cost-effectiveness (change in share of water going to under-consumers per JD) of recommended interventions will address the following:

- ✓ The relative trade-off between increases in water consumption and cost of operations and intervention administration will be estimated for interventions that might directly target individual under-consuming households.

- ✓ Factors that principally determine the cost of each intervention to achieve the increase in the share of incremental water going to under-consumers will be identified for interventions that are not directly targeting individual households.

The cost-effectiveness assessment of the interventions will be based on the economic rate of return (ERR). The intervention economic returns will be evaluated as following:

- ✓ Define the beneficiaries for each intervention recommended.

- ✓ Estimate the total value-added or incomes of the intended beneficiaries without and with the potential intervention over time.

- ✓ Perform a cash-flow analysis over time where intervention costs are considered negative value and the difference in the value-added with and without the intervention are considered positive value. In this way, the incremental benefit of the intervention is taken into account to calculate ERR.

After analysing the economic impact of the recommended interventions, the interventions will be ranked and marked according to their ERR values where the intervention with the highest ERR will be assigned a full mark of 5 and the lowest with the lowest mark of 1.

The final decision on the best intervention will be taken based on a weighted value for the ERR and feasibility marks of each intervention. The ERR will represent the expected improvement in distributional outcome (impact on economic growth and poverty reduction) while the feasibility assessed in subtask 3.1 represent the intervention applicability to be implemented and considered by MCA-J.

Subtask 3.4: *Prepare Monitoring Plan*

MCA-J in the Jordan Country Concept Paper developed the monitoring framework and a set of recommended indicators that are divided into three levels: program goal level, project objective level and outcome level. The developed monitoring framework and recommended indicators will be reviewed based on the program objectives, their relation with potential interventions and the water situation. The indicators will cover but not limited to water consumption, wastewater reuse, socioeconomic, poverty level, health conditions, Zarqa utility performance and regional impact aspects.

To the extent possible, proposed indicators will be quantitative. However, in some cases and in order to obtain sufficient information on complex situations it is necessary to use several indicators of both a qualitative and a quantitative nature.

The indicators will be based on:

- The best fit ones for the above aspects

- The developed monitoring framework and recommended indicators
- New Water Strategy
- MCC overall program goals and project objectives

In addition, the inputs for the proposed indicators will be revised according to the current situation. Indicator targets and formulas for predicting targets where inputs from other feasibility studies are required will be recommended. In addition to composing data collection strategy for life of projects to track these recommended indicators.

Subtask 3.5: *Preparation of Diagnostic Final Report*

Based on the outcome of the previous Tasks 1,2 and 3, a Diagnostic Final Report will be prepared. The report will cover a detailed description of data collection, compilation and analysis, assessment of current situation, findings and recommendations, assessment of intervention options, recommended intervention, monitoring plan and current and future indicators. The report will conclude whether to proceed with Tasks 4 and 5 (project preparation) based on the result of the whole study analysis and recommended intervention.

If the recommended intervention involves engineering elements related to large public infrastructure, then Tasks 4 and 5 will not be executed. However, if the recommended intervention is related to the MCC proposed projects in Zarqa then recommendations will take the form of criteria to be submitted to MCA-J for integration into a separately contracted engineering study. If the recommended intervention is outside the scope of other MCA-J funded infrastructure and involve engineering design, then preliminary level costing of this work will be provided by the project team. In this case, detailed design and costing would be outside the scope of work.

Subtask 3.6*: Report presentation to Study Advisory Committee and final Report submission*

The Diagnostic Final Report will be presented to the SAC to discuss and get feedback on the final results obtained, potential interventions and their feasibility and recommendations including the recommendation of whether to proceed with Tasks 4 and 5. The arguments and the rationale behind the potential interventions and their feasibility and recommendations will be the main focus of the presentation. Since the study duration is considered limited compared with the required scope of work, it is expected that during this presentation session an agreement on the final recommendations will be reached, specifically on whether to proceed with Tasks 4 and 5. This will allow Tasks 4 and 5 to be accomplished within the study period as stated in Table 3 (the deliverables schedule). All feedback and comments received from SAC including final decision on the recommendations will be reflected in the Diagnostic Final Report and a final version will be submitted to the SAC within 5 working days after the presentation session.

3.4.2 Phase 2

The methodology and tasks of phase 2 will be revised later during the 7th month of study execution and a revised Inception Report will be submitted. The following is almost an extraction of the original proposal submitted by ECO Consult.

Task 4: Preparatory Work for Project Preparation

Subtask 4.1: *Detailed outline for the Project Preparation Final Report*

If needed and upon the approval of the final recommendations of proceeding with Tasks 4 and 5, the project team will start preparing a detailed outline for the recommended intervention. A methodology and a work plan will be prepared which will elaborate how the previously recommended intervention could be implemented as a discrete project within the MCA-J Compact. Possible gender concerns will be addressed in the detailed outline of the recommended intervention.

Subtask 4.2: *Development of logical framework for proposed project*

Further elaboration and clarification of the arguments and the rationale behind selecting the potential intervention will be developed. This will be presented through developing a logical framework for the proposed (potential) project supported by fact finding.

Subtask 4.3*: Inception Report Revision*

The detailed outline of the logical framework for the proposed project will be added to the Inception Report and a revised version will be submitted to the SAC.

Task 5: Project Preparation

Subtask 5.1: *Further data collection*

Further data collection and field observations will be made based on the features of the recommended intervention. It is not expected to require extensive data collection at this stage since most related data will be collected and available to the project team.

Subtask 5.2: *Validate cost effectiveness*

Revise the cost benefits calculation including assumptions behind the value of variables used to perform the analysis. Intervention components will be further detailed and then revise cost according. The impact of the intervention on poor household and on achieving MCC objectives will be further examined and re-evaluated.

Subtask 5.3: *Describe the expected beneficiaries*

Expected project beneficiaries either direct or indirect will be identified and described in line with MCC's guidelines of Chapter 28 on Beneficiary Analysis and Chapter 14 on Gender Policy. Beneficiaries might be individuals or groups that derive economic gains from MCC projects. Some beneficiaries are affected directly by the project investment such as the poor through improving their accessibility to safe water and hygiene wastewater disposal. Other beneficiaries might gain economic return indirectly as a result of the MCC investment such as reducing the government expenditure on health treatment provided to the poor. Of course there are many indirect beneficiaries and benefits however, the project team will attempt to specify the complete set of beneficiaries and quantify the impact on the project on them.

Subtask 5.4: *Assemble a detailed costing and project budget*

Based on the components and the technical specification of the project, the project team will prepare a detailed costing and project budget. If the proposed project involves engineering elements related to large public infrastructure, the project team will provide only preliminary level costing of this work. In case that the proposed project is a social intervention or policy adjustment, the project team will evaluate in details the costs of the intervention activities and actions.

Subtask 5.5: *Formulation of implementation arrangements*

The project team will describe the potential implementation arrangements for the proposed project, including an assessment of the capacity of relevant implementing entities. Existing entities that have the capacity and could participate in the implementation the proposed project will be identified. The assessment will include

- Brief overview of entities
- Past experience of implementing similar projects
- Technical capacity that can be provided for project implementation,
- Description of capacity building needs
- Summary of implementing entities support of the project

A detailed implementation schedule in Gantt chart format will also be provided that will cover the management unit(s) establishment with staff and office space, preparation of bidding documents, procurement, mobilization, time in field for experts in case of technical assistance is needed and construction arrangement if the project includes civil works. In addition, If the activities of the proposed project are to continue beyond the five-year term of MCC financing, the project team will describe briefly how these activities will be financed and managed and by whom.

Subtask 5.6: Formulation of timeline

A detailed work plan and duration for the overall work, including any dependencies between the separate items in the scope of the recommended project will be developed. The schedule will be presented in milestone format showing the main outcomes.

Subtask 5.7: *Consultant Diaries*

The project team at the end of the consultancy will summarize all the meetings conducted in the process of preparing the project and present them in the Consultant Diaries deliverable. The summaries will be simple in a form of minutes meeting organized sequentially.

Subtask 5.8: *Prepare and present the Project Preparation Final Report*

A detailed report (Project Preparation Final Report) will be prepared. The report will cover all issues related to project rationale and description, project context and development plans, project benefits and beneficiaries, environmental and social impacts, project sustainability in

terms of financial and institutional arrangement of its operation and maintenance, tariff and users fees, legal and regulatory issues, implementation arrangements, and budgets. In addition to annexes to cover the sociological issues and technical issues.

The sociological issues will include socio-economic context, institutional context, implications for project design, issues and following-up. The technical issues include technical design features, institutional arrangements for operation and maintenance/sustainability, technical concerns for procurement planning, and draft work plan for implementation of works or provision of technical services.

3.4.3 Methodology for Social Assessment

There are three main tracts to the social assessment, which combine both qualitative and quantitative data.

i. Desk Research:

a. Quantitative Data: This data can be found from several key sources: the Department of Statistics Census, Income and Expenditure Survey, Establishments Survey; the Ministry of Health; the Ministry of Planning and International Cooperation; amongst others. Quantitative data can be used to establish trends and time-series analyses, as well as form the basis for statistical analyses.

For the purposes of our exercise, the disaggregation of potential data sources based upon income, gender, ethnicity, age and household typology must be very clearly examined.

b. Qualitative Data: This type of data includes reports, such as the UNDP Human Development Report, the Ministry of Social Development Reports, and Ministry of Planning and International Cooperation Reports amongst many others.

ii. Field Research:

Initial Sample Interviews: Socio-economic conditions – especially those tying into productivity and health - may be established through sample interviews with local officials and community leaders who may give us deeper insight into the habits, and realities of their communities. Interviews may also be required with local health care providers. Any interviews, if deemed necessary, will be conducted to provide indicative information and results must keep in mind the geographic context at the district levels.

Observations: Other qualitative data may be collected by the team by simply observing land use, economic activities, and other daily routines of the Zarqa society.

iii. Analysis:

Correlation Analysis: The focus of the initial research will determine the relationships between socio-economic data, poverty, health and productivity through analysing the existing or newly-collected data, as described in previous sections.

GIS Analysis: Using existing data, the spatial distribution will be explored looking at under-consumption and its relationship to:

(i) Water quality/perception of water quality on under-consumption: this will involve behaviour analysis based on reactions to water quality and perceived water quality.
(ii) Socio-demographic factors: such as income levels, ethnicity, age, amongst others.
(iii) Using existing data, the spatial distribution will be explored looking at under-consumption and its relationship to:
    a. Socio-economic and demographic conditions
    b. Health and medical expenditure
    c. Productivity and other work related consequences

3.5 DESK REVIEW

A desk review of secondary literature and documents that were provided to the project team by MCA-J and that were collected from other sources has been conducted to develop the socio-economic, historical, water and wastewater, legal and institutional contexts of the project. A succinct summary of this review and key relevant issues have been provided later in this report in *Section 4*. A detailed bibliography of some of the documents reviewed is provided in *Annex C*. The review has enabled the team to identify data gaps that need to be filled and acquired, and better understand the recent relevant sectors' development issues at the national and local levels, including socio-economic issues related to under consumption of water in Zarqa Governorate.

Some of the key documents that were reviewed included:

- **MCC Documents and guidelines:**
    - Guidelines for Economic and Beneficiary Analysis of a Compact Proposal, CH28, 2006
    - Country Concept Paper, Millennium Challenge Account, Jordan, 2008.
    - Guidelines for Environment and Social Assessment, 2006
    - Gender Policy, 2006
- **Water Sector / Socio- Economic related documents:**
    - Annual Data on Water Supplied and Billing Statistics for Governorates, WAJ, 2003-2006
    - Tariff Blocks & History, WAJ, 2008
    - Customer Satisfaction Survey, Results of Phase 1, Operations Management Support to the Middle Governorates, 2008
    - Customer Satisfaction Survey, Results of Phase 2, Operations Management Support to the Middle Governorates, 2008
    - Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (V1: main report & V2: Annexes), KFW, 2008
    - Household Income and Expenditure Survey, DOS, 2006

- Jordan Atlas of Health Indicators, USAID, 2004
- The Economic Advancement of Women in Jordan- Gender Assessment, World Bank, 2005
- Assessment and Evaluation of Health Impacts of Water Efficiency Policies in Jordan, Technical note 1, abstracted from Environment Linkages Initiative (HELI) Jordan Pilot

3.6 DATA REQUIREMENTS

A relatively extensive data base relating household characteristics and attitudes to their water consumption by source is available from the Socio-economic Baseline study. However, consumption amounts from the public supply, as well as consumption amounts from water tankers, are not available from this data set. Although time series consumption data are available for each meter from the WAJ (CIS), the subscriber number was not identified in the Baseline survey. Moreover, neither household income nor expenditures is included in the data set. It will be absolutely necessary to identify consumption levels from all sources of water with each survey respondent for two reasons:

First, without those data, there is no way to verify that these households consume more or less than 50 l/c/d of water in total (that is, from the public system, tankers, bottled water suppliers, water treatment shops, or other sources). The data from this survey do suggest that other sources (such as springs or rainwater) are not significant in the areas of Zarqa that were sampled.

Second, the relationships among consumption levels and other socioeconomic and supply variables cannot be statistically determined without data for all three, except at an aggregate (perhaps "block") level, and then only at a very general level. Without knowing the extent of under-consumption, it will be difficult to identify benefits to increasing public supplies of water on anything but an aggregate basis.

Finally, the Socioeconomic Baseline study focused on blocks of poor households. Little information was developed for high income, high consumption households, so that analyses of the interventions for those households cannot be accomplished.

The second data set, the Comprehensive Consumer Survey (CCS) from WAJ, includes the identification of the meter or subscriber number and therefore the time series of consumption can be obtained. However, the data set contains only a limited set of socioeconomic data, including household size, house or apartment size, and type of usage. Meter location and condition are also included (an indicator of "illegal" use).

Although CIS/billing data and consequently water consumption from the public supply are available for most individual households, data for household consumption from other sources are not a part of the CIS/billing system nor was it included in the CCS. Thus CCS data set cannot be used to determine whether or not an individual household is under-consuming water. In order to accomplish the objectives of the study, it is imperative that the CIS/billing data for the surveyed households are identified.

The third data set, the DoS socioeconomic census data, does not contain any water consumption information. Moreover, the data are available only at an aggregate (block or sub-division) level. This data set might be used to augment the CIS consumption data in order to examine aggregate consumption parameters, but it cannot be used for household specific analyses.

As a result of the data review, it was concluded that the requested household-level econometric analyses of under-consumption and demand functions cannot be accomplished using the available existing data sets. A new survey of households, focused on the data needed for the under-consumption and poor households, will be undertaken. Of course, individual recall data has sometimes been shown to quite inaccurate. It may be necessary to find a way to verify the household respondents from other data sources. Where possible, verification of responses to quantity questions in the survey from alternative data will be undertaken, although the probability of finding adequate data is low.

One problem that is consistently mentioned by local water experts is the problem of "illegal" consumption. It is their opinion that about half of the "non-revenue" water (water provided but not metered to households) is the result of this illegal consumption. Illegal consumption can occur when illegal connections to the system are made by households, or when households tamper with meters. Although general estimates of this consumption by the experts are available, and some data on water provided versus water metered has been collected, the exact level of illegal consumption cannot be determined, and it is highly unlikely that households will provide those data on the new survey (in fact, it is likely to be counter-productive to include such questions).

To the degree that water meters serve groups of households among whom is the surveyed household; a reasonable way to identify the specific consumption of the surveyed household must be found. Generally speaking, under these kinds of circumstances, there is incentive to increase individual consumption at the expense of the group.

Where CIS/billing data or complaints report indicate water quality parameters, it may be informative to relate those parameters with the household's perception of water quality and the amount of water used and/or treated from the source, even if the quality data are not specific to a given household, but are indicative of the "block" in which that household is found.

CIS/billing data or complaints report on water interruptions and the condition of specific distribution systems, if available, will be used to (1) verify household responses, and (2) relate system condition to both "under-consumption" and income levels of households within the service area.

Although ECO Consult has identified required data for the study and has officially asked for additional missing information and data related to water and socio-economic information from MWI, Zarqa Water Administration and DOS, it is clear that only a new data collection effort will provide the needed data.

Below is a list of the additional data that was officially requested. Some of these have not been received yet:

1. Zarqa Governorate subscribers' sample details and information from MWI/PMU:

- Details of Zarqa Governorate sample of subscribers' (names, meter subscription number, telephone number,....etc) that was included in the Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector Study that was implemented by GFA Consulting Group and ENGICON in 2008 and funded by KFW These data are unavailable.

2. Water and wastewater GIS maps and billing information from Zarqa Water Administration:

I. GIS Maps:

- Municipal water network
- Wastewater network
- Billing and collection areas to the smallest water administrative level according to billing system
- Water breakage and complaints according to their types
- Wastewater blockage and complaints according to their types
- Baseline maps to the smallest water administrative level including roads and lands.

II. Billing Information

- Billed water quantities and no. of annual bills to the smallest water administrative levels for the last three to ten years.
- Quantity of quarterly billed water for the last five years for the Zarqa water subscribers sample that were included in the Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: KFW, 2008

Socio-Economic Data from DOS:

I. 2004 Census Data

On the 2004 Block Level for the Zarqa Governorate:

General Characteristics of Persons

- Distribution of Population by Category, Sex, Nationality
- Distribution of Population by Category, Sex, Nationality, Age Group
- Distribution of Private Household Members by Household Size
- Distribution of Population by Nationality, Sex, Health Insurance Status
- Distribution of Population Covered by Health Insurance by Nationality, Sex, Type of Health Insurance and Governorates
- Distribution of Jordanian Population by Duration of Residence (in Years)
- Distribution of Population Living in Jordan 15 + Years of Age by Marital Status, Age, Sex

Building Characteristics

- Distribution of Buildings by Type of Occupancy, Type of Building
- Distribution of Buildings by Type of Building Dominant Material, Type of Building
- Distribution of Conventional Buildings by Year of Laying Fundaments, Type of Building, Number of Floors

Housing Units & Households Characteristics

- Distribution of Housing Units by Type of Occupancy, Type of Housing Unit
- Distribution of Occupied Housing Unit by Private or Collective Households by Type of Tenure, Type of Housing Unit
- Distribution of Occupied Housing Units by Private or Collective Households by Main Source of Drinking Water, Type of Housing Unit
- Distribution of Occupied Housing Units by Private or Collective Households by Type of Sewage System, Type of Housing Unit
- Distribution of Housing Units Occupied by Private or Collective Households by Number of Households in the Housing Unit, Type of Housing Unit
- Distribution of Housing Units Occupied by Private Households by Average Number of Person Per room
- Distribution of Occupied Rented Conventional Housing Units by Monthly Rent Value in (JD),Type of Housing Unit
- Distribution of Conventional Housing Units Occupied by private or Collective Households by Area of the Housing Unit (square meter), Type of Housing Unit, Type of Household
- Distribution of Private Households and Members by sex and age of the Head of Household
- Distribution of Private Households and Members by Sex and Economic Activity Status of the Head of Household
- Distribution of Private Households and Members by Sex and Marital Status of the Head of Household

Educational Characteristics

- Distribution of Population Living in Jordan Aged 5-29 Years by Nationality, Enrolment Status, Age, Sex and Governorates
- Distribution of Population Living in Jordan 15+ Years of Age, by Nationality, Sex, Educational Level, Urban – Rural and Governorates

Economic Characteristics

- Distribution of Population Living in Jordan 15+ Years of Age by Economic Activity Status, Age, Sex and Governorates

Deleted: l

- Distribution of Employed Persons Living in Jordan 15 + Years of Age by Nationality, Sex, Main Economic Activity and Governorates
- Distribution of Employed Persons Living in Jordan 15 + Years of Age by Nationality, Sex, Current Occupation and Governorates
- Distribution of Employed Persons Living in Jordan 15 + Years of Age by Nationality, Sex, Employment Status and Governorates
- Distribution of Employed Persons Living in Jordan 15 + Years of Age by Nationality, Sex, Sector of Work and Governorates

II. Income and Expenditure Data for the year 2008

On district level where available:

Income

- Percent Distribution of Households by Groups of Annual Current Income
- Average Annual Current Income of Household by Source

Expenditure

- Percent Distribution of Households by Household Expenditure Group
- Percent Distribution of Household Members and Household Expenditure Group
- Percent Distribution of Household Members and Household Member Expenditure Group
- Average Annual Household Expenditure on Groups of Commodities & Services
- Average Annual Household Member Expenditure on Groups of Commodities & Services
- Percentage Annual Household Member Expenditure on Groups of Commodities and Services

III. Health

On district level where available:

- Infant and child mortality rates by three five – year period

IV. GIS Data Required

- 2004 Census Blocks for Zarqa governorate
- Zarqa Districts for Income and Expenditure data
- Locations of hospitals and health clinics

V. Socio-economic data at neighbourhood level for Zarqa Governorate for the year 2008 including GIS maps

- No. of population
- Population density

- Average household number
- Average household income
- Average household expenditure
- Type of household Expenditure
- Average poverty
- Average unemployment
- Percentage of employment to population
- Number of commercial and economic buildings
- Number of Governmental buildings
- Number of public and private schools
- Number of hospitals
- Number of health clinics

3.7 FIELD VISITS

A field visit to Zarqa Water Administration was conducted on the 6th of October 2009 where the project team and MCA-J met with the senior staff of Zarqa Water Administration and presented the study's scope and objectives, and discussed current situation related to water and wastewater distribution networks in Zarqa Governorates and data requirements and availability. As mentioned in section 3.5, one of the key data information that was inquired for is the subscribers' sample details and information for Zarqa Governorate that was included in the "Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector" study that was conducted by GFA Consulting Group and ENGICON in 2008 and funded by KFW. The project team were informed that this information is not available at Zarqa Water Administration and that it might be available at the PMU at WAJ. Unfortunately, this information was not available anywhere (see the next section for further details).

A visit to the Department of Statistics was also conducted on the 7th of October 2009 where the project team, lead by our Social Expert and MCA-J met with the Head of the DOS and the Head of the IT Department at DOS. The project team presented the project's objectives, approach and methodology and discussed the availability of the required related socio-economic data and GIS maps for the study. The project team were informed that most of the needed data is available at DOS.

Official requests of data and GIS maps were sent to PMU/MWI, Zarqa Water Administration and DOS on the 11th of October 2009.

A second visit to the DoS was conducted on the 28th of October to discuss the implementation time requirements and costs for the new Socio-economic survey. As mentioned earlier, dead line for completion of the survey was set by DOS as end of December 2009. A revised Arabic questionnaire was submitted to DOS on the 3rd of November 2009 by the project team and discussed during a meeting with DOS and MCC on the 4th of November 2009.

3.8 KEY ISSUES, LIMITATIONS AND PROPOSED MODIFICATIONS ON SCOPE

The key issue in these analyses is the ability to link water consumption from the public supply to the socioeconomic characteristics of the households surveyed in 2008. As indicated above, there is no way to identify households in the Socioeconomic Baseline study and obtaining CIS/billing data for them. Alternatively, the CSS data sets do contain sufficient socioeconomic data for specific households, and, therefore, the modeling approach suggested above cannot be applied. There are two alternative solutions:

As discussed earlier, a new survey of households should be undertaken. The data obtained by the new survey should be consistent with the requirements of the analyses. This survey would permit the analyses suggested in Section 3.4.1. In addition, a comparison of the two household surveys (and perhaps with the CSS data) could provide a way to "ground truth" the household responses. Further, this survey should include questions related to the proposed MCC interventions in order to provide a basis for the selection of interventions to be implemented. This includes data collection for high income, high consumption households.

Second, DoS data on socioeconomic characteristics of groups of households on the "block" basis, can be linked with consumption levels of those blocks. It is clear, however, that households who consume less than 50 l/c/d could not be identified from the CIS/billing data, because those data do not include consumption from other sources. There may be ways in which that level of consumption can be "inferred" for a portion of the "block" of households, although that depends on the specificity of the data. Cross-section statistical analyses of these "blocks" might yield indications of the significant variables that determine the proportion of under-consuming households within a block. However, even under the best of circumstances in this case, it would be impossible to identify specific beneficiaries of MCC interventions relative to their consumption and/or income.

Third, CIS/billing geographical zones are different from DOS and land geographical zones. Current geographical zones in Zarqa CIS/billing system are divided into the following zones: Operation centre, main region, secondary region, path and subscriber sequential number. The Comprehensive Customer Survey carried on recently in Zarqa has updated the subscribers information according to the geographical zones used by the Department of Land and Survey where zones are divided into Directorate, Village, Block, Sector and Parcel (plot number).

As a result of the assessment of data availability and consistency, it was recommended that a new household survey, focused on the analyses requested by the MCC and the potential lists of interventions, be undertaken as quickly as possible.

As mentioned above, ECO Consult, in cooperation with MCC and MCA-J, has begun efforts to develop a new questionnaire for DoS to implement the new Socioeconomic survey. Using the template of the Socioeconomic Baselline study, the team identified questions that were pertinent, those that were not pertinent, and those that were needed to assure that the data set will be complete. Note that a part of the DoS implementation will include the identification of appropriate sample frames and locations consistent with the proposed interventions and the requirements of the econometric analyses. It was agreed between MCC and DOS that the new survey will cover 4 sub-districts out of 6 in Zarqa Governorate as follows:

- Zarqa sub-district
- Russeifeh sub-district
- Hashmyieh sub-district and
- Bireen sub-district

Limitations:

- Level of analysis: Inability to get all requested data as described in the data requirements section (3.6) and according to the required level of detail. This might lead to delays in carrying out the analysis, or put limitations on the analysis.
- Global assessment of water allocation: Presence of many variables that can affect the accuracy of the historical water supply allocation to the poor like unaccounted for water, urban expansion, increase in subscribers' number, etc. that will affect the accuracy of the carried out analysis.
- Exclusion of Azraq and Dhulail sub-districts: the exclusion of these two sub-districts from the new survey will not allow the project team to perform any econometric analysis or correlations of data for these two sub-districts.

4 THE PROJECT CONTEXT: SUMMARY OF DESK REVIEW

4.1 GENERAL SOCIAL CONTEXT

Jordan's population has expanded from 4.1 million in 1994 to 5.9 million in 2008. Jordan's rapid growth has two sources: high birth rates and large waves of migration, principally Palestinian and Iraqi immigrants, following wars in these respective countries. Between 1952 and 1979 the Jordanian growth rate was 4.8%, although between 2000 to 2004, this dropped to 2.8% per annum, and between 2004 to 2008 it dropped further to 2.3% per annum. This drop can mainly be attributed to lower fertility rates - from 5.6 to 3.6 between 1990 and 2007, due to family and reproductive awareness programs by the government. Although demographic growth is slowing, total population is expected to reach almost 7 million by the year 2015.

Urbanization has become a core fact of life in Jordan; the number of citizens living in urban areas almost doubled from 40% to 79% between 1952 and 2002, dropping to 72.1% by 2004, due to rural to urban migration and the fact that Palestinian/Iraqi immigrants usually prefer to immigrate to cities rather than rural areas. Amman, Zarqa and Irbid combined make up 71.4% of the Jordanian population, as of 2008.

Table 8 Population Density by Governorate

Region and Governorate	Population	Area Sqkm	Population Density
Central Region	**3,674,900**	**15,395**	**238.7**
Amman	2265100	8231	275.2
Balqa	391900	1076	364.2
Zarqa	871600	4080	213.6
Madaba	146300	2008	72.9
North Region	**1,626,300**	**28,870**	**56.3**
Irbid	1041300	1621	642.4
Mafraq	275000	26435	10.4
Jarash	175500	402	436.6
Ajlun	134500	412	326.5
South Region	**548,800**	**45,077**	**34.4**
Karak	228200	3217	70.9
Tafiela	81900	2114	38.7
Ma'an	111200	33163	3.4
Aqaba	127500	6583	19.4
The Kingdom	**5,850,000**	**89,342**	**65.5**

Source: DOS, 2007

4.1.1 Poverty in Jordan

The Household Income Survey conducted by DoS in 2006 indicated that the national poverty line has climbed from JD392/ person a year in 2002 to JD 556/person a year in 2006; an increase of JD164 or 41.8%. According to the same study, Jordan has succeeded in lowering poverty rates from 21.3% in 1997 to 14.2% in 2002 and to 13% in 2006. These gains have been accompanied by significant achievements in terms of human development, especially in health and education.

While the northern governorate of Mafraq was ranked first on the poverty list, followed by Karak which ranked eighth before 2002, Amman remained the richest. Compared to 2002, the situation relatively improved in Maan (9th) and Zarqa (8th).

In the poor category, each family supporter is responsible for an average 6.4 people, while in the non-poor segment, each supports 3.7 people. Between 2002-2006, income of poor class grew by 5 per cent, while expenditure growth hit a 17.4 per cent mark.

Table 9 *Incidence of poverty*

Governorate	**2002**	**2006**
Kingdom	14.2	13
Amman	9.2	9.4
Madaba	10.7	10
Irbid	13.8	12.1
Ma'an	24.1	12.7
Zarqa	22.3	14.9
Balqa	17.8	15.3
Aqaba	15.2	15.4
Jerash	18.4	16.7
Ajloun	9.7	17.7
Tafeela	10.6	19.1
Karak	12.2	21.7
Mafraq	25.4	23

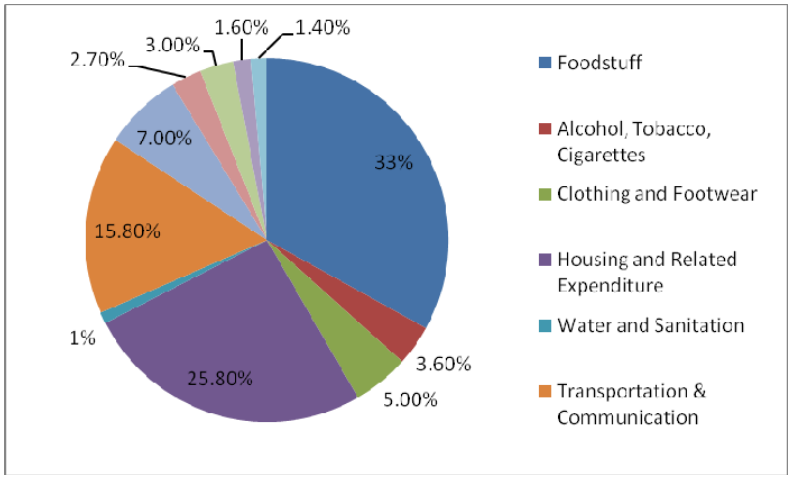
Source: Department of Statistics

A Department of Statistics Study covering the 2002-2006 period said a Jordanian needed JD46 a month on average in order to stay alive. Accordingly, the Jordanian citizen needs JD26 monthly to spend on essential non-food products and JD20 for food.

Poverty factors are not restricted to income, and do extend to include the fact that more than half of poor Jordanian families do not have sewage networks. While poor families have fewer luxury items than the non-poor segment, their percentage in basic education is higher, while the non-poor dominate in secondary and university education. However, according to the study, around 60% of poor Jordanians owned houses in the surveyed period.

From the beginning of 2002 to the end of 2006, Jordanians spent less on food by 3.2%, while their expenditure on non-food products increased by the same percentage.

Figure 2Jordanian Expenditure Breakdown, 2006



Source: Department of Statistics

4.2 ZARQA SPECIFIC OVERVIEW

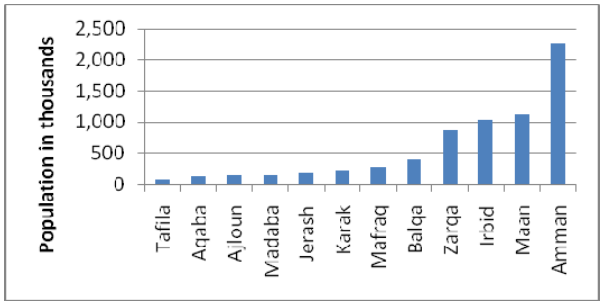
The Zarqa governorate is located to the North-East of Amman. It consists of 4,080 sqkm. Zarqa consists of several major districts: Qasabet Ezzarqa, Russifa, and Hashemiyyeh, with several subdistricts in each.

Zarqa is one of the poorer governorates of Jordan, with a large urban population. As a close neighbour of Amman, daily work commuters from Zarqa to Amman number in the hundreds of thousands. Zarqa has also been placed high on the government development agenda, with an Industrial and Free Zone, as well as concessions for large-scale real estate projects. The governorate currently consists of two major universities: Al-Hashemite University which is public, and al-Zarqa University which is private. Other landmarks include historic sites, and the Zarqa River.

4.2.1 Demographics

Between 1994 and 2004, the overall population growth rates within Amman and Zarqa Governorates were approximately 2.1% and 1.9% annually, respectively. Approximately 38% of the country's population lives in Amman, and approximately 15% of the population lives in Zarqa. Within Jordan, as more than 80 % of the population lives in urban areas, infrastructure challenges are growing. This situation is even more pronounced in Zarqa where 95% of the population lives in urban areas. The average household size in Zarqa is 6.07 people (as of 2004). Across Jordan the average number is 5.4 people, as of 2004.

Figure 3 Population per Governorate



Source: DOS

The two largest cities in the Zarqa governorate are Zarqa and Russeifa; with Zarqa City's population at about 52% of the governorate's total population. *Zarqa*, and *Russeifa* are also amongst the most densely populated subdistricts in the study area.

Table 10 Population Figures 2007

	Total	**Urban**	**Rural**	**Male**	**Female**
Jordan	5,723,000			2,950,000	2,773,000
Zarqa Governorate	852,700			441,200	411,500
Zarqa	442,240	440,740	1,500	228,670	213,570
Dhlail	36,360	30,830	5,530	17,610	18,750
Russeifa	299,130	296,900	2,230	155,360	143,770
Hashemiyyeh	51,640	42,550	9,090	26,970	24,670

Source: DOS

Across the Zarqa governorate, dependency rates, as well as fertility rates are fairly standardized.

Table 11 Population Growth, Dependency and Fertility Rates

	Annual Growth Rate (%)	**Dependency Rate (%)**	**Fertility Rate (%)**
Jordan	2.2		
Zarqa	2.2	70	3.8
Russeifa	2.2	76.5	3.8
Hashemiyyeh	2.2	70.8	3.8

Source: DOS

Table 12 Percentage of Non-Jordanians within certain Zarqa Districts

Sub-District	Total Population	No. of Non-Jordanians	Percentage of Non-Jordanians (%)
Zarqa	442,240	19,320	4.40%
Dhlail	36,360	10,180	27.90%
Russeifa	229,130	30,060	10.50%
Hashemiyyeh	51,640	1,510	2.90%

Source: DOS

The percentage of non-Jordanians varies significantly across the different districts in Zarqa. The non-Jordanian population from Iraqi descent resides almost exclusively in urban areas. However, Dhlail and Russeifa subdistrict accommodate a large number of foreign laborers mainly coming from Sri Lanka and Egypt. Especially in Dhlail the large percentage of foreign workers is causing conflicts within the community when it comes to water supply management. Foreign laborers are often accused to utilize water resources in an uneconomic manner and increase the pressure on service delivery in general.

4.2.2 Education

In 2002, Zarqa had the second highest literacy rates of the governorates in Jordan, however, it had the lowest combined primary, secondary and tertiary enrolment rates, implying that, without proper actions, it would see its ranking in literacy drop significantly in the future.[1] By 2004, 56.8% of young people were enrolled wither in primary, secondary or tertiary education.[2]

Table 13 Education Rates Zarqa, 2004

	Urban Males (%)	Urban Females (%)	Rural Males (%)	Rural Females (%)	Urban Total (%)	Rural Total (%)
Illiterate	4.6	11.2	15.2	24.3	7.8	19.4
Read and Write	4.6	5.3	5.8	5.1	5.0	5.5
Elementary	11.4	9.8	12.7	11.7	10.6	12.2
Preparatory	20.3	17.9	18.6	16.8	19.1	17.8
Basic Education	16.8	14.8	18.5	17.5	15.8	18.0
Vocational Apprenticeship	3.1	0.3	1.5	0.1	1.7	0.9
Secondary	21.8	24.1	17.8	16.1	23.0	17.0
Intermediate Diploma	8.7	11.2	4.9	4.2	10.0	4.5

[1] Jordan Human Development Report, 2004, UNDP

[2] DOS, Population and Housing Census 2004

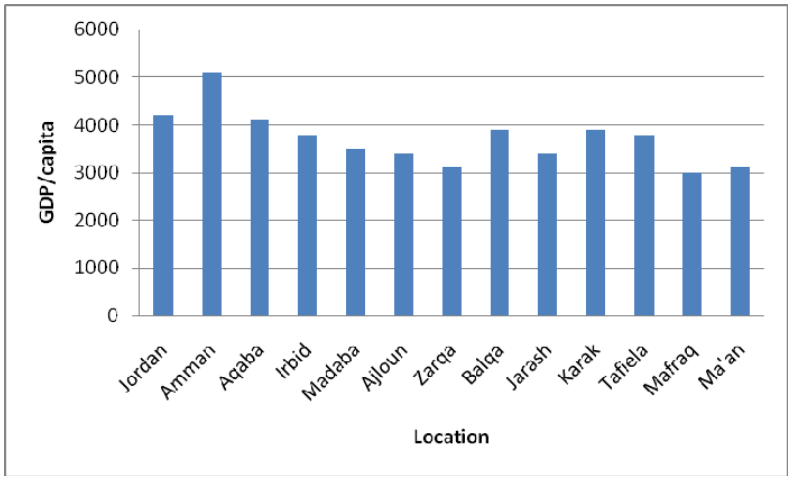
BA	7.5	4.9	4.4	4.0	6.2	4.2
Higher Diploma	0.3	0.1	0.2	0.0	0.2	0.1
MA	0.6	0.2	0.3	0.1	0.4	0.2
PhD	0.1	0.0	0.1	0.0	0.1	0.0
Unspecified	0.1	0.1	0.2	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: DOS

4.2.3 General Economic Description

According to DOS, out of the 21,600 firms in Zarqa, the vast majority of them were dealing in retail trade (excluding automobile sales/repair) reaching almost 11,000 firms in 2006, or 50.9% of companies, far and above any other industry (the second biggest was manufacturing, at 2,549 firms, or 11.8% of firms, and the third biggest was the sales/repair of automobiles, at almost 2,300 firms, or 10.6% of firms). However, it should also be added that while manufacturing firms totaled only 11.8% of firms, they offer a high value added capability, while retail trade offers a quite low value added.

Figure 4 GDP/capita per Jordanian Governorate, 2002



Source: Jordan Human Development Report, 2004, UNDP

Comparing GDP/capita to other governorates, one discovers that, out of the 12 governorates in Jordan, Zarqa has one of the lowest GDP/capita rates in the country (second only to Mafraq).

The GDP/capita decline in Zarqa over the period leading up to 2002 is reflective of an unemployment jump witnessed in the Governorate rising between 9.7% in 1997 to 15.9% in 2002, although it dropped to 8.9% in 2004, compared to 22.8% in the rest of Jordan. National unemployment reached 14% by the third quarter of 2009, up from 12.1% in the first quarter of 2009. Zarqa accounted for 15.5% of this unemployment.

4.2.4 *Employment and Unemployment*

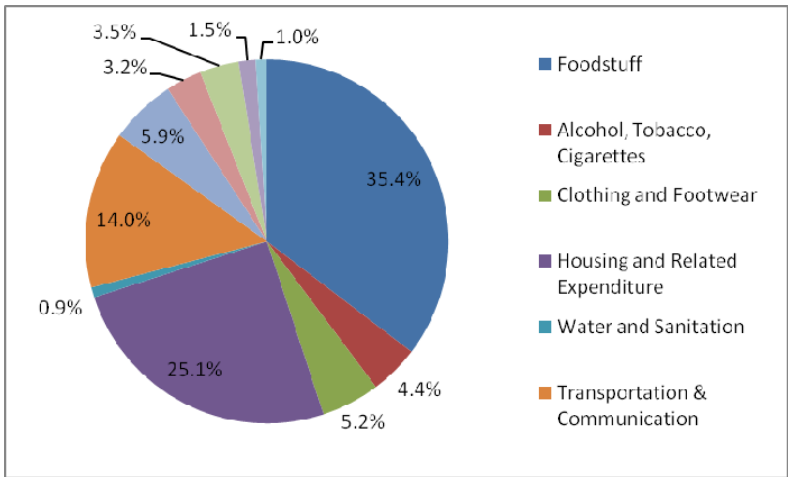
While in 2004 in Zarqa there were 165 thousand total employed, or 36% of the population above 15 years old; the unemployment rate has been rising. The increase in unemployment registered in Zarqa indicate that the living conditions must have become more difficult. In 2004, the male unemployment rate in Zarqa was 16.2%; compared to the female unemployment rate of 38.8%.

4.2.5 *Income and Expenditure*

Within the Middle Governorates, the Zarqa Governorate has historically the lowest average household income with JD 4,681 per year in 2006 compared to JD 5,732 per year in Balqa Governorate and JD 5,164 per year in Madaba Governorate.

Between 2002 and 2006, in Zarqa, the price of food increased by approximately one third, and household expenditure increased by a little over one fifth. The price of housing increased by 10%, with a corresponding increase in household expenditure; the price of energy increased by over a half, and household spending increased by almost two thirds. The price of education increased by almost one fifth, and the amount of spending on education increased by almost 80%; the price of medical care increased by almost one fifth, and the amount of spending on medical care increased by almost a half.

Figure 5 Zarqa Expenditure Breakdown, 2006



Source: DOS

The food poverty line lies at 380 JD/annum, or 2,100 Kcalories per person, daily; if one were to include all basic needs, the poverty line would jump to 5,900 JD/annum per household from 380 JD/annum. Within the Middle Governorates, *Zarqa* is most affected by growing poverty with the poverty rate estimated to be at 14.9% in 2006.

4.2.6 Water

Water poverty is one of the most pertinent cases of poverty within Jordan. The MENA region is a very arid part of the world, and this can be clearly illustrated in Zarqa, with its poor, and inequitable, supplies of water.1 Only on 'Water Day,' which is usually Wednesdays during the week, is water supplied (usually between 4-5 hours during the day). The water network is outdated and dilapidated, suffering from leaks, broken sections and extensive rusting. Zarqa's rapidly growing population, due to regular population increases as well as inter-governmental immigration, has put additional strains on this weak system.2

Most of the Middle Governorates' houses are connected to a water source; 97% of homes in Balqa Governorate and Zarqa Governorate are connected to a network, dropping to 90% in Madaba.3

On average, the Water Authority of Jordan (WAJ) supplies each family with 2 cubic meters of water weekly, meaning that many residents have to purchase their own water.4

The vast majority of homes (around 95%) are connected to a water meter; in Balqa Governorate and Madaba Governorate this increases to 99% and in Zarqa 94% of homes have water meters. Families and neighboring homes do share water connections, supplies and meters, occasionally, (approximately 5% of neighbors share water meters). In Zarqa, 6% of homes share a water connection.5

The lack of water in Jordan is obviously exacerbated during the summer months, with almost all households going without water for long lengths of time. The rate of water supply, per week, is, for Balqa, Madaba and Zarqa respectively, 2.91 days, 1.55 days and 3.24 days.[6]

Demand for water during the summer, from water tanks specifically, jumps 12% and 17% in Zarqa and Russeifa, respectively. Water prices from these private sources are not moderated by oversight or governmental action; many people report that those with 'Wasta' get better deals than those without. While most Jordanians have to pay 4-7 JD per cubic meter, this can

[1] Millenium Challenge Account, 17 November 2008, Jordan, Country Concept Paper

[2] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[3] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

[4] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[5] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[6] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

rise to 8 JD per cubic meter in Zarqa and Russeifa. Many individuals have to wait for up to 3 weeks to obtain water from this source; in summer and Ramadan, the waiting time increases.

The bias in water supplies, favoring those with high levels of disposable incomes, and urban areas, has engendered resentment, and in some cases disputes, among the inhabitants of Zarqa. It should be noted that within urban Zarqa, 91.6% of the population made use of water pipes, compared with 87.9% of rural Zarqa.

Zarqa residents, who took part in a recent study, the, Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II), stated that "If the swimming pools at the 5 star hotels in Amman were emptied people would have enough water to use."

The lack of water leads to many issues of anger and resentment; many husbands cannot provide adequate water for use by their families, engendering arguments, fights, and sometimes divorces.

Also, inadequate water supplies are a source of tension between neighbors, as some neighbors are accused of wasting this scarce resource, and sometimes even stealing it; disposing of the waste in cesspits might be a source of conflict in apartment buildings.

During 2006, WAJ stated that water usage per person amounted to 75 liters per person daily in Balqa, 67 liters per person daily in Zarqa, and 76 liters per person daily in Madaba. Assuming a typical home has 6 people, water and sewage would cost 31 JD annually in Zarqa, 39 JD annually in Madaba and 32 JD annually in Balqa. However, if each household consumed 100 litres per day, this price would double.1

While different homes receive their water from a range of sources, from rainfall and springs (unprotected source) to the governmental network and water containers (protected source). Almost 80% of homes in the survey have the governmental network as their primary supply of water. Another 15% of homes use water vendors or sellers who can purify the water (usually more so in urban as opposed to rural areas).

Over one third of Jordanian homes (as well as Zarqa homes) treat or purify their water before consuming it; before treatment, many have complained that the water contained too much salt and chlorine, giving it a terrible taste.

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

As a result, four out of every five residents of Zarqa buy bottled water. This can cost as much as 2 JD for 45 liters; those that cannot afford such a price, have no choice but to consume public water.1

As many people believe that WAJ water is insanitary anyway, they do not take the necessary precautions to keep their water tanks hygienic, and in some cases even to place cesspits near the water tanks.2

The overwhelming majority of survey respondents (99%) had a water storage device in their home, each being able to hold (on average) 2.7 cubic meters. Six out of ten people wash their tanks according to the survey, Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I). The governorate with one of the highest percentage of people who washed their tanks was Madaba (at 82%), but in Balqa only 62% of people washed their tanks, compared to 56% in Zarqa.

Residents also believe that they are not getting a fair deal from their tax, due to a lack of transparency; many of the pipes are overland, making the possibility of excessive damage and leakage much higher. Many inhabitants who live in high, mountainous areas have no choice but to buy water tanks, as the low pressure of the pipes implies that the water cannot reach uphill locations. Response times from the WAJ are also extensive, with one example whereby a damaged pipe was not tended to until 10 days after the complaint had been registered; there is also minimal coordination between the various agencies involved. Those that cannot afford bottled water, have no choice but to drink filtered municipal water.[3]

4.2.7 Wastewater and Sewage

Approximately 86% of Zarqa is connected to a sewage disposal network, while a few of the newer locations are not, thus leading to many people relying on cesspits. Most families drain their cesspits monthly, putting extra strains on the families' budgets. In order to obtain a connection to the sewer, it may cost a family 400 JD.4

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[2] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

[3] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

[4] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

In Zarqa, approximately half of households drain their septic containers frequently; however hiring the specialized truck for this purpose can cost (for one load) between 21 JD to 40 JD (even though costs fluctuate with location and demand).1

Much like the water supply system, the sewage disposal system urgently requires modernization and repair. Aside from the consistent flooding from the sewage system, there is noise pollution, horrible smells and an abundance of insects and other pests. Some farms are located near the sewage system.

4.2.8 Solid waste

There is a high level of littering in Zarqa; garbage is often not collected, piling up in their trash cans outside homes, many residents believe that street cleaners only perform their duties if they are paid extra by inhabitants. Almost one fifth of homes in Zarqa get rid of their garbage by leaving it on their roads or sidewalks.2

Others have maintained that, due to the lack of public parks, children are forced to play in highly polluted areas.

4.2.9 Health

Two studies, the 'HELI' study and the *World Bank Poverty Report, 2004*, show that the lack of water in Jordan is one of the main issues exacerbating water associated illnesses, particularly diarrhea in children (a problem caused by both lack of water and poor quality water). While the poorest groups in Jordan would, as expected, have the highest infant mortality rates, the water problems greatly exacerbate this issue.[3]

Poor hygiene habits regarding water storage/usage and water associated illnesses are, as expected, to be found in the areas of Zarqa with minimal water, although, there is no pervasiveness of illnesses such as Typhoid Fever and Cholera. The vast majority of homes (90%) reported, according to, Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I), that they did not suffer from diseases pertaining to illnesses caused by water/sanitation problems. However, 6% of homes did

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

[2] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[3] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

report diarhoea, half that number reported amoebic infections, and 2% reported illnesses from worms.1

Most of the diseases found in the Zarqa Governorate are gastrointestinal (mainly diarhoea) although other diseases such as Hepatitis are also found. Amoebic infections are found particularly in students; many maintained this was due to poor hygienic conditions in schools, as well as the dirty water supplied by WAJ and dirty water tanks.2

Many women maintained that the majority of inhabitants in Zarqa do not wash water tanks regularly, instead purchasing a new tank when the old one stops functioning properly (approximately every 2 years). These women also maintained that knowledge of hygiene related issues and health was minimal (many noted the irony of washing a tank when the water supplied by WAJ was in itself dirty). There were also cases of kidney stones; a significant percentage of children developed kidney diseases, most probably from the impure water. A school official pointed out that annually 2-3 children suffer from a kidney related illness or kidney failure in her school alone. There are also a rising number of people who have contracted cancer, made worse by the absence of adequate medical services. The bathrooms in the schools have no water, and students do not know how to deal with a situation such as this. Of the homes that utilize the governmental water system in Zarqa, approximately one quarter do not understand the fundamental steps of cleaning their water tanks.

When giving birth, over 99% of urban Zarqa's women received some form of medical assistance (94.9% doctor, 4.7% nurse), compared with 93% (85.3% doctor and 7.5% nurse) of rural Zarqa. It should also be noted that in urban Zarqa, 42.5% of the population use modern contraceptives, as compared to 16.1% who use more ancient or traditional contraceptive; in rural Zarqa, 37.3% use modern contraceptives, and 13.8% use ancient or traditional contraceptives. The neonatal mortality rate in Zarqa is 16%, compared with an under 5 mortality rate of 31%. Also, 97.9% of Zarqa's children receive vaccinations.3

Table 14 Contraceptive Use Rate 2002

	Urban		Rural	
Region	Traditional	Modern	Traditional	Modern
Amman	13.72	45.11	11.51	37.21
Irbid	15.53	41.08	18.19	38.99
Zarqa	16.12	42.5	13.78	37.31
Balqa/Madaba	13.08	40.1	15.07	40.45
Mafraq/Jarash/Ajloun	15.35	39.25	12.78	32.32
Karak/Tafiela/Ma'an/Aqaba	14.03	34.91	15.49	31.34
Total	14.54	42.59	14.62	35.83

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[2] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[3] Neuman, M, September 2004, "Jordan: Atlas of Health Indicators," ORC Macro, Calverton, Maryland USA

Source: Neuman, M, September 2004, "Jordan: Atlas of Health Indicators," ORC Macro, Calverton, Maryland USA

Table 15Medical Care Received During Birth, 2002

	Urban			Rural		
Region	No one	Doctor	Nurse/ Traditional	No one	Doctor	Nurse/ Traditional
Amman	0.61	95.86	3.53	2.07	93.15	4.79
Irbid	1.57	92.04	6.39	1.44	87.89	10.68
Zarqa	0.36	94.94	4.7	7.21	85.34	7.45
Balqa/Madaba	1.69	94.27	4.03	1.72	91.93	6.35
Mafraq/Jarash/Ajloun	1.34	85.9	12.75	3.78	89.04	7.18
Karak/Tafiela/Ma'an/ Aqaba	3.19	91.84	4.95	3.2	93.58	3.21
Total	1.02	94.11	4.88	2.67	90.86	6.47

Source: Neuman, M, September 2004, "Jordan: Atlas of Health Indicators," ORC Macro, Calverton, Maryland USA

Table 16Infant Mortality in Jordan, 2002

	Neonatal Mortality	Postneonatal Mortality	Infant Mortality	Child Mortality	Under-Five Mortality
Amman	15	6	19	4	23
Irbid	18	8	25	6	31
Zarqa	16	9	24	7	31
Urban	17	5	23	5	27
Rural	20	7	30	6	36
Total	17	7	24	5	29

Source: Neuman, M, September 2004, "Jordan: Atlas of Health Indicators," ORC Macro, Calverton, Maryland USA

4.2.10 Hygiene

The lack of water leads to poor hygiene standards among the inhabitants of Zarqa. In addition to the many problems faced by students previously mentioned, the lack of water (as well as proper hygiene practices) has led many students to suffer from lice; approximately 17% do not brush or take other care of their teeth, 7.5% do not wash their hands during meal time and 5.6% do not wash hands after going to the latrine, according to the 'Jordan Global School-based Student Health Survey.'1

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

Some women placed cotton (used for medical purposes) inside the tip of the tap, as an improvised filter. Knowledge of the link between diseases and hygiene is weak, for instance, many people wash their vegetables in the highly polluted/dirty Zarqa River. Many people also dump their trash outside of garbage cans, and it is apparent there is little regard for the environment.[1]

4.2.11 Gender and Water

The lack of water and poor sanitation standards are also a possible barrier to bridging the gap in the roles played by men and women.2

Although there is little discrimination in water provision between men and women, the significant exception is when a woman is the leader of the home; there have been impediments to women attempting to receive water from WAJ when they lead the household.

Also, when it comes to the individual home, there is a clear bias towards certain tasks for each gender; women have the duties of cooking, cleaning, bathing children, filling the water tanks during 'Water Day,' and determining how much water to be used on which task. It is considered the man's duty to contact the government or company, water the garden, clean the car, order and purchase water services. Although, more women are making decisions regarding buying extra water, ordering the waste disposal truck for cesspits, for complaining to, and purchasing from, the WAJ. The task of cleaning the tank is varied across different communities, with some having women, and others having men, do it.

The *Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)* identified family care as the priority of women; water is carefully rationed during the week, primarily for the care of the young members of the family, the sick, then water used for internal consumption, after that for home maintenance, after that hygiene and finally gardening. More women are turning to plants that can survive with minimal water to cope with the lack of water. The roles performed by men and women, relating to water are usually absorbed and imitated by the younger generation, to be repeated when they are older.

4.3 INSTITUTIONAL FRAMEWORK

Ministry of Water and Irrigation (MWI) is the official body responsible for the overall monitoring of the water sector, 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. Its role also includes the provision of centralized water-related data, standardization and consolidation of data.

[1] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume II)" GFA Consulting Group

[2] August 2008, "Water Management Programme in the Middle Governorates – Zarqa, Balqa and Madaba, Socio-Economic Baseline Survey in the Water Supply and Sanitation Sector: Draft Final Report (Volume I)" GFA Consulting Group

The MWI was established in: 1992 by-law issued by the executive branch of the Government under the Jordanian Constitution. The establishment of the Ministry of Water and Irrigation was in response to Jordan's recognition of the need for a more integrated approach to national water management. Since its establishment, MWI has been supported by several donor organization projects that have assisted in the development of water policy and water master planning as well as restructuring the water sector.

Seven directorates under the direction of the Assistant Secretary Generals for Finance and Administration and Technical Affairs as well as two units for Legal Affairs and Project Finances directly subordinate to the Secretary General fulfill the said functions (MWI Organizational Chart).

Units for public relations, internal monitoring and water security and protection are directly subordinate to the Minister of Water and Irrigation with responsibilities overarching MWI, WAJ and JVA (Ministry By-Law No.52 of 1992).

The Ministry of Water and Irrigation embraces the two most important entities dealing with water in Jordan:

***The Water Authority of Jordan (WAJ)*:** in charge of water & sewage systems.

The Jordan Valley Authority (JVA): responsible for the socio-economic development of the Jordan Rift Valley, including water development and distribution of irrigation.

This relative position with respect to WAJ & JVA reinforces MWI's leading role as Jordan's lead entity on water issues.

Water Authority of Jordan

WAJ was originally established in 1983, pursuant to the Water Authority Law No.34 of 1983 (temporary law), as an autonomous corporate body, with financial and administrative independence. 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,
- 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 the Minister of Water and Irrigation. WAJ carries full responsibility for the public water supply, wastewater services and related projects 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 and are briefly described hereafter:

1. Survey the different water resources, conserve them, determine ways, means and priorities for their implementation and use.
2. Develop potential water resources in the Kingdom, increase their capacity and improve their quality, protect them from pollution, supervise them and administer their affairs and put forth programmes and plans to meet future water needs by providing additional water resources from inside or outside the Kingdom and through the use of water treatment and desalination.
3. Regulate, and advise on, the construction of public and private wells, investigate ground water resources, drill exploratory, reconnaissance, and production wells, and license well-drilling rigs and drillers.
4. Study, design, construct, operate, maintain, and administer water and public sewerage projects including collecting, purifying, treating, disposing and the use of any other methods dealing with water.
5. Draw terms, specifications and special requirements in relation to the preservation of water and water basins, protect them from pollution, and ascertain the safety of water and sewerage structures, public and private distribution and disposal networks, and take the necessary action to ensure technical control and supervision, including all necessary tests.
6. Carry out theoretical and applied research and studies regarding water and public sewerage to achieve the Authority's objectives including the preparation of approved water quality standards for different uses and technical specifications concerning materials and construction in order to apply the findings to the Authority's projects in coordination with other concerned departments, and publish the final findings and standards so as to generalize their application by all means available to the Authority.
7. Issue permits to engineers and licensed professionals to perform public water and sewerage works and participate in organizing special training courses to qualify them in order to improve the standard of such works and to reduce water loss and pollution. All those involved in water and sewerage works are requested to adjust their practice in accordance with the provisions of this Article and to obtain the specified permit accordingly.
8. Regulate the use of water, prevent its waste, and limit its consumption.

Eighteen Directorates under the direction of eight Assistant Secretary Generals (Water Affairs, Sewerage Affairs, Technical Affairs, Regional Affairs [Southern, Middle and Northern Region], Financial Affairs, Administrative Affairs), as well as five units directly subordinate to the Secretary General fulfil the said functions. WAJ Programme Management Unit (PMU) regulates water supply and wastewater utilities under private management

4.4 REGULATORY FRAMEWORK

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 20 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.

5 ANNEXES

5.1 ANNEX A ANALYSIS TOOLS

There are many statistical packages that would be adequate for these analyses. STATA, SPSS, TSP, SAS, LIMDEP, and others are available. STATA is preferred by the client and by the Consultant. However, should extensive programming of complex maximum likelihood estimators be necessary as a result of the data and/or the model structure (AIDS models, for example), Gauss or Gaussx would be the package of choice. For standard statistical analyses, such as data distribution tables, MS Excel will be adequate.

It is clear from the evaluation of existing data, that additional household survey data from the field is necessary. Field data relative to the functioning of the distribution systems will also need to be identified and collected. Where possible, verification of household responses in terms of quantity, prices, and quality of other sources of water should be verified. Where records exist relative to the sale of water from other than public sources to specific households, those data could be collected in order to verify responses to the new Socioeconomic survey. If those records do not exist then random selections of bottled water providers, tankers, and other water supplies should be evaluated for at least the area, if not the "blocks," of households within the new survey to determine average supplies of water to households to the extent possible.

Field teams will need to visit the areas of proposed MCC interventions to more completely determine local attitudes about water service and acceptability of those interventions. It is anticipated that discussion groups will be identified and meetings held to assess current conditions and expectations of local households.

It is anticipated that the public water providers, the JVA, WAJ, and GoJ, will provide adequate records with regard to system reliability and quality, as well as cost data on which the interventions can be evaluated. Data collected would include quantity delivered, prices including the block rates, costs of service, periods of supply interruptions, causes of supply interruptions, water quality issues, water treatment practices, and wastewater treatment.

GIS

Geographical Information Systems (GIS) combine database, spatial analysis and graphics technology to provide a powerful method of summarizing, analyzing and modelling spatial data to support important management decisions. It allows the capture, storage, integration, analysis and output of spatial data, by using location as the common key between the data sets. Eighty percent of data has a spatial content, such as customers' location, water network, water supply facilities, water resources, sensitive social areas and terrain features. Presenting this data on a map or within map viewing software allows visualization and exploration of data relationships.

5.2 ANNEX B DETAILED WORK PLANS

5.3 ANNEX C BIBLIOGRAPHY

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5.4 ANNEX D LIST OF PARTICIPANTS AT KICK OFF MEETING

Attendees:

From MCA-J:

Dr. Khaled Al-Hmoud
Dr. Barry Deren
Mr. Paul Pleva

From ECO Consult:

Mr. Ra'ed Daoud
Dr. Lo'ay Frookh
Ms. Tamam Mango
Mr. Tamer Assa'd
Ms. Razan Quossous
Mr. Farah Nushaiwat
Ms. Maysam Rawashdeh

5.5 ANNEX E OUTLINE FOR DIAGNOSTIC REPORT

1. Executive summary
2. Introduction
    2.1. Layout of the report
3. Project background and scope of work
    3.1. Background
    3.2. Overview of recent sector developments
    3.3. Study area
    3.4. Study objectives
    3.5. Study tasks
4. Assessment of drinking water allocation
    4.1. Historical water supply and consumption
    4.2. UFW
    4.3. Global assessment at governorates' level
    4.4. Factors influencing water allocation decision
    4.5. Findings and conclusions
5. Priority investment zones
    5.1. Categorization criteria
    5.2. GIS maps
    5.3. Results of zones categorization
    5.4. Priority zones
6. Statistical Analyses and Results
    6.1. Data sources and sets
    6.2. Data lacks and/or limitations
    6.3. Models of consumption
    6.4. Models analysis and interpretation of results
    6.5. Benefits arising from MCC investments
    6.6. Findings and recommendations

7. Assessment of interventions

    7.1. Evaluation criteria

    7.2. Potential interventions and their feasibility

    7.3. Cost-effectiveness assessment

    7.4. Recommended intervention

    7.5. Rationales for recommendation

    7.6. Further data and analyses needed

8. Monitoring plan

    8.1. Revision of monitoring framework

    8.2. Recommendations for indicators

5.6 ANNEX F OUTLINE FOR PROJECT PREPARATION REPORT

Project Preparation Report for Intervention

Household Infrastructure and Knowledge Improvement

1. Introduction
    1.1 MCC Program
    1.1 Project Background
2. Intervention description and Rationale
    2.1 Rationale
    2.2 Purpose and Focus of the Intervention
    2.3 Description of Target Areas
3. Situational Analysis
    3.1 Water supply and implications on the poor
    3.2 water utility in Zarqa
    3.3 Micro and Macro Environment Factors
    3.4 Jordan water strategy and overall water policies
    3.5 Pro-poor related water policies
4. Logical Framework Design
    4.1 Activities
    4.2 Outputs
    4.3 Monitoring actions

5. Budget for Implementation
    5.1 resources and staffing
    5.2 revolving fund
    5.3 Office support
    5.4 Other costs
    5.5 Overall Budget

6. Ongoing Similar Programs
    6.1 Programs description
    6.2 Lessons learned
    6.3 Areas of Cooperation
    6.4 Potential Joint activities

7. Implementation arrangements

    7.1 Scenarios for implementation

    7.2 Recommended implementation mechanism

    7.3 Organization Plan

    7.4 Implementation timeline

8. Program Benefits

    8.1 description of beneficiaries

    8.2 Cost Effectiveness Validation

    8.3 Assumptions and the underlying parameters

9. Sustainability Considerations