The Hashemite Kingdom of Jordan
Ministry of Water and Irrigation

Millennium Challenge Corporation

PREPARATION OF THE FEASIBILITY STUDY AND ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR ZARQA GOVERNORATE WATER SYSTEM RESTRUCTURING AND REHABILITATION

FEASIBILITY STUDY

May 2010

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AMMAN CONSULTING
Engineering and Planning Office

THE HASHEMITE KINGDOM OF JORDAN
MINISTRY OF WATER AND IRRIGATION

WATER AUTHORITY OF JORDAN

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FEASIBILITY STUDY

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May 2010

PROJECT NO. 20445					
Revision	**Reason for Revision**	**Prepared by**	**Reviewed by**	**Approved by**	**Issue Date**
-	First Issue - Draft	T. Cuddy	M. McArdle	J. Cronin	04/03/10
A	Issue for Approval	T. Cuddy	M. McArdle	J. Cronin	20/05/10

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1. INTRODUCTION

1.1 On 13th October 2009, Nicholas O'Dwyer Ltd and ACEPO were appointed by the Ministry of Water and Irrigation to proceed with the Consultancy Services for the Preparation of the Feasibility Study and Environmental and Social Impact Assessment for Zarqa Governorate Water System Restructuring and Rehabilitation. A copy of the Notice to Proceed is contained in Appendix 1.

1.2 The Terms of Reference for the project provide for the preparation of three linked reports on the restructuring and rehabilitation of the water supply system in the Zarqa Governorate. These are :

1. **Investment Master Plan**
2. **Priority Investment Programme**
3. **Feasibility Study – <u>this document</u>**

In the preparation of this report – the **Feasibility Study** – a detailed examination of economic benefits of the proposed Restructuring and Rehabilitation project was undertaken. These benefits were then assessed against the schemes costs in order to derive an Economic Rate of Return for the overall project and for the prioritised projects on an individual basis in accordance with the MCC Guidelines for Economic and Beneficiary Analysis. The Investment Master Plan is submitted as a separate document.

The **Priority Investment Programme** which is compiled as a separate document contains details of the selection criteria for project prioritisation and set outs a list of the prioritised projects.

1.3 This report contains a total of 6 sections. Section 2 provides details of project costs which were determined as part of the Investment Master Plan and the Priority Investment Programme. Section 3 contains the detailed Economic Analysis. The review of the Beneficiary Analysis is contained in Section 4 and Section 5 contains the Economic Rate of Return Assessment (ERR). Section 6 contains our Conclusion Statements and Recommendations.

2. PROJECT COSTS

2.1 Capital Costs

The cost estimates for the projects set out in the Investment Master Plan (IMP) Schedules of Works in Section 8 of the IMP document are set out in Table 2.1 overleaf. The cost estimates associated with the specific projects identified in the Priority Investment Programme (PIP) are also summarised in Table 2.1 as the Phase 1 (MCC) projects.

2.2 Operating and Maintenance Costs

At the present time, as noted in Section 2.7 of the IMP document, the revenue obtained by Zarqa Water Affairs is unable to cover its operational costs. In the year 2007, there was a deficit of JD 3.75m or a recovery ratio of only 74%. In relation to water supply, a loss of JD 1.06m was recorded. The major areas of expenditure were water import and energy costs.

The proposed restructuring and rehabilitation project will significantly reduce the excessive quantity of unaccounted for and non-revenue water in the existing system, leading to significant reductions in the costs of water importation and pumping energy. Accordingly, for the purposes of the economic study we have assumed that, in the future, the Zarqa Governorate will be in a position to fully recover its operational costs through its revenue collection systems.

2.3 Beneficiaries and Unit Costs

The current populations of the areas which will benefit from the IMP and PIP projects are set out in Table 2.2 overleaf, together with the unit cost per beneficiary of the project investment.

	Strategic Infra.	Water Supply Area (WSA)									Total Cost
		Azraq	Dulail	King Abdullah City	Tatweer	Zarqa	Awajan	Russaifah	North	West-NW	
Phase 1 (MCC)											
Primary Network	1,984,000	-	-	-	1,664,031	3,616,787	8,182,192	1,614,147	-	-	**17,061,156**
Secondary Network	-	-	-	-	1,412,292	7,152,275	8,026,195	5,197,827	-	-	**21,788,589**
Tertiary Network	-	-	-	-	1,038,827	16,268,506	12,983,065	6,340,053	-	-	**36,630,451**
Sum	**1,984,000**	**-**	**-**	**-**	**4,115,150**	**27,037,567**	**29,191,452**	**13,152,026**	**-**	**-**	**75,480,195**
Phase 1 (TBD)											
Primary Network	5,120,729	-	86,800	-	-	813,676	-	3,766,342	-	-	**9,787,546**
Secondary Network	-	-	2,326,919	-	-	-	-	12,128,262	7,843,329	5,085,722	**27,384,232**
Tertiary Network	-	125,121	5,481,260	-	-	-	-	14,793,456	4,161,569	4,442,093	**29,003,500**
Sum	**5,120,729**	**125,121**	**7,894,980**	**-**	**-**	**813,676**	**-**	**30,688,060**	**12,004,898**	**9,527,815**	**66,175,279**
Phase 2.											
Primary Network	29,811,513	876,516	6,862,552	3,145,012	-	5,319,600	8,622,030	11,926,148	3,028,248	4,427,274	**74,018,893**
Secondary Network	-	-	-	-	80,476	-	-	-	-	-	**80,476**
Tertiary Network	-	-	-	-	-	-	-	-	-	-	**-**
Sum	**29,811,513**	**876,516**	**6,862,552**	**3,145,012**	**80,476**	**5,319,600**	**8,622,030**	**11,926,148**	**3,028,248**	**4,427,274**	**74,099,369**
Phase 3.											
Primary Network	32,725,932	-	334,476	-	-	740,652	-	-	1,337,972	1,844,364	**36,983,397**
Secondary Network	-	-	-	-	-	-	-	-	-	-	**-**
Tertiary Network	-	-	-	-	-	-	-	-	-	-	**-**
Sum	**32,725,932**	**-**	**334,476**	**-**	**-**	**740,652**	**-**	**-**	**1,337,972**	**1,844,364**	**36,983,397**
Total											
Primary Network	69,642,174	876,516	7,283,829	3,145,012	1,664,031	10,490,714	16,804,222	17,306,636	4,366,220	6,271,638	**137,850,992**
Secondary Network	-	-	2,326,919	-	1,492,768	7,152,275	8,026,195	17,326,089	7,843,329	5,085,722	**49,253,297**
Tertiary Network	-	125,121	5,481,260	-	1,038,827	16,268,506	12,983,065	21,133,509	4,161,569	4,442,093	**65,633,951**
Sum	**69,642,174**	**1,001,637**	**15,092,008**	**3,145,012**	**4,195,626**	**33,911,495**	**37,813,482**	**55,766,234**	**16,371,118**	**15,799,454**	**252,738,240**

Phase 1 Works: Required for immediate upgrading of network. Will have immediate benefit, and will have structure and capacity for 2030 demand levels

Phase 2 Works: Required for improvement of network, Will be necessary for secure long term operation of the system with structure and capacity to 2030 demand levels even without additional inflows of water to the system.

Phase 3 Works: Additional works required to meet 2030 demands, as demand and flows grow with increasing population.

Table 2-1 - Summary IMP Cost Estimate

Population 2008 and 2030

	Strategic Infrastructure	Water Supply Area (WSA)									Total
		Azraq	Dulail	King Abdullah City	Tatweer	Zarqa	Awajan	Russaifah	North	West-NW	
Population with Water Supply 2008		**7,396**	**37,790**	**-**	**8,501**	**283,526**	**149,171**	**303,448**	**51,629**	**12,864**	**854,325**
Projected Population with Water Supply 2030		**10,154**	**55,329**	**436,008**	**16,888**	**399,586**	**225,680**	**450,472**	**76,008**	**19,874**	**1,690,000**
Full Investment Master Plan (IMP) Projects											
Beneficiaries 2008	854,325	7,396	37,790	-	8,501	283,526	149,171	303,448	51,629	12,864	854,325
Unit cost per Beneficiary	82	135	399	-	494	120	253	184	317	1,228	296
Priority Investment Programme (PIP) Projects											
Beneficiaries 2008	854,325	-	-	-	8,501	226,821	149,171	91,034	-	-	475,527
Unit cost per Beneficiary	2	-	-	-	484	119	196	144	-	-	159

Table 2-2 – Beneficiary Populations of IMP and PIP project areas

3. ECONOMIC ASSESSMENT

3.1 An economic model has been constructed in order to assess the costs and benefits of the proposed IMP and PIP projects. The structure of the model, including the determination of parameters and methods of calculation, has been developed in consultation with MCC economic advisors. The input data for the model has been obtained from the population, water demand, engineering and cost estimate analyses set out in the IMP, the prioritisation analysis set out in the PIP, the socio-economic and beneficiaries analysis set out in the MCA Beneficiaries Study (Ecoconsult April 2010), and the WAJ data records in relation to customer water use, water tariffs, billing revenue and expenditure.

3.2 To assess the economic rate of return (ERR) a cost benefit analysis (CBA) model has been developed on an excel spreadsheet. Two versions of the model have been prepared, one for the overall IMP projects, and one for the PIP, MCC priority projects. The model has 6 worksheets (Appendix 2).

3.3 In the "Soceon" worksheet, the socio-economic analysis is conducted using Household Expenditure and Income Survey (HEIS) (2006 and 2008) data. By using the purchasing power parity (PPP) exchange rate to convert dollars to JD and based on the HEIS data, it is estimated that in the Zarqa Governorate 5.60% of households (HHs) earn less than $2 per day, 29.65% earn $2-4 per day, and 64.76% earn > $4 per day.

3.4 In the "wcon" worksheet, the current consumption patterns in terms of the following three types of water – network, tanker and shop water- are analysed (step 2) as a basis to develop a baseline model of water consumption and expenditure (step 3). This leads to the creation of 20 tables (without project) and 20 tables (with project) to assess water supply and consumption patterns in years 1-20 (2010-2029) of the project. This worksheet is central and electronically feeds into the worksheets "hsehold", "heli", and "prod", which in turn feeds into worksheet "CBA" which contains a summary of the cost benefit analysis.

3.5 Central to the model are the input variables. They relate to consumption patterns of the three different types of water (network, tanker and shop), average size of HH, price of different types of water, the size of the target population, annual growth rate, size of unaccounted for water (UFW) with and without the project , and the reduction in the consumption of shop water with project as a percentage.

It is assumed that consumers will switch away from tanker water if their needs are sufficiently satisfied with the additional network water generated by the reduction of UFW. The switching from shop water to the additional network water depends very much on the quality of the additional network water as shop water is usually devoted to drinking and cooking, and hence quality if a factor.

The forty tables of the "wcon" worksheet depend on the values of the above input variables. The tables monitor:

- <i> changes in water consumption patterns with and without the project for year 2010-2029;
- <ii> changes in population size,
- <iii> changes in the demand for water; and
- <iv> the extent to which WAJ will have to purchase additional water (see box "deficit") in order to main HHs at current levels of consumption in the "without project" scenario. In the "with project" context the figures in box "deficit" have a negative sign indicating consumption levels above current consumption level, in other words it is a measure of the quantity of the additional water.

3.6 In the worksheet "hsehold", the total quantities of water (network, tanker and shop) are shown without and with project and over years 2010-2029. In addition the worksheet estimates the savings HHs gain from switching from tanker and shop water when faced when increased supply of network water over the twenty years of the life of the proposed project.

To proceed with the beneficiary analysis, it is necessary to reach an agreement on the quantities of water consumed across the three socio-economic categories and the three different water types.

3.7 Worksheet "heli" analyses the unequal distribution of network water and water expenditure patterns. Worksheet "heli" also analyses the gains in health if those domestic consumers now consuming less than 50 lcd of network water are given access to 60 lcd of network water. The analysis depends on the Health and Environment Linkages Initiative (HELI): Jordan Pilot of June 2005. The "with project" scenario is analysed where water is more evenly distributed between group 1 (consumers formerly consuming less than 50 lcd) and group 2 (consumers formerly consuming more than 50lcd) as there are gains in a more equal distribution across HHs.

3.8 In worksheet "prod" the unit costs of network water production are estimated in both the "without project" scenario (rows) and "with project" as well as the opportunity cost to WAJ if there is no investment. WAJ will be faced with supplying increased demand due to population increase if current consumption patterns of water are to be maintained; and WAJ would forego the benefit of additional supplies above the increased demand generated by population growth at current consumption levels.

4. SOCIO ECONOMIC ASSESSMENT AND BENEFICIARY ANALYSIS

4.1 The analysis of the socio-economic breakdown is conducted in worksheet "socecon"; and the figures have been given above. Conservative assumptions are made about the water consumption apportionment across the three different water types and across the three socio-economic categories.

5. ECONOMIC RATE OF RETURN (ERR)

5.1 The CBA model for the projects set out in the IMP generates an ERR of 20% if no allowance is made for WAJ investment costs which are likely to occur in any event to maintain the existing infrastructure in its current condition, and 26% if allowance is made for these costs. A sensitivity analysis is included in the model, which indicates that the ERR could be as low as 15% if no allowance is made for costs which are likely to occur in any event and if costs increase by 10% and benefits decrease by 10%.

5.2 The CBA model for the MCC priority projects set out in the PIP generates a higher ERR than for the full set of IMP projects. The ERR is 22% if no allowance is made for WAJ investment costs which are likely to occur in any event to maintain the existing infrastructure in its current condition, and 29% if allowance is made for these costs.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The CBA model for the Investment Master Plan generates an ERR of 20% - 26%, depending on whether allowance is made for WAJ investment costs which are likely to occur in any event to maintain the existing infrastructure in its current condition.

6.2 The CBA model for the MCC priority projects set out in the PIP generates a higher ERR of 22% - 29%.

APPENDIX 1 – NOTICE TO PROCEED

MINISTRY OF WATER AND IRRIGATION
Water Authority

Ref.: 7/2/12639
Date: 12/10/2009

Nicholas O'Dwyer Consulting Engineers Ltd.
And Amman Consulting Engineering and
Planning Office

Project :Consultancy Services for preparation of the feasibility study and environmental and social impact assessment for Zarqa Governorate Water System Restructuring and rehabilitation .
Subject : Central Tender No. 67/2009 "Notice to Proceed . "

Dear Mr. Richard Crowe ,

Reference to the awarding decision, please be informed that the notice to proceed for contract No. 67/2009 will be 13th.October 2009 .

Minister of Water and Irrigation /WAJ

Eng. Raed Abu Soud

Cc : MCA / Jordan
Cc : Secretary General / WAJ
Cc : Project Manager for P1-B
Cc : File No. (13/1)

h.h/notice to proceed/1

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APPENDIX 2 – ECONOMIC ANALYSIS

Zarqa Water Supply Feasibility Study. Full List of IMP Projects. Work-sheet "Socecon"

Step 1
Step 1 ascertains the percentage of households that belong to the key socio-economic groupings of the TOR, namely, <$ 2, $2 - $4, and >$4.
PPP exchange rates for the USA $1 (2005) are used (see the Global Purchasing Power Parities and Real Expenditure: 2005 International Comparison Program, IBRD World Bank 2008)

Income per capita per day ($)	**Income per capita per day (JOD)**		**Annual income per capita (JOD)**	**Mean nr per household**	**Annual income per household (JOD)**	**Monthly income per household (JOD)**
2	0.7600	365	277	6	1,664	139
4	1.5200	365	555	6	3,329	277

PPP exchange rate		1
US$ 1= .38 JOD	0.38	

		Zarqa Governorate……		Zarqa sub-district……..		Ruseifa sub-district……		Berein sub-district……..		Hashameer sub-district		Dhilail sub-district……		Ashraq sub-district……	
Income per capita per day ($)	**Annual income per household (JOD)**	% of households	% of households (cumulative)	% of households	% of households (cumulative)	% of households	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)
< 2	<1664	6.2%	6.2%	5.1%	5.1%	7.9%	7.9%	3.8%	3.8%	4.1%	4.1%	8.0%	8.0%	14.7%	14.7%
Between 2-4	Between 1664-3329	32.3%	38.5%	27.0%	32.1%	40.6%	48.5%	37.2%	41.0%	22.4%	26.5%	39.3%	47.3%	38.0%	52.7%
> 4	>3329	61.5%	100.0%	67.9%	100.0%	51.5%	100.0%	59.0%	100.0%	73.5%	100.0%	52.7%	100.0%	47.3%	100.0%
		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%	

Income Groups 2006 (JOD per annum)			Zarqa Governorate ……			Zarqa sub-district……..			Ruseifa sub-district……			Berein sub-district……..			Hashameer sub-district…….			Dhilail sub-district……			Ashraq sub-district……..		
			Nr households	% of households	% of households (cumulative)	Nr households	% of households	% of households (cumulative)	Nr households	% of households	% of households (cumulative)	Nr household	% of households	% of households (cumulative)	Nr household	% of households	% of households (cumulative)	Nr household	% of households	% of households (cumulative)	Nr household	% of households	% of households (cumulative)
Low income group	<	1,800	9,786	6.7%	6.7%	4,208	5.5%	5.5%	4,492	8.5%	8.5%	88	4.1%	4.1%	382	4.4%	4.4%	382	8.6%	8.6%	235	15.9%	15.9%
64.4%	1,800	2,400	14,742	10.1%	16.8%	5,749	7.5%	12.9%	7,563	14.3%	22.8%	280	13.0%	17.1%	545	6.3%	10.7%	383	8.6%	17.3%	236	15.9%	31.8%
	2,400	3,000	21,634	14.8%	31.5%	9,281	12.1%	25.0%	9,865	18.7%	41.5%	281	13.0%	30.1%	1168	13.5%	24.3%	822	18.5%	35.8%	238	16.1%	47.9%
	3,000	3,600	18,549	12.7%	44.2%	9,942	12.9%	37.9%	6,770	12.8%	54.3%	427	19.8%	49.9%	352	4.1%	28.3%	927	20.9%	56.7%	130	8.8%	56.7%
	3,600	4,200	16,389	11.2%	55.4%	8,276	10.8%	48.7%	6,572	12.4%	66.7%	426	19.8%	69.7%	541	6.3%	34.6%	475	10.7%	67.4%	98	6.6%	63.3%
	4,200	4,800	13,228	9.0%	64.4%	7,566	9.8%	58.5%	3,863	7.3%	74.0%	238	11.0%	80.7%	1177	13.6%	48.2%	278	6.3%	73.7%	93	6.3%	69.6%
Midde income group	4,800	5,400	11,578	7.9%	72.3%	6,900	9.0%	67.5%	3,265	6.2%	80.2%	139	6.5%	87.2%	741	8.6%	56.8%	463	10.4%	84.1%	58	3.9%	73.5%
28.4%	5,400	6,000	7,386	5.0%	77.4%	4,306	5.6%	73.1%	2,083	3.9%	84.2%	44	2.0%	89.2%	569	6.6%	63.4%	288	6.5%	90.6%	96	6.5%	80.0%
	6,000	7,000	11,141	7.6%	85.0%	6,272	8.2%	81.3%	3,220	6.1%	90.3%	0	0.0%	89.2%	1315	15.2%	78.6%	201	4.5%	95.2%	134	9.1%	89.1%
	7,000	8,000	6,365	4.3%	89.3%	4,265	5.5%	86.8%	1,674	3.2%	93.4%	45	2.1%	91.3%	178	2.1%	80.7%	108	2.4%	97.6%	95	6.4%	95.5%
	8,000	9,000	5,140	3.5%	92.8%	3,691	4.8%	91.6%	771	1.5%	94.9%	46	2.1%	93.5%	565	6.5%	87.2%	0	0.0%	97.6%	67	4.5%	100.0%
High income group	9,000	10,000	3,025	2.1%	94.9%	1,755	2.3%	93.9%	1,116	2.1%	97.0%	51	2.4%	95.8%	0	0.0%	87.2%	106	2.4%	100.0%	0	0.0%	100.0%
7.2%	10,000	12,000	3,007	2.1%	97.0%	1,431	1.9%	95.8%	965	1.8%	98.8%	45	2.1%	97.9%	565	6.5%	93.7%	0	0.0%	100.0%	0	0.0%	100.0%
	12,000	14,000	2,093	1.4%	98.4%	1,614	2.1%	97.9%	299	0.6%	99.4%	0	0.0%	97.9%	180	2.1%	95.8%	0	0.0%	100.0%	0	0.0%	100.0%
	>14000		2,369	1.6%	100.0%	1,642	2.1%	100.0%	322	0.6%	100.0%	45	2.1%	100.0%	360	4.2%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%
			146,432	100.0%		76,898			52,840			2,155			8,638			4,433			1,480		

Source: HEIS 2006, Department of Statistics

Adjustments at the income boundaries			Zarqa Governorate…….		Zarqa sub-district……..		Ruseifa sub-district……		Berein sub-district……..		Hashameer sub-district…….		Dhilail sub-district……..		Ashraq sub-district……..	
			Nr households	% of households	Nr households	% of households	Nr households	% of households	Nr household	% of households	Nr household	% of households	Nr household	% of households	Nr household	% of households
	<	1,800	9,786	6.7%	4,208	5.5%	4,492	8.5%	88	4.1%	382	4.4%	382	8.6%	235	15.9%
	<	1,664	9,049	6.2%	3,891	5.1%	4,154	7.9%	81	3.8%	353	4.1%	353	8.0%	217	14.7%
	1,664	1,800	737	0.5%	317	0.4%	338	0.6%	7	0.3%	29	0.3%	29	0.6%	18	1.2%
	3,000	3,600	18,549	12.7%	9,942	12.9%	6,770	12.8%	427	19.8%	352	4.1%	927	20.9%	130	8.8%
	3,000	3,329	10,165	6.9%	5,448	7.1%	3,710	7.0%	234	10.9%	193	2.2%	508	11.5%	71	4.8%
	3,329	3,600	8,384	5.7%	4,494	5.8%	3,060	5.8%	193	9.0%	159	1.8%	419	9.5%	59	4.0%

Analysis of socio-economic breakdown of population of MCC priority areas

WSA	Population connected (NOD/ACEPO)	Population (host)	Zarqa sub-district (host) population	Zarqa sub-district <$2	Zarqa sub-district between $2-$4	Zarqa sub-district >$4	Russaifah (host population)	Russaifah <$2	Russaifah between $2-$4	Russaifah >$4	Host Population of MCC priority areas <$2	$2-$4	>$4	
Tatweer	8,501	8,673	8,673	439	2,345	5,889								
Zarqa	226,821	231,407	231,407	11,709	62,579	157,120								
Awajan	149,171	152,187	152,187	7,701	41,155	103,331								
Russaifah	91,034	92,875					92,875	7,301	37,748	47,826				
Total	475,527	485,142	392,268	19,849	106,079	266,340	92,875	7,301	37,748	47,826	27,149	143,828	314,166	in real numbers
											5.60%	29.65%	64.76%	percentage terms
Connection rate	98.02%													

Zarqa Water Supply Feasibility Study. Full List of IMP Projects. Work-sheet "Wcon"

Step 2 is to assess the structure of water distribution across the three socio-economic groups outlined in the TOR

From the analysis conducted in step 1 it is shown that the percentage of the Zarqa population in each socio-economic group is as follows:

<$2	**6.2%**
$2-$4	**32.3%**
>$4	**61.5%**

(for details of the analysis see worksheet "Socecon")

Proportionate shares across socio-economic categores (assumptions)

	<$2	$2 - $4	>$4
Shop water shares	1	1.5	3
Tanker water	1	1	2

Percentage water shares across water type and socio-economic category

	network water (percentage)	tanker water (share)	tanker water (percentage)	shop water (share)	shop water (percentage)
<$2	6.2%	2	3.8%	1	2.6%
$2-$4	32.3%	8	20.0%	9	20.2%
>$4	**61.5%**	31	76.2%	34	77.2%
	100%		100%		100%

These figures represent the distribution of network water across the three main socio-economic groupings based on the 2008 billing data. The ECO Consult draft report indicates that there is no relationship between income and the quanitity of network water received. However, the distribution of shop and tanker water across socio-economic categories remains unknown. In the absence of data assumptions are made; and these assumptions apply only to the beneficiary analysis

Values of key independent (or input) variables are outlined here, appropriately referenced:

Average annual tanker water consumption per household (m3/hse/a)	13.535	(ECO Consult 2010:calculated from raw data and adjusted to HH size)
		This is an under-estimate as ECO Consult figures are based on one quarter.
Average annual shop water consumption per household (m3/hse/a)	1.521	(GFA Aug 2008 raw data analysed)
Price of shop water (JOD/m3)	52.826	NOD/ACEPO engineers
Price of tanker water (JOD/m3) (conservative)	4	(GFA Aug 2008:107)
Average size of household (HH)	7.083	Based on DOS Zarqa population 2008, 98.02% connection rate.

N.B. HH size in demographic data refers to person sharing the same roof. Here in the context of the water sector, HH refers to multiple HHs that share the same water meter.

	lcd	m³/HH / annum
The model below (table 1:last row) shows average consumption of all types of water is	62	161
The model also shows (table 1:first row) average consumption of network water only is	56	146

The findings are only shown here but the analysis is conducted on the excel file of the 2008 billing data and based on the certain assumptions which were necessary as the 2008 billing data (in contrast to the 2006 billing data) does not distinguish between domestic and non-domestic consumers. Hence, in order to distinguish between domestic and non-dometic consumption the following assumptions were used:

<i> the quantities of water consumed by domestic HHs and non-domestic units are based on the 2006 billing data as 85% and 15% respectively;

<ii> units that did not consume any water in 2008 are excluded from the analysis. Some of them were only registered in 2009.

<iii> units that consume quantities >265 lcd are assumed to be non-domestic.

The relevant conclusions of the analysis is outline in Table 1 below under network water in terms of HHs and quantities of water consumed.

The breakdown of domestic consumers in terms of eleven consumption bands is shown in worksheet "Heli". More specifically 51.44% of HHs consume less than 50 lcd which is a figure close to the findings of the EC Consult survey of 49.5%.

Soc econ cat (HEIS 06)	**Annual water consumption (total) (m3)**	**Annual water consumption per HH (average) (m3)**	**lcd**	**Nr HH**	**Water revenue (total) (JOD)**	**Water expenditure per HH (JOD)**	**Price/ m3 /socio-econ cat (JOD)**

Table 1: Supplies of water to households in Zarqa Governorate: network, shop and tanker water (based on 2008 billing data)																					
	Network water																				
Total	**17,600,328**	**146**	**56**	**120,611**	**3,874,082**	**32**	0.22														
<$2	**0**	**0**	**0**	**0**	0	**0**	0.00														
$2-$4	**0**	**0**	**0**	**0**	0	**0**	0.00														
>$4	**0**	**0**	**0**	**0**	0	**0**	0.00														
	Shop water																				
Total	183,471	2	1	120,611	9,692,035	80	53														
<$2																					
$2-$4																					
>$4																					
	Tanker water																				
Total	1,632,498	14	5	120,611	2,483,321	21	1.5														
<$2																					
$2-$4																					
>$4																					
	Shop & tanker water																				
Total	1,815,969	15	6	120,611	12,175,356	101															
<$2																					
$2-$4																					
>$4																					
	Network, shop & tanker water																				
Total	19,416,297	161	62	120,611	16,049,438	133															
<$2																					
$2-$4																					
>$4																					

Step 3																
A baseline (2010) model of water consumption based on table 1 above is generated. The 2010 population that is connected to the WAJ network is:																
911,673	This figure refers to HHs with consumption <265 lcd, as the analysis assumes no HHs consume >265 lcd.						For details see									
see worksheet "Heli" section (a). The 2010 population including those not connected is:					929,162	(for details see "Heli" section (d))										
Table 2 Supplies of water to targeted households: network, bottled and tanker water (without project)							BASELINE									
network	**target pop**	**current pop**	**hse incr**	**incr water**	**current water demand**		2010									
18,782,594	**911,673**	**911,673**	**0**	**0**	20,720,547	0										
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3									
Total	18,782,594	146	56	128,713	4,134,316	32	0.22									
<$2	1,160,673	0	0	7,954	0	0	0.00									
$2-$4	6,064,280	0	0	41,557	0	0	0.00									
>$4	11,557,641	0	0	79,202	0	0	0.00									
	Shop water															
Total	195,795	2	1	128,713	10,343,078	80.35780185	53									
<$2																
$2-$4																
>$4																
	Tanker water															
Total	1,742,158	14	5	128,713	6,968,630	54	4.0									
<$2																
$2-$4																
>$4																
	Network, shop & tanker water															
Total	20,720,547	161	62	128,713	21,446,023	167										
<$2																
$2-$4																
>$4																

Step 4																		
Step 4 consists in assessing annual models of water consumption over the 20 years of the life of the project (2010-2029) taking into																		
account population growth and "without project" and "with project" scenarios.																		
The following additional assumptions are made:																		
Population and connectivity parameters																		
Annual population growth rate:				3.25%		Generated by the CBA model												
Population (2008)				871,600		Source: Department of Statistics												
Population (2029)				1,705,876		Source: NOD/ ACEPO engineers												
Baseline data (2010)				929,162		Generated by the CBA model												
Percentage of population connected (2008)				98.02%		Source: NOD/ ACEPO engineers												
Percentage of population connected (2029)				99.07%		Source: NOD/ ACEPO engineers												
Average annual increase in population connected				0.05%		Generated by the CBA model												
Percentage of population connected (2010)				98.12%		Generated by the CBA model												
UFW parameters																		
UFW physical as % of total system input, without project (2008)				63.60%	70hrs/wk	Source: NOD/ ACEPO engineers												
UFW physical as % of total system input, without project (2010)				63.9%	70hrs/wk	Generated by the CBA model												
UFW physical as % of total system input,without project (2029)				66.4%	70hrs/wk	Source: NOD/ ACEPO engineers												
Average annual % change to UFW physical without project (2010-2029)				0.2%	70hrs/wk	Generated by the CBA model												
UFW administrative as % of total system input, without project (2008)				5.2%	70hrs/wk	Source: NOD/ ACEPO engineers												
UFW administrative as % of total system input, without project (2010)				5.2%	70hrs/wk	Generated by the CBA model												
UFW administrative as % of total system input, without project (2029)				5.0%	70hrs/wk	Source: NOD/ ACEPO engineers												
Average annual % change to UFW administrative without project (2010 -				-0.2%	70hrs/wk	Generated by the CBA model												
UFW physical as % of total system input, with project (2008)				13.8%	70hrs/wk	Source: NOD/ ACEPO engineers	The 2008 & 2010 UFW figures with project											
UFW physical as % of total system input, with project (2010)				13.7%	70hrs/wk	Generated by the CBA model	are hypothetical for the sake of the											
UFW physical as % of total system input,with project (2029)				12.4%	70hrs/wk	Source: NOD/ ACEPO engineers	engineering calculations. In reality UFW											
Average annual % change to UFW physical with project (2010-2030)				-0.5%	70hrs/wk	Generated by the CBA model	with project is only realised in year 3 of the											
UFW administrative as % of total system input, with project (2008)				6.7%	70hrs/wk	Source: NOD/ ACEPO engineers	life of the project.											
UFW administrative as % of total system input, with project (2010)				6.7%	70hrs/wk	Generated by the CBA model												
UFW administrative as % of total system input, with project (2029)				6.9%	70hrs/wk	Source: NOD/ ACEPO engineers												
Average annual % change to UFW administrative with project				0.1%	70hrs/wk	Generated by the CBA model												
Percentage of HHs affected adversely by UFW administrative				89.0%		Source: NOD/ ACEPO engineers												
Consumption of shop water is reduced "with project" by 50%				50%	(Conjecture that can be modified with evidence)													
Currently, this is conjecture. But it is not foreseen that all HHs particulary the richer ones will not totally give up the use of shop water as it is																		
used for drinking and cooking. However, the quality of the additional network water would be significant in this decision.																		
On the other hand, tanker water will be easily subsituted for additional network water on a one to one basis when available, as it is mainly relied upon																		
when network water is not available and usually not for drinking and cooking (unless treated) but for more general domestic uses. This has been borne																		
out by the ECO Consult draft report.																		
The model assumes that benefits of the proposed project only are realised in year 3 of the life of the project. Up till then the network operates in																		
accordance with UFW figures "without project" as outlined above.																		

Table 3: Supplies of water to targeted households: network, shop and tanker water							**2010**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**1**
18,782,594	0	**929,162**	**911,673**	**20,720,547**	0		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,782,594	146	56	128,713	4,134,316	32	0.22
<$2	1,160,673	146	56	7,954	0	0	0.00
$2-$4	6,064,280	146	56	41,557	0	0	0.00
>$4	11,557,641	146	56	79,202	0	0	0.00
	Shop water						
Total	195,795	2	1	128,713	10,343,078	80	53
<$2	5,058						
$2-$4	39,640						
>$4	151,097						
	Tanker water						
Total	1,742,158	14	5	128,713	6,968,630	54	4
<$2	66,647						
$2-$4	348,215						
>$4	1,327,296						
	Network, shop & tanker water						
Total	20,720,547	161	62	128,713	21,446,023	167	
<$2							
$2-$4							
>$4							

Given the variety of variables it was thought necessary to devote separate "without project" and "with project" tables for each of the 20 years of the life of the project. However, the 40 tables feed off variables that are identified at the top of the worksheet, such as the size of population, population growth years, quanities of water used, water prices etc. These can be changed at the top of the worksheet, and the changes will be fed electronically and automatically to all the 40 tables for those who wish to explore different scenarii, and onward to the summary CBA worksheet where the ERR is decided.

The data generated by these 40 tables is fed into the more traditional worksheets "hsehold", "prod" and "CBA".

Supplies of water to targeted households: network, shop and tanker water							**2010**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**1**
18,782,594	0	**929,162**	**911,673**	**20,720,547**	0		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,782,594	146	56	128,713	4,134,316	32	0.22
<$2	1,160,673	146	56	7,954	0	0	0.00
$2-$4	6,064,280	146	56	41,557	0	0	0.00
>$4	11,557,641	146	56	79,202	0	0	0.00
	Shop water						
Total	195,795	2	1	128,713	10,343,078	80	53
<$2	5,058						
$2-$4	39,640						
>$4	151,097						
	Tanker water						
Total	1,742,158	14	5	128,713	6,968,630	54	4
<$2	66,647						
$2-$4	348,215						
>$4	1,327,296						
	Network, shop & tanker water						
Total	20,720,547	161	62	128,713	21,446,023	167	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2011**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**2**
18,709,586	693,174	**929,162**	**941,774**	**21,404,700**	1		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	18,709,586	141	54	132,963	4,118,245	31	0.22
<$2	1,156,162	141	54	8,216	0	0	0.00
$2-$4	6,040,708	141	54	42,929	0	0	0.00
>$4	11,512,716	141	54	81,817	0	0	0.00
	Shop water						
Total	202,260	2	1	132,963	10,684,586	80	53
<$2	5,225						
$2-$4	40,949						
>$4	156,086						
	Tanker water						
Total	1,799,680	14	5	132,963	7,198,721	54	4
<$2	68,847						
$2-$4	359,713						
>$4	1,371,120						
	Network, shop & tanker water						
Total	21,404,700	161	62	132,963	22,001,553	165	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2011**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**2**
18,709,586	693,174	**929,162**	**941,774**	**21,404,700**	1		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	18,709,586	141	54	132,963	4,118,245	31	0.22
<$2	1,156,162	141	54	8,216	0	0	0.00
$2-$4	6,040,708	141	54	42,929	0	0	0.00
>$4	11,512,716	141	54	81,817	0	0	0.00
	Shop water						
Total	202,260	2	1	132,963	10,684,586	80	53
<$2	5,225						
$2-$4	40,949						
>$4	156,086						
	Tanker water						
Total	1,799,680	14	5	132,963	7,198,721	54	4
<$2	68,847						
$2-$4	359,713						
>$4	1,371,120						
	Network, shop & tanker water						
Total	21,404,700	161	62	132,963	22,001,553	165	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2012**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**3**
18,636,407	1,406,995	**929,162**	**972,870**	**22,111,442**	2		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	18,636,407	136	52	137,353	4,102,138	30	0.22
<$2	1,151,640	136	52	8,488	0	0	0.00
$2-$4	6,017,081	136	52	44,347	0	0	0.00
>$4	11,467,686	136	52	84,518	0	0	0.00
	Shop water						
Total	208,938	2	1	137,353	11,037,371	80	53
<$2	5,397						
$2-$4	42,301						
>$4	161,240						
	Tanker water						
Total	1,859,102	14	5	137,353	7,436,409	54	4
<$2	71,120						
$2-$4	371,590						
>$4	1,416,392						
	Network, shop & tanker water						
Total	22,111,442	161	62	137,353	22,575,918	164	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2012**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**3**
18,636,407	1,406,995	**929,162**	**972,870**	**22,111,442**	2		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	18,636,407	136	52	137,353	4,102,138	30	0.22
<$2	1,151,640	136	52	8,488	0	0	0.00
$2-$4	6,017,081	136	52	44,347	0	0	0.00
>$4	11,467,686	136	52	84,518	0	0	0.00
	Shop water						
Total	208,938	2	1	137,353	11,037,371	80	53
<$2	5,397						
$2-$4	42,301						
>$4	161,240						
	Tanker water						
Total	1,859,102	14	5	137,353	7,436,409	54	4
<$2	71,120						
$2-$4	371,590						
>$4	1,416,392						
	Network, shop & tanker water						
Total	22,111,442	161	62	137,353	22,575,918	164	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2013**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**4**
18,563,058	2,142,139	**929,162**	**1,004,992**	**22,841,520**	3		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,563,058	131	51	141,888	4,085,993	29	0.22
<$2	1,147,107	131	51	8,768	0	0	0.00
$2-$4	5,993,399	131	51	45,811	0	0	0.00
>$4	11,422,552	131	51	87,309	0	0	0.00
	Shop water						
Total	215,837	2	1	141,888	11,401,804	80	53
<$2	5,576						
$2-$4	43,698						
>$4	166,563						
	Tanker water						
Total	1,920,486	14	5	141,888	7,681,945	54	4
<$2	73,469						
$2-$4	383,859						
>$4	1,463,159						
	Network, shop & tanker water						
Total	22,841,520	161	62	141,888	23,169,742	163	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2013**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**4**
27,559,224	-6,245,506	**929,162**	**1,004,992**	**22,841,520**	30%	3	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	27,559,224	194	75	141,888	6,066,176	43	0.22
<$2	1,703,026	194	75	8,768	0	0	0.00
$2-$4	8,897,965	194	75	45,811	0	0	0.00
>$4	16,958,233	194	75	87,309	0	0	0.00
	Shop water						
Total	183,461	1	1	141,888	9,691,533	68	53
<$2	4,739						
$2-$4	37,143						
>$4	141,579						
	Tanker water						
Total	1,344,340	9	4	141,888	5,377,362	38	4
<$2	51,428						
$2-$4	268,701						
>$4	1,024,211						
	Network, shop & tanker water						
Total	29,087,026	205	79	141,888	21,135,071	149	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2014**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**5**
18,489,538	2,899,304	**929,162**	**1,038,175**	**23,595,703**	4		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,489,538	126	49	146,573	4,069,810	28	0.22
<$2	1,142,564	126	49	9,057	0	0	0.00
$2-$4	5,969,662	126	49	47,324	0	0	0.00
>$4	11,377,312	126	49	90,192	0	0	0.00
	Shop water						
Total	222,963	2	1	146,573	11,778,270	80	53
<$2	5,760						
$2-$4	45,141						
>$4	172,063						
	Tanker water						
Total	1,983,897	14	5	146,573	7,935,589	54	4
<$2	75,894						
$2-$4	396,533						
>$4	1,511,470						
	Network, shop & tanker water						
Total	23,595,703	161	62	146,573	23,783,668	162	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2014**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**5**
36,663,575	-14,017,505	**929,162**	**1,038,175**	**23,595,703**	60%	4	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	36,663,575	250	97	146,573	8,070,173	55	0.22
<$2	2,265,631	250	97	9,057	0	0	0.00
$2-$4	11,837,459	250	97	47,324	0	0	0.00
>$4	22,560,485	250	97	90,192	0	0	0.00
	Shop water						
Total	156,074	1	0	146,573	8,244,789	56	53
<$2	4,032						
$2-$4	31,598						
>$4	120,444						
	Tanker water						
Total	793,559	5	2	146,573	3,174,235	22	4
<$2	30,358						
$2-$4	158,613						
>$4	604,588						
	Network, shop & tanker water						
Total	37,613,209	257	99	146,573	19,489,198	133	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2015**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**6**
18,415,848	3,679,214	**929,162**	**1,072,454**	**24,374,789**	5		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,415,848	122	47	151,412	4,053,589	27	0.22
<$2	1,138,010	122	47	9,357	0	0	0.00
$2-$4	5,945,870	122	47	48,886	0	0	0.00
>$4	11,331,968	122	47	93,170	0	0	0.00
	Shop water						
Total	230,325	2	1	151,412	12,167,166	80	53
<$2	5,950						
$2-$4	46,631						
>$4	177,744						
	Tanker water						
Total	2,049,402	14	5	151,412	8,197,607	54	4
<$2	78,400						
$2-$4	409,626						
>$4	1,561,375						
	Network, shop & tanker water						
Total	24,374,789	161	62	151,412	24,418,362	161	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2015**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**6**
45,951,476	-21,908,307	**929,162**	**1,072,454**	**24,374,789**	90%	5	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	45,951,476	303	117	151,412	10,114,572	67	0.22
<$2	2,839,579	303	117	9,357	0	0	0.00
$2-$4	14,836,216	303	117	48,886	0	0	0.00
>$4	28,275,681	303	117	93,170	0	0	0.00
	Shop water						
Total	126,679	1	0	151,412	6,691,941	44	53
<$2	3,272						
$2-$4	25,647						
>$4	97,759						
	Tanker water						
Total	204,940	1	1	151,412	819,761	5	4
<$2	7,840						
$2-$4	40,963						
>$4	156,138						
	Network, shop & tanker water						
Total	46,283,095	306	118	151,412	17,626,274	116	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2016**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**7**
18,341,986	4,482,613	**929,162**	**1,107,864**	**25,179,598**	6		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,341,986	117	45	156,412	4,037,331	26	0.22
<$2	1,133,446	117	45	9,665	0	0	0.00
$2-$4	5,922,022	117	45	50,500	0	0	0.00
>$4	11,286,518	117	45	96,246	0	0	0.00
	Shop water						
Total	237,930	2	1	156,412	12,568,902	80	53
<$2	6,146						
$2-$4	48,171						
>$4	183,613						
	Tanker water						
Total	2,117,069	14	5	156,412	8,468,276	54	4
<$2	80,989						
$2-$4	423,151						
>$4	1,612,929						
	Network, shop & tanker water						
Total	25,179,598	161	62	156,412	25,074,510	160	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2016**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**7**
46,772,283	-21,890,533	**929,162**	**1,107,864**	**25,179,598**	92%	6	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	46,772,283	299	116	156,412	10,295,243	66	0.22
<$2	2,890,300	299	116	9,665	0	0	0.00
$2-$4	15,101,228	299	116	50,500	0	0	0.00
>$4	28,780,755	299	116	96,246	0	0	0.00
	Shop water						
Total	128,482	1	0	156,412	6,787,207	43	53
<$2	3,319						
$2-$4	26,012						
>$4	99,151						
	Tanker water						
Total	169,366	1	0	156,412	677,462	4	4
<$2	6,479						
$2-$4	33,852						
>$4	129,034						
	Network, shop & tanker water						
Total	47,070,131	301	116	156,412	17,759,913	114	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2017**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**8**
18,267,953	5,310,271	**929,162**	**1,144,444**	**26,010,980**	7		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,267,953	113	44	161,576	4,021,036	25	0.22
<$2	1,128,871	113	44	9,985	0	0	0.00
$2-$4	5,898,119	113	44	52,168	0	0	0.00
>$4	11,240,962	113	44	99,424	0	0	0.00
	Shop water						
Total	245,786	2	1	161,576	12,983,904	80	53
<$2	6,349						
$2-$4	49,761						
>$4	189,676						
	Tanker water						
Total	2,186,971	14	5	161,576	8,747,882	54	4
<$2	83,663						
$2-$4	437,123						
>$4	1,666,185						
	Network, shop & tanker water						
Total	26,010,980	161	62	161,576	25,752,821	159	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2017**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**8**
47,607,380	-21,857,885	**929,162**	**1,144,444**	**26,010,980**	94%	7	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	47,607,380	295	114	161,576	10,479,060	65	0.22
<$2	2,941,905	295	114	9,985	0	0	0.00
$2-$4	15,370,853	295	114	52,168	0	0	0.00
>$4	29,294,622	295	114	99,424	0	0	0.00
	Shop water						
Total	130,267	1	0	161,576	6,881,469	43	53
<$2	3,365						
$2-$4	26,373						
>$4	100,528						
	Tanker water						
Total	131,218	1	0	161,576	524,873	3	4
<$2	5,020						
$2-$4	26,227						
>$4	99,971						
	Network, shop & tanker water						
Total	47,868,865	296	115	161,576	17,885,402	111	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2018**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**9**
18,193,747	6,162,984	**929,162**	**1,182,231**	**26,869,813**	8		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,193,747	109	42	166,911	4,004,702	24	0.22
<$2	1,124,285	109	42	10,314	0	0	0.00
$2-$4	5,874,161	109	42	53,890	0	0	0.00
>$4	11,195,301	109	42	102,707	0	0	0.00
	Shop water						
Total	253,902	2	1	166,911	13,412,607	80	53
<$2	6,559						
$2-$4	51,404						
>$4	195,938						
	Tanker water						
Total	2,259,180	14	5	166,911	9,036,721	54	4
<$2	86,426						
$2-$4	451,556						
>$4	1,721,199						
	Network, shop & tanker water						
Total	26,869,813	161	62	166,911	26,454,030	158	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2018**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**9**
48,456,940	-21,809,523	**929,162**	**1,182,231**	**26,869,813**	96%	8	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	48,456,940	290	112	166,911	10,666,060	64	0.22
<$2	2,994,404	290	112	10,314	0	0	0.00
$2-$4	15,645,148	290	112	53,890	0	0	0.00
>$4	29,817,388	290	112	102,707	0	0	0.00
	Shop water						
Total	132,029	1	0	166,911	6,974,556	42	53
<$2	3,411						
$2-$4	26,730						
>$4	101,888						
	Tanker water						
Total	90,367	1	0	166,911	361,469	2	4
<$2	3,457						
$2-$4	18,062						
>$4	68,848						
	Network, shop & tanker water						
Total	48,679,336	292	113	166,911	18,002,085	108	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2019**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**10**
18,119,370	7,041,575	**929,162**	**1,221,266**	**27,757,003**	9		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,119,370	105	41	172,422	3,988,330	23	0.22
<$2	1,119,689	105	41	10,655	0	0	0.00
$2-$4	5,850,147	105	41	55,669	0	0	0.00
>$4	11,149,533	105	41	106,098	0	0	0.00
	Shop water						
Total	262,285	2	1	172,422	13,855,466	80	53
<$2	6,776						
$2-$4	53,102						
>$4	202,408						
	Tanker water						
Total	2,333,774	14	5	172,422	9,335,096	54	4
<$2	89,279						
$2-$4	466,465						
>$4	1,778,030						
	Network, shop & tanker water						
Total	27,757,003	161	62	172,422	27,178,892	158	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2019**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**10**
49,321,137	-21,744,575	**929,162**	**1,221,266**	**27,757,003**	98%	9	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	49,321,137	286	111	172,422	10,856,282	63	0.22
<$2	3,047,807	286	111	10,655	0	0	0.00
$2-$4	15,924,169	286	111	55,669	0	0	0.00
>$4	30,349,161	286	111	106,098	0	0	0.00
	Shop water						
Total	133,765	1	0	172,422	7,066,288	41	53
<$2	3,456						
$2-$4	27,082						
>$4	103,228						
	Tanker water						
Total	46,675	0	0	172,422	186,702	1	4
<$2	1,786						
$2-$4	9,329						
>$4	35,561						
	Network, shop & tanker water						
Total	49,501,578	287	111	172,422	18,109,272	105	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2020**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**11**
18,044,819	7,946,891	**929,162**	**1,261,590**	**28,673,487**	10		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	18,044,819	101	39	178,115	3,971,921	22	0.22
<$2	1,115,082	101	39	11,007	0	0	0.00
$2-$4	5,826,077	101	39	57,508	0	0	0.00
>$4	11,103,660	101	39	109,601	0	0	0.00
	Shop water						
Total	270,945	2	1	178,115	14,312,947	80	53
<$2	6,999						
$2-$4	54,855						
>$4	209,091						
	Tanker water						
Total	2,410,831	14	5	178,115	9,643,323	54	4
<$2	92,227						
$2-$4	481,867						
>$4	1,836,737						
	Network, shop & tanker water						
Total	28,673,487	161	62	178,115	27,928,191	157	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2020**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**11**
50,200,151	-21,662,137	**929,162**	**1,261,590**	**28,673,487**	100%	10	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	50,200,151	282	109	178,115	11,049,766	62	0.22
<$2	3,102,126	282	109	11,007	0	0	0.00
$2-$4	16,207,973	282	109	57,508	0	0	0.00
>$4	30,890,051	282	109	109,601	0	0	0.00
	Shop water						
Total	135,473	1	0	178,115	7,156,474	40	53
<$2	3,500						
$2-$4	27,427						
>$4	104,545						
	Tanker water						
Total	0	0	0	178,115	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	50,335,623	283	109	178,115	18,206,239	102	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2021**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**12**
17,970,097	8,879,811	**929,162**	**1,303,245**	**29,620,230**	11		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,970,097	98	38	183,996	3,955,473	21	0.22
<$2	1,110,465	98	38	11,370	0	0	0.00
$2-$4	5,801,952	98	38	59,406	0	0	0.00
>$4	11,057,680	98	38	113,220	0	0	0.00
	Shop water						
Total	279,891	2	1	183,996	14,785,533	80	53
<$2	7,230						
$2-$4	56,666						
>$4	215,995						
	Tanker water						
Total	2,490,432	14	5	183,996	9,961,727	54	4
<$2	95,272						
$2-$4	497,777						
>$4	1,897,383						
	Network, shop & tanker water						
Total	29,620,230	161	62	183,996	28,702,734	156	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2021**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**12**
50,444,671	-20,964,387	**929,162**	**1,303,245**	**29,620,230**	11		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	50,444,671	274	106	183,996	11,103,588	60	0.22
<$2	3,117,236	274	106	11,370	0	0	0.00
$2-$4	16,286,921	274	106	59,406	0	0	0.00
>$4	31,040,514	274	106	113,220	0	0	0.00
	Shop water						
Total	139,946	1	0	183,996	7,392,767	40	53
<$2	3,615						
$2-$4	28,333						
>$4	107,997						
	Tanker water						
Total	0	0	0	183,996	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	50,584,617	275	106	183,996	18,496,355	101	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2022**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**13**
17,895,200	9,841,240	**929,162**	**1,346,276**	**30,598,234**	12		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,895,200	94	36	190,071	3,938,988	21	0.22
<$2	1,105,837	94	36	11,745	0	0	0.00
$2-$4	5,777,770	94	36	61,368	0	0	0.00
>$4	11,011,594	94	36	116,958	0	0	0.00
	Shop water						
Total	289,133	2	1	190,071	15,273,724	80	53
<$2	7,469						
$2-$4	58,537						
>$4	223,126						
	Tanker water						
Total	2,572,661	14	5	190,071	10,290,644	54	4
<$2	98,418						
$2-$4	514,213						
>$4	1,960,030						
	Network, shop & tanker water						
Total	30,598,234	161	62	190,071	29,503,356	155	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2022**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**13**
50,691,508	-20,237,840	**929,162**	**1,346,276**	**30,598,234**	12		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	50,691,508	267	103	190,071	11,157,920	59	0.22
<$2	3,132,490	267	103	11,745	0	0	0.00
$2-$4	16,366,616	267	103	61,368	0	0	0.00
>$4	31,192,402	267	103	116,958	0	0	0.00
	Shop water						
Total	144,566	1	0	190,071	7,636,862	40	53
<$2	3,735						
$2-$4	29,269						
>$4	111,563						
	Tanker water						
Total	0	0	0	190,071	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	50,836,074	267	103	190,071	18,794,782	99	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2023**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**14**
17,820,131	10,832,114	**929,162**	**1,390,728**	**31,608,529**	13		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,820,131	91	35	196,347	3,922,464	20	0.22
<$2	1,101,198	91	35	12,133	0	0	0.00
$2-$4	5,753,533	91	35	63,394	0	0	0.00
>$4	10,965,400	91	35	120,820	0	0	0.00
	Shop water						
Total	298,679	2	1	196,347	15,778,033	80	53
<$2	7,716						
$2-$4	60,470						
>$4	230,494						
	Tanker water						
Total	2,657,605	14	5	196,347	10,630,422	54	4
<$2	101,667						
$2-$4	531,191						
>$4	2,024,747						
	Network, shop & tanker water						
Total	31,608,529	161	62	196,347	30,330,918	154	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2023**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**14**
50,940,698	-19,481,508	**929,162**	**1,390,728**	**31,608,529**	13		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	50,940,698	259	100	196,347	11,212,771	57	0.22
<$2	3,147,888	259	100	12,133	0	0	0.00
$2-$4	16,447,072	259	100	63,394	0	0	0.00
>$4	31,345,738	259	100	120,820	0	0	0.00
	Shop water						
Total	149,340	1	0	196,347	7,889,016	40	53
<$2	3,858						
$2-$4	30,235						
>$4	115,247						
	Tanker water						
Total	0	0	0	196,347	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	51,090,038	260	101	196,347	19,101,787	97	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2024**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**15**
17,744,887	11,853,400	**929,162**	**1,436,647**	**32,652,183**	14		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,744,887	87	34	202,830	3,905,902	19	0.22
<$2	1,096,548	87	34	12,534	0	0	0.00
$2-$4	5,729,239	87	34	65,487	0	0	0.00
>$4	10,919,100	87	34	124,809	0	0	0.00
	Shop water						
Total	308,541	2	1	202,830	16,298,993	80	53
<$2	7,971						
$2-$4	62,466						
>$4	238,104						
	Tanker water						
Total	2,745,355	14	5	202,830	10,981,418	54	4
<$2	105,024						
$2-$4	548,730						
>$4	2,091,600						
	Network, shop & tanker water						
Total	32,652,183	161	62	202,830	31,186,313	154	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2024**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**15**
51,192,282	-18,694,369	**929,162**	**1,436,647**	**32,652,183**	14		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	51,192,282	252	98	202,830	11,268,148	56	0.22
<$2	3,163,435	252	98	12,534	0	0	0.00
$2-$4	16,528,300	252	98	65,487	0	0	0.00
>$4	31,500,547	252	98	124,809	0	0	0.00
	Shop water						
Total	154,271	1	0	202,830	8,149,497	40	53
<$2	3,985						
$2-$4	31,233						
>$4	119,052						
	Tanker water						
Total	0	0	0	202,830	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	51,346,552	253	98	202,830	19,417,644	96	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2025**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**16**
17,669,470	12,906,097	**929,162**	**1,484,082**	**33,730,296**	15		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,669,470	84	33	209,527	3,889,301	19	0.22
<$2	1,091,888	84	33	12,948	0	0	0.00
$2-$4	5,704,889	84	33	67,649	0	0	0.00
>$4	10,872,693	84	33	128,930	0	0	0.00
	Shop water						
Total	318,729	2	1	209,527	16,837,155	80	53
<$2	8,234						
$2-$4	64,529						
>$4	245,966						
	Tanker water						
Total	2,836,001	14	5	209,527	11,344,004	54	4
<$2	108,492						
$2-$4	566,848						
>$4	2,160,661						
	Network, shop & tanker water						
Total	33,730,296	161	62	209,527	32,070,460	153	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2025**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**16**
51,446,298	-17,875,367	**929,162**	**1,484,082**	**33,730,296**	15		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	51,446,298	246	95	209,527	11,324,060	54	0.22
<$2	3,179,132	246	95	12,948	0	0	0.00
$2-$4	16,610,313	246	95	67,649	0	0	0.00
>$4	31,656,853	246	95	128,930	0	0	0.00
	Shop water						
Total	159,364	1	0	209,527	8,418,578	40	53
<$2	4,117						
$2-$4	32,265						
>$4	122,983						
	Tanker water						
Total	0	0	0	209,527	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	51,605,662	246	95	209,527	19,742,638	94	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2026**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**17**
17,593,878	13,991,236	**929,162**	**1,533,084**	**34,844,006**	16		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,593,878	81	31	216,446	3,872,662	18	0.22
<$2	1,087,216	81	31	13,375	0	0	0.00
$2-$4	5,680,483	81	31	69,883	0	0	0.00
>$4	10,826,178	81	31	133,187	0	0	0.00
	Shop water						
Total	329,252	2	1	216,446	17,393,086	80	53
<$2	8,506						
$2-$4	66,660						
>$4	254,087						
	Tanker water						
Total	2,929,640	14	5	216,446	11,718,561	54	4
<$2	112,074						
$2-$4	585,564						
>$4	2,232,002						
	Network, shop & tanker water						
Total	34,844,006	161	62	216,446	32,984,309	152	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2026**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**17**
51,702,788	-17,023,409	**929,162**	**1,533,084**	**34,844,006**	16		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	51,702,788	239	92	216,446	11,380,518	53	0.22
<$2	3,194,982	239	92	13,375	0	0	0.00
$2-$4	16,693,125	239	92	69,883	0	0	0.00
>$4	31,814,681	239	92	133,187	0	0	0.00
	Shop water						
Total	164,626	1	0	216,446	8,696,543	40	53
<$2	4,253						
$2-$4	33,330						
>$4	127,044						
	Tanker water						
Total	0	0	0	216,446	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	51,867,415	240	93	216,446	20,077,061	93	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2027**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**18**
17,518,111	15,109,883	**929,162**	**1,583,703**	**35,994,488**	17		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,518,111	78	30	223,592	3,855,985	17	0.22
<$2	1,082,534	78	30	13,817	0	0	0.00
$2-$4	5,656,020	78	30	72,191	0	0	0.00
>$4	10,779,556	78	30	137,585	0	0	0.00
	Shop water						
Total	340,124	2	1	223,592	17,967,372	80	53
<$2	8,786						
$2-$4	68,861						
>$4	262,477						
	Tanker water						
Total	3,026,371	14	5	223,592	12,105,486	54	4
<$2	115,775						
$2-$4	604,899						
>$4	2,305,698						
	Network, shop & tanker water						
Total	35,994,488	161	62	223,592	33,928,843	152	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2027**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**18**
51,961,794	-16,137,368	**929,162**	**1,583,703**	**35,994,488**	17		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	51,961,794	232	90	223,592	11,437,528	51	0.22
<$2	3,210,987	232	90	13,817	0	0	0.00
$2-$4	16,776,750	232	90	72,191	0	0	0.00
>$4	31,974,057	232	90	137,585	0	0	0.00
	Shop water						
Total	170,062	1	0	223,592	8,983,686	40	53
<$2	4,393						
$2-$4	34,430						
>$4	131,238						
	Tanker water						
Total	0	0	0	223,592	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	52,131,856	233	90	223,592	20,421,215	91	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2028**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**19**
17,442,169	16,263,139	**929,162**	**1,635,994**	**37,182,958**	18		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,442,169	76	29	230,975	3,839,269	17	0.22
<$2	1,077,842	76	29	14,273	0	0	0.00
$2-$4	5,631,501	76	29	74,574	0	0	0.00
>$4	10,732,826	76	29	142,127	0	0	0.00
	Shop water						
Total	351,354	2	1	230,975	18,560,621	80	53
<$2	9,076						
$2-$4	71,134						
>$4	271,143						
	Tanker water						
Total	3,126,296	14	5	230,975	12,505,186	54	4
<$2	119,597						
$2-$4	624,871						
>$4	2,381,828						
	Network, shop & tanker water						
Total	37,182,958	161	62	230,975	34,905,075	151	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2028**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**19**
52,223,359	-15,216,078	**929,162**	**1,635,994**	**37,182,958**	18		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	52,223,359	226	87	230,975	11,495,102	50	0.22
<$2	3,227,150	226	87	14,273	0	0	0.00
$2-$4	16,861,200	226	87	74,574	0	0	0.00
>$4	32,135,008	226	87	142,127	0	0	0.00
	Shop water						
Total	175,677	1	0	230,975	9,280,310	40	53
<$2	4,538						
$2-$4	35,567						
>$4	135,572						
	Tanker water						
Total	0	0	0	230,975	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	52,399,035	227	88	230,975	20,775,413	90	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2029**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**20**
17,366,051	17,452,141	**929,162**	**1,690,011**	**38,410,668**	19		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	17,366,051	73	28	238,601	3,822,514	16	0.22
<$2	1,073,138	73	28	14,744	0	0	0.00
$2-$4	5,606,925	73	28	77,036	0	0	0.00
>$4	10,685,988	73	28	146,820	0	0	0.00
	Shop water						
Total	362,955	2	1	238,601	19,173,457	80	53
<$2	9,376						
$2-$4	73,483						
>$4	280,096						
	Tanker water						
Total	3,229,521	14	5	238,601	12,918,083	54	4
<$2	123,546						
$2-$4	645,503						
>$4	2,460,471						
	Network, shop & tanker water						
Total	38,410,668	161	62	238,601	35,914,055	151	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2029**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**20**
52,487,524	-14,258,334	**929,162**	**1,690,011**	**38,410,668**	19		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	52,487,524	220	85	238,601	11,553,249	48	0.22
<$2	3,243,475	220	85	14,744	0	0	0.00
$2-$4	16,946,491	220	85	77,036	0	0	0.00
>$4	32,297,559	220	85	146,820	0	0	0.00
	Shop water						
Total	181,477	1	0	238,601	9,586,729	40	53
<$2	4,688						
$2-$4	36,741						
>$4	140,048						
	Tanker water						
Total	0	0	0	238,601	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	52,669,002	221	85	238,601	21,139,978	89	
<$2							
$2-$4							
>$4							

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Table 4: Household water consumption analysis across 20 years						pop growth:	3.25%		annual connectivity growth:		0.05%									
	water prioces per m³:		network	0.22	shop	52.826	tanker	4												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
	Year	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	19	20
Target population (all HHs)	**929,162**	**959,354**	**990,526**	**1,022,711**	**1,055,942**	**1,090,253**	**1,125,679**	**1,162,255**	**1,200,021**	**1,239,013**	**1,279,273**	**1,320,840**	**1,363,758**	**1,408,071**	**1,453,824**	**1,501,063**	**1,549,837**	**1,600,196**	**1,652,191**	**1,705,876**
Target population (connected HHs)	**911,673**	**941,774**	**972,870**	**1,004,992**	**1,038,175**	**1,072,454**	**1,107,864**	**1,144,444**	**1,182,231**	**1,221,266**	**1,261,590**	**1,303,245**	**1,346,276**	**1,390,728**	**1,436,647**	**1,484,082**	**1,533,084**	**1,583,703**	**1,635,994**	**1,690,011**
Without project																				
Total network water consumed	***18,782,594***	***18,709,586***	***18,636,407***	***18,563,058***	***18,489,538***	***18,415,848***	***18,341,986***	***18,267,953***	***18,193,747***	***18,119,370***	***18,044,819***	***17,970,097***	***17,895,200***	***17,820,131***	***17,744,887***	***17,669,470***	***17,593,878***	***17,518,111***	***17,442,169***	***17,366,051***
Total shop water consumed	***195,795***	***202,260***	***208,938***	***215,837***	***222,963***	***230,325***	***237,930***	***245,786***	***253,902***	***262,285***	***270,945***	***279,891***	***289,133***	***298,679***	***308,541***	***318,729***	***329,252***	***340,124***	***351,354***	***362,955***
Total tanker water consumed	***1,742,158***	***1,799,680***	***1,859,102***	***1,920,486***	***1,983,897***	***2,049,402***	***2,117,069***	***2,186,971***	***2,259,180***	***2,333,774***	***2,410,831***	***2,490,432***	***2,572,661***	***2,657,605***	***2,745,355***	***2,836,001***	***2,929,640***	***3,026,371***	***3,126,296***	***3,229,521***
With project																				
Total network water consumed	***18,782,594***	***18,709,586***	***18,636,407***	***27,559,224***	***36,663,575***	***45,951,476***	***46,772,283***	***47,607,380***	***48,456,940***	***49,321,137***	***50,200,151***	***50,444,671***	***50,691,508***	***50,940,698***	***51,192,282***	***51,446,298***	***51,702,788***	***51,961,794***	***52,223,359***	***52,487,524***
Total shop water consumed	***195,795***	***202,260***	***208,938***	***183,461***	***156,074***	***126,679***	***128,482***	***130,267***	***132,029***	***133,765***	***135,473***	***139,946***	***144,566***	***149,340***	***154,271***	***159,364***	***164,626***	***170,062***	***175,677***	***181,477***
Total tanker water consumed	***1,742,158***	***1,799,680***	***1,859,102***	***1,344,340***	***793,559***	***204,940***	***169,366***	***131,218***	***90,367***	***46,675***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**1,703,144**	**3,518,758**	**5,452,411**	**5,757,604**	**6,077,007**	**6,411,226**	**6,760,889**	**7,126,654**	**7,361,963**	**7,605,041**	**7,856,145**	**8,115,540**	**8,383,499**	**8,660,306**	**8,946,253**	**9,241,641**	**9,546,783**
Savings from switching from tanker water to network water			**0**	**2,177,766**	**4,499,343**	**6,971,854**	**7,362,097**	**7,770,509**	**8,197,865**	**8,644,971**	**9,112,665**	**9,413,548**	**9,724,365**	**10,045,445**	**10,377,127**	**10,719,760**	**11,073,706**	**11,439,338**	**11,817,043**	**12,207,220**
Total savings from switching from shop and tanker water			**0**	**3,880,910**	**8,018,100**	**12,424,264**	**13,119,701**	**13,847,516**	**14,609,091**	**15,405,861**	**16,239,319**	**16,775,510**	**17,329,406**	**17,901,590**	**18,492,666**	**19,103,259**	**19,734,012**	**20,385,592**	**21,058,685**	**21,754,003**
Poorest socio-economic group (<$2 per person per day)																				
Target population (all HHs)	**57,418**	**59,283**	**61,210**	**63,199**	**65,252**	**67,372**	**69,561**	**71,822**	**74,155**	**76,565**	**79,053**	**81,622**	**84,274**	**87,012**	**89,839**	**92,758**	**95,772**	**98,884**	**102,097**	**105,415**
Target population (connected HHs)	**56,337**	**58,197**	**60,119**	**62,104**	**64,154**	**66,272**	**68,461**	**70,721**	**73,056**	**75,468**	**77,960**	**80,534**	**83,193**	**85,940**	**88,778**	**91,709**	**94,737**	**97,865**	**101,096**	**104,435**
Without project																				
Total network water consumed	***1,160,673***	***1,156,162***	***1,151,640***	***1,147,107***	***1,142,564***	***1,138,010***	***1,133,446***	***1,128,871***	***1,124,285***	***1,119,689***	***1,115,082***	***1,110,465***	***1,105,837***	***1,101,198***	***1,096,548***	***1,091,888***	***1,087,216***	***1,082,534***	***1,077,842***	***1,073,138***
Total shop water consumed	***5,058***	***5,225***	***5,397***	***5,576***	***5,760***	***5,950***	***6,146***	***6,349***	***6,559***	***6,776***	***6,999***	***7,230***	***7,469***	***7,716***	***7,971***	***8,234***	***8,506***	***8,786***	***9,076***	***9,376***
Total tanker water consumed	***66,647***	***68,847***	***71,120***	***73,469***	***75,894***	***78,400***	***80,989***	***83,663***	***86,426***	***89,279***	***92,227***	***95,272***	***98,418***	***101,667***	***105,024***	***108,492***	***112,074***	***115,775***	***119,597***	***123,546***
With project																				
Total network water consumed	***1,160,673***	***1,156,162***	***1,151,640***	***1,703,026***	***2,265,631***	***2,839,579***	***2,890,300***	***2,941,905***	***2,994,404***	***3,047,807***	***3,102,126***	***3,117,236***	***3,132,490***	***3,147,888***	***3,163,435***	***3,179,132***	***3,194,982***	***3,210,987***	***3,227,150***	***3,243,475***
Total shop water consumed	***5,058***	***5,225***	***5,397***	***4,739***	***4,032***	***3,272***	***3,319***	***3,365***	***3,411***	***3,456***	***3,500***	***3,615***	***3,735***	***3,858***	***3,985***	***4,117***	***4,253***	***4,393***	***4,538***	***4,688***
Total tanker water consumed	***66,647***	***68,847***	***71,120***	***51,428***	***30,358***	***7,840***	***6,479***	***5,020***	***3,457***	***1,786***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**43,997**	**90,900**	**140,852**	**148,736**	**156,987**	**165,621**	**174,653**	**184,102**	**190,181**	**196,460**	**202,947**	**209,648**	**216,570**	**223,721**	**231,108**	**238,739**	**246,621**
Savings from switching from tanker water to network water			**0**	**83,311**	**172,123**	**266,710**	**281,639**	**297,263**	**313,611**	**330,716**	**348,607**	**360,118**	**372,008**	**384,291**	**396,980**	**410,087**	**423,627**	**437,615**	**452,064**	**466,990**
Total savings from switching from shop and tanker water			**0**	**127,308**	**263,023**	**407,562**	**430,375**	**454,250**	**479,232**	**505,369**	**532,710**	**550,299**	**568,468**	**587,238**	**606,628**	**626,657**	**647,348**	**668,723**	**690,803**	**713,611**
Medium poor socio-economic group ($2 - $4 per person per day)																				
Target population (all HHs)	**299,996**	**309,744**	**319,808**	**330,200**	**340,929**	**352,007**	**363,445**	**375,254**	**387,447**	**400,036**	**413,035**	**426,456**	**440,313**	**454,620**	**469,392**	**484,644**	**500,391**	**516,650**	**533,438**	**550,771**
Target population (connected HHs)	**294,349**	**304,068**	**314,108**	**324,479**	**335,193**	**346,260**	**357,693**	**369,503**	**381,703**	**394,307**	**407,326**	**420,775**	**434,668**	**449,020**	**463,846**	**479,161**	**494,982**	**511,326**	**528,208**	**545,649**
Without project																				
Total network water consumed	***6,064,280***	***6,040,708***	***6,017,081***	***5,993,399***	***5,969,662***	***5,945,870***	***5,922,022***	***5,898,119***	***5,874,161***	***5,850,147***	***5,826,077***	***5,801,952***	***5,777,770***	***5,753,533***	***5,729,239***	***5,704,889***	***5,680,483***	***5,656,020***	***5,631,501***	***5,606,925***
Total shop water consumed	***39,640***	***40,949***	***42,301***	***43,698***	***45,141***	***46,631***	***48,171***	***49,761***	***51,404***	***53,102***	***54,855***	***56,666***	***58,537***	***60,470***	***62,466***	***64,529***	***66,660***	***68,861***	***71,134***	***73,483***
Total tanker water consumed	***348,215***	***359,713***	***371,590***	***383,859***	***396,533***	***409,626***	***423,151***	***437,123***	***451,556***	***466,465***	***481,867***	***497,777***	***514,213***	***531,191***	***548,730***	***566,848***	***585,564***	***604,899***	***624,871***	***645,503***
With project																				
Total network water consumed	***6,064,280***	***6,040,708***	***6,017,081***	***8,897,965***	***11,837,459***	***14,836,216***	***15,101,228***	***15,370,853***	***15,645,148***	***15,924,169***	***16,207,973***	***16,286,921***	***16,366,616***	***16,447,072***	***16,528,300***	***16,610,313***	***16,693,125***	***16,776,750***	***16,861,200***	***16,946,491***
Total shop water consumed	***39,640***	***40,949***	***42,301***	***37,143***	***31,598***	***25,647***	***26,012***	***26,373***	***26,730***	***27,082***	***27,427***	***28,333***	***29,269***	***30,235***	***31,233***	***32,265***	***33,330***	***34,430***	***35,567***	***36,741***
Total tanker water consumed	***348,215***	***359,713***	***371,590***	***268,701***	***158,613***	***40,963***	***33,852***	***26,227***	***18,062***	***9,329***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**344,814**	**712,399**	**1,103,882**	**1,165,670**	**1,230,336**	**1,298,001**	**1,368,793**	**1,442,845**	**1,490,485**	**1,539,698**	**1,590,536**	**1,643,052**	**1,697,303**	**1,753,344**	**1,811,236**	**1,871,040**	**1,932,818**
Savings from switching from tanker water to network water			**0**	**435,283**	**899,310**	**1,393,505**	**1,471,505**	**1,553,137**	**1,638,555**	**1,727,921**	**1,821,402**	**1,881,541**	**1,943,666**	**2,007,842**	**2,074,137**	**2,142,621**	**2,213,366**	**2,286,447**	**2,361,942**	**2,439,928**
Total savings from switching from shop and tanker water			**0**	**780,097**	**1,611,709**	**2,497,387**	**2,637,176**	**2,783,473**	**2,936,556**	**3,096,714**	**3,264,247**	**3,372,026**	**3,483,364**	**3,598,378**	**3,717,189**	**3,839,924**	**3,966,711**	**4,097,684**	**4,232,982**	**4,372,747**
Total savings from switching from shop and tanker water (both socio-economic categories)			**0**	**907,405**	**1,874,732**	**2,904,949**	**3,067,550**	**3,237,723**	**3,415,788**	**3,602,083**	**3,796,956**	**3,922,324**	**4,051,832**	**4,185,616**	**4,323,817**	**4,466,581**	**4,614,059**	**4,766,406**	**4,923,784**	**5,086,358**
Target Population (all HHs) of both socio-economic categories	**357,414**	**369,027**	**381,018**	**393,398**	**406,181**	**419,379**	**433,006**	**447,076**	**461,603**	**476,601**	**492,088**	**508,077**	**524,586**	**541,632**	**559,231**	**577,402**	**596,164**	**615,535**	**635,535**	**656,186**
	Table 4 feeds off the worksheet "Wcon" electronically.																			
Health benefits for those consuming < 50 lcd																				
Disability Adjusted Life Years (DALY)	The health impact of the proposed project is analysed in section (d),of the worksheet "Heli"																			
Avoided health-related costs																				

Zarqa Water Supply Feasibility Study. Full List of IMP Projects. Work-sheet "Heli"

(a) Analysing the 2008 billing data: a story of inequality in distribution between network water-poor and network water-rich HHs

Tables 1 & 3 are derived from the 2008 billing data and provide the following findings:
<i> total quanities of network water and nr HHs across 11 different consumption bands (table H1)
<ii> average annual consumption per HH, average HH bill and total revenue across consumption bands (table H3)

Table H1: Water consumption across consumption ranges

Consumption bands (con band)		Water quantities per con band (m³)	Water quantities per con band in % terms	Cumulative in % terms increasing	Cumulative in % terms declining	nr HHs per con band	nr HHs per con range in % terms	Cumulative in % terms increasing	Cumulative in % terms declining
<50lcd		4,635,648	26.34%	26.34%	100.00%	62,044	51.44%	51.44%	100.00%
50lcd-	65lcd	2,709,956	15.40%	41.74%	73.66%	18,291	15.17%	66.61%	48.56%
65lcd-	80lcd	2,522,226	14.33%	56.07%	58.26%	13,528	11.22%	77.82%	33.39%
80lcd-	120lcd	4,793,678	27.24%	83.30%	43.93%	19,259	15.97%	93.79%	22.18%
120lcd-	145lcd	1,389,365	7.89%	91.20%	16.70%	4,104	3.40%	97.19%	6.21%
145lcd-	165lcd	624,570	3.55%	94.75%	8.80%	1,570	1.30%	98.49%	2.81%
165lcd-	185lcd	349,621	1.99%	96.73%	5.25%	777	0.64%	99.14%	1.51%
185lcd	205lcd	230,410	1.31%	98.04%	3.27%	460	0.38%	99.52%	0.86%
205lcd	225lcd	136,962	0.78%	98.82%	1.96%	248	0.21%	99.72%	0.48%
225lcd	245lcd	125,671	0.71%	99.53%	1.18%	207	0.17%	99.90%	0.28%
245lcd	265lcd	82,220	0.47%	100.00%	0.47%	125	0.10%	100.00%	0.10%
Total water consumption (2008)		17,600,327				120,613			

The above table speaks for itself with respect to the unequal distribution of network water. This is indicated by a number of observations:
62,044 HHs or in % terms 51.44% of all Zarqa HHs consume <50lcd of network water and 26.34% of Zarqa network water
58,569 HHs or in % terms 48.56% of all Zarqa HHs consume between 50-265 lcd of water and 73.66% of Zarqa network water

Since the ECO Consult report indicates no correlation between income and water consumption levels, the inequality is based on unequal distribution generated by poor quality piping in certain areas which disadvantages households across all income groups.

The HELI (2005) report highlights the health benefit accruing from raising network water consumption from <50 lcd to 60 lcd and higher.
In the context of Zarqa Governorate the following statistics are of interest in the HELI framework:

Table H2: Water consumption across groups 1 (HHs consuming <50 lcd) & 2 (HHs consuming between 50 - 265 lcd) with project

Year	Total water	Group 1 water	Group 2 water	Total HHS connect	Group 1 HHs	Group 2 HHs	Group 1 m³/HH/annum	Group 2 m³/HH/annum	Group 1 lcd	Group 2 lcd	Group 1 =>60lcd (m³)	Group 2 after transf to Group 1 (m³)	Group 2 after transf to Group 1 (lcd)
2,010	18,782,594	4,947,038	13,835,556	128,713	66,211	62,502	75	221	29	86			
2,011	18,709,586	4,927,809	13,781,776	132,963	68,397	64,566	72	213	28	83			
2,012	18,636,407	4,908,535	13,727,872	137,353	70,655	66,698	69	206	27	80			
2,013	27,559,224	7,258,664	20,300,560	141,888	72,988	68,900	99	295	38	114			
2,014	36,663,575	9,656,606	27,006,969	146,573	75,398	71,175	128	379	50	147			
2,015	45,951,476	12,102,893	33,848,584	151,412	77,887	73,525	155	460	60	178			
2,016	46,772,283	12,319,080	34,453,203	156,412	80,459	75,953	153	454	59	175	12,480,625	34,291,658	175
2,017	47,607,380	12,539,032	35,068,348	161,576	83,116	78,460	151	447	58	173	12,892,711	34,714,669	171
2,018	48,456,940	12,762,792	35,694,148	166,911	85,860	81,051	149	440	57	170	13,318,404	35,138,536	168
2,019	49,321,137	12,990,408	36,330,729	172,422	88,695	83,727	146	434	57	168	13,758,152	35,562,985	164
2,020	50,200,151	13,221,926	36,978,224	178,115	91,623	86,492	144	428	56	165	14,212,420	35,987,730	161
2,021	50,444,671	13,286,329	37,158,342	183,996	94,649	89,348	140	416	54	161	14,681,687	35,762,984	155
2,022	50,691,508	13,351,342	37,340,166	190,071	97,774	92,298	137	405	53	156	15,166,449	35,525,059	149
2,023	50,940,698	13,416,975	37,523,723	196,347	101,002	95,345	133	394	51	152	15,667,216	35,273,482	143
2,024	51,192,282	13,483,238	37,709,044	202,830	104,337	98,493	129	383	50	148	16,184,518	35,007,764	137
2,025	51,446,298	13,550,142	37,896,156	209,527	107,782	101,745	126	372	49	144	16,718,900	34,727,398	132
2,026	51,702,788	13,617,697	38,085,091	216,446	111,341	105,105	122	362	47	140	17,270,926	34,431,863	127
2,027	51,961,794	13,685,916	38,275,879	223,592	115,017	108,575	119	353	46	136	17,841,179	34,120,615	122
2,028	52,223,359	13,754,807	38,468,551	230,975	118,815	112,160	116	343	45	133	18,430,261	33,793,098	117
2,029	52,487,524	13,824,384	38,663,140	238,601	122,738	115,863	113	334	44	129	19,038,793	33,448,732	112

This table shows that in year 6 group 1 achieves average consumption level of 60 lcd. However to maintain this beyond year 6 redistribution of water from group 2 to group 1 is necessary. It is doable as it only requires modest reduction in the average water consumption level of group 2. In year 7 there is no reduction involved but in year 8 there is a reduction from 173 lcd to 171 lcd and in year 20 from 129 lcd to 119 lcd.

There are a number of reasons why network water poor HHs receive inadequate supplies. These include the following:
<i> unequal storage capacity
GFA 2008: 100 show that 1% of HHs have no storage; 13% have 1 m³ storage capacity, 48% have 2 m³ and 38% have more than 2.7 m³ (mean size) storage capacity.

Impact of storage capacity on benefiting from network water	storage:1m³	storage:2m³	storage:2.73m³
Where tanks are only filled once a week this would generate the following consumption rates (lcd):-	20	40	55
It means that those HHs with the smaller tanks obtain <50 lcd			
The situation can be improved with 3 fillings per week giving the following lcd:-	61	121	165

<ii> Altitude
Where the household lives in high altitude areas pressure is weak and supply erratic as others at lower altitudes are at the front of the queue and hence supplied first.

<iii> Tariff structure
Given the large gap between the m³ price of network water (varying between Jd 0.18 - JD 0.64),and that of tanker water (JD 4) and shop water (JD 52.83)
(in the context of water scarcity) those who have the influence, storage capacity and appropriate altitude are able to harvest a disproportionate share
of the network water as illustrated by table H1 above. In addition, EC Consult points out that the sharing of meters by poor HHs pushes up the price of network water for the poor.
One resolution is to ensure that poor HHs have access to one meter per HH as recommended by ECO Consult.
Another resolution to this situation is to raise tariff rates much closer to commercial rates of tanker water, so that when HHs consume more than 165 lcd,
the price of network water is > JD 4, so that the network water-rich HHs are forced to purchase tanker water when their consumption is >165 lcd.
Network water-poor HHs are willing to pay higher tariffs at the lower consumption band rates (see GFA 2008:163-173)
In summary, constraints <i> and <ii> require an engineering resolution, while constraint <iii> faces the challenge of reform of the tariff structure.
Both sets of resolutions will be required to address the plight of network water-poor HHs, of which there are 62,044 HHs representing
51.44% of all HHs of Zarqa.

<c> Economic and financial analysis of the 2008 billing data
Table H 3 below analyses annual HH expenditure on water, average prices per m³ and revenue across the consumption bands

Table H3: HH network water consumption, water bills and revenue

Consumption bands (con band)		av HH con/annum per con band (m³)	av HH con/quart per con band (m³)	tariff (JD)	av HH annual bill (JD)	av price per m³ per con band (JD)	revenue created per con band (JD)		Cumulative in % terms increasing	Cumulative in % terms declining
<50lcd		75	19	3.750	15	0.20	930,660	22.32%	22.32%	100.00%
50lcd-	65lcd	148	37	6.450	26	0.17	471,908	11.32%	33.64%	77.68%
65lcd-	80lcd	186	47	9.341	37	0.20	505,460	12.12%	45.76%	66.36%
80lcd-	120lcd	249	62	14.870	59	0.24	1,145,525	27.47%	73.24%	54.24%
120lcd-	145lcd	339	85	26.657	107	0.31	437,601	10.50%	83.73%	26.76%
145lcd-	165lcd	398	99	36.483	146	0.37	229,113	5.50%	89.23%	16.27%
165lcd-	185lcd	450	112	47.097	188	0.42	146,377	3.51%	92.74%	10.77%
185lcd	205lcd	501	125	58.296	233	0.47	107,265	2.57%	95.31%	7.26%
205lcd	225lcd	552	138	71.896	288	0.52	71,321	1.71%	97.02%	4.69%
225lcd	245lcd	607	152	88.250	353	0.58	73,071	1.75%	98.77%	2.98%
245lcd	265lcd	658	164	102.341	409	0.62	51,171	1.23%	100.00%	1.23%
							4,169,472			

There are some minor inequalities in billing before average price per m³ begins to rise from 80 lcd onwards.

(d) Planning and implementing the HELI-desired outcome
It is now assumed that engineering and policy steps relating to tariff reform will take place so that the necessary quantities of additional water created by the proposed projec will be channelled to HHs with <50 lcd so that their consumption rate is raised to 60 lcd; and this continues even in the face of population growth from year 9 onwards.
The details of the re-distribution of water between groups 1 & 2 in order to lift HHs of group 1 to 60 lcd and to maintain these HHs at this level are worked out above (table H2).

Hence, I move on to calculate the health benefits. I assume that the diarrhoea incidence/ person / year for those consuming < 50 lcd is .61
This is a conservative figure given Figure 6, HELI (2005) report, page 40. I also assume that the diarrhoea incidence/person/year is .27 for those consuming 60 lcd (ibid.)
Appling Table 10 (HELI 2005:43) to the metered population the health gains for raising consumption of group 1 to 60 lcd, health gains are estimated in Table H4 below.

Table H4 Estimating the health benefits in lifting group 1 to consumption level of 60 lcd

Diarrhoea incidence	Total health cost (JD)	population size	
0.61	56,323,128	5,100,396	(HELI 2005:43)
0.27	24,929,909	5,100,396	(HELI 2005:43)
Health gain (JD)	31,393,219	5,100,396	

	All socio-economic categories		Socio-economic categories (poor & medium poor)	
Year of the project	Target population	Heath gain (JD)	Target population	Heath gain (JD)
1	929,162	0	357,414	0
2	959,354	0	369,027	0
3	990,526		381,018	0
4	1,022,711		393,398	0
5	1,055,942		406,181	0
6	1,090,253	6,710,568	419,379	2,581,302
7	1,125,679	6,928,615	433,006	2,665,176
8	1,162,255	7,153,747	447,076	2,751,776
9	1,200,021	7,386,194	461,603	2,841,189
10	1,239,013	7,626,194	476,601	2,933,509
11	1,279,273	7,873,993	492,088	3,028,827
12	1,320,840	8,129,843	508,077	3,127,243
13	1,363,758	8,394,007	524,586	3,228,857
14	1,408,071	8,666,754	541,632	3,333,773
15	1,453,824	8,948,364	559,231	3,442,097
16	1,501,063	9,239,124	577,402	3,553,942
17	1,549,837	9,539,332	596,164	3,669,420
18	1,600,196	9,849,294	615,535	3,788,651
19	1,652,191	10,169,328	635,535	3,911,756
20	1,705,876	10,499,761	656,186	4,038,861

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Step 5

Step 5 consists of an analysis of production costs in order to ascertain costs per m3 of water produced and water delivered to consumers

This analysis is based on WAJ 2009, Zarqa Water Administration Profit and Loss Statement for 2008

	Years																			
Table 5a: Water production analysis Zarqa Governorate (2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Without project																				
Water production	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**
Internal water sources (wells and springs)	*39,074,642*																			
Water imports	*13,060,162*																			
Authorised consumptior	**25,606,380**	25,506,847	25,407,082	25,307,086	25,206,856	25,106,393	25,005,697	24,904,767	24,803,603	24,702,204	24,600,569	24,498,699	24,396,593	24,294,250	24,191,670	24,088,853	23,985,798	23,882,505	23,778,973	23,675,202
Billed metered consumption (billing system, tankers, exports)	*24,184,161*																			
Unbilled metered consumption (free water in arid areas)	*490,706*																			
Flushing of network	*931,513*																			
Water production costs	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700
Salaries and wages (minus Sewerage Directorate & Irrigation Division)	1,743,119																			
Electricity expenses (Water Directorate total minus water treatement)	4,973,336																			
Spare parts and maintenance (Water Directorate & Desert Wells)	803,256																			
Vehicle expenses (Water Directorate/ water tankers/ desert wells)	306,998																			
General and Admin Expenses devoted to water-related staff & activities	358,614																			
Fuel expenses (minus Sewarage Directory but plus 81% of Admin Dir)	212,854																			
Water imports	4,086,524																			
***Water related salaries & wages as percentage of total salary and wage bill (JOD 2,156,313)*	81%																			
Average cost per m3 of water produced (internal plus imports	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239
Average cost per m3 of water delivered to consumer:	0.488	0.489	0.491	0.493	0.495	0.497	0.499	0.501	0.503	0.505	0.507	0.510	0.512	0.514	0.516	0.518	0.521	0.523	0.525	0.527
(authorised consumption																				
Step 6																				
Step 6 ascertains what happens production costs (with project) given																				
percentage UFW "without project"……..	68.5%	68.6%	68.7%	68.8%	69.0%	69.1%	69.2%	69.3%	69.5%	69.6%	69.7%	69.8%	70.0%	70.1%	70.2%	70.3%	70.5%	70.6%	70.7%	70.8%
but percentage UFW "with project" ……..	68.5%	68.6%	68.7%	19.5%	19.4%	19.3%	19.3%	19.2%	19.2%	19.1%	19.0%	19.0%	18.9%	18.9%	18.8%	18.8%	18.7%	18.7%	18.6%	18.5%
For the sake of the calculations it is assumed that the whole Zarqa water system is being rehabilitated and restructured. The key factors between the "without project" and "with project" scenarii is the the difference between the UFW of without & with project Making this wider assumption does not alter the calculation of unit costs of water production & delivery																				
With project																				
Percentage of connected consumers reached				30%	60%	90%	92%	94%	96%	98%	100%									
Water production	**52,134,804**	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804
Internal water sources (wells and springs)	*39,074,642*																			
Water imports	*13,060,162*																			
Authorised consumptior	**25,606,380**	**25,506,847**	**25,407,082**	**37,339,502**	**49,361,034**	**61,471,626**	**62,315,937**	**63,165,915**	**64,021,556**	**64,882,860**	**65,749,825**	**65,796,493**	**65,842,879**	**65,888,985**	**65,934,811**	**65,980,360**	**66,025,632**	**66,070,630**	**66,115,353**	**66,159,804**
The quanity of water delivered to consumers with project																				
We do not expect any energy saving of note due to the project works. At present the water is pumped from low-level pumping stations up to high-level reservoirs, and from there by gravity into the distribution network for customers' supply. There will in fact be more water pumped to higher elevations than at present, but there will be a trade-off in that the pumping to a reservoir can be done with steady state pumping which is more energy efficient. In overall terms no energy saving of note is envisaged. (NOD/ACEPO engineers 2010)																				
Water production costs	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700
Salaries and wages (minus Sewerage Directorate & Irrigation Division)	1,743,119																			
Electricity expenses (Water Directorate total minus water treatement)	4,973,336																			
Spare parts and maintenance (Water Directorate & Desert Wells)	803,256																			
Vehicle expenses (Water Directorate/ water tankers/ desert wells)	306,998																			
General and Admin Expenses devoted to water-related staff & activities	358,614																			
Fuel expenses (minus Sewarage Directory but plus 81% of Admin Dir)	212,854																			
Water imports	4,086,524																			
***Water related salaries & wages as percentage of total salary and wage bill (JOD 2,156,313)*	81%																			
Average cost per m3 of water produced (internal plus imports	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239
Average cost per m3 of water delivered to consumer:	0.488	0.489	0.491	0.334	0.253	0.203	0.200	0.198	0.195	0.192	0.190	0.190	0.190	0.189	0.189	0.189	0.189	0.189	0.189	0.189
(authorised consumption																				
Water production & delivery savings per m3 (years 1-20	0.000000	0.000000	0.000000	0.158972	0.242364	0.294175	0.298929	0.303648	0.308334	0.312989	0.317615	0.319859	0.322126	0.324414	0.326725	0.329059	0.331415	0.333795	0.336199	0.338627
(Year 3)																				

Table 5b Opportunity cost to WAJ for not investing: cost of	**Years**																			
additional water required (without project)and loss of surpluse	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
(with project)																				
Without project																				
Quantities of water (m³)	0	693,174	1,406,995	2,142,139	2,899,304	3,679,214	4,482,613	5,310,271	6,162,984	7,041,575	7,946,891	8,879,811	9,841,240	10,832,114	11,853,400	12,906,097	13,991,236	15,109,883	16,263,139	17,452,141
Cost (JD)	0	337,965	685,997	1,044,426	1,413,591	1,793,845	2,185,552	2,589,087	3,004,837	3,433,205	3,874,603	4,329,459	4,798,215	5,281,328	5,779,268	6,292,523	6,821,596	7,367,006	7,929,290	8,509,002
With project																				
Quantities of water (m³)	0	693,174	1,406,995	-6,245,506	-14,017,505	-21,908,307	-21,890,533	-21,857,885	-21,809,523	-21,744,575	-21,662,137	-20,964,387	-20,237,840	-19,481,508	-18,694,369	-17,875,367	-17,023,409	-16,137,368	-15,216,078	-14,258,334
Cost (JD)	0	337,965	685,997	-3,045,072	-6,834,404	-10,681,660	-10,672,994	-10,657,076	-10,633,496	-10,601,830	-10,561,637	-10,221,440	-9,867,204	-9,498,445	-9,114,666	-8,715,351	-8,299,969	-7,867,969	-7,418,783	-6,951,823
Opportunity cost to WAJ for not investing	0	0	0	4,089,497	8,247,995	12,475,505	12,858,546	13,246,163	13,638,334	14,035,035	14,436,240	14,550,899	14,665,419	14,779,773	14,893,934	15,007,875	15,121,565	15,234,975	15,348,073	15,460,825

The analysis only includes costs relating to the provision of network water both for residents and non-residents. Hence it excludes costs relating to the sewerage directorate, and waste water treatment. The figures for cost reduction "with project" are provisional and will be updated by data from the work of the engineers.

The analysis in this worksheet is conducted for the Zarqa Governorate as a whole, since the data provided (WAJ 2009) are governorate-wide and for that reason it is assumed for the sake of the analysis that the reduction in water leakage "with project" is applicable to the whole governorate.

The ultimate goal of the analysis is to ascertain savings in the production & delivery of network water "with project" for the whole governorate (see cell b 80 below).

The findings of this work sheet feed into the "CBA" worksheet.

There is an adjustment for the fact that pumping at wells is subsidized at JD0.043 per Kw instead of the industrial rate of JD0.050

Source: NOD/ACEPO engineers

Source: NOD/ACEPO engineers

Zarqa Water Supply Feasibility Study. Full List of IMP Projects. Work-sheet "CBA"

Table 6 Cost benefit analysis summary		Cost	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
		Totals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Across	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
		20 years																				
Investment costs without project			3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154	3,846,154							
(Natural development of network to connect new HHs)																						
Investment costs with project		***252,738,237***	3,705,564	22,293,751	30,284,404	32,928,728	32,188,536	35,074,363	14,819,874	14,819,874	14,819,874	14,819,874	7,396,679	7,396,679	7,396,679	7,396,679	7,396,679	0	0	0	0	0
Phase 1 (MCC) direct investment in MCC priority areas		***73,496,192***	0	7,471,495	17,049,348	19,693,672	18,953,480	10,328,197														
Phase 1 (MCC) strategic infrastructure		***1,984,000***	396,800	1,587,200																		
Phase (TBD) direct investment in the sub-districts		***61,054,550***	2,284,618	9,138,473	13,235,056	13,235,056	13,235,056	9,926,292														
Phase (TBD) strategic infrastructure		***5,120,729***	1,024,146	4,096,583																		
Phase 2 direct investment in the WSA		***44,287,856***						8,857,571	8,857,571	8,857,571	8,857,571	8,857,571										
Phase 2: strategtic infrastructure		***29,811,513***						5,962,303	5,962,303	5,962,303	5,962,303	5,962,303										
Phase 3: direct investment in the WSA		***4,257,465***											851,493	851,493	851,493	851,493	851,493					
Phase 3: strategic infrastructure		***32,725,932***											6,545,186	6,545,186	6,545,186	6,545,186	6,545,186					
NOD/ACEPO engineers have provided these costings and																						
are responsible for the details. The costs are inclusive of																						
construction and ancillary costs including management costs.																						
Percentage of costs assigned to domestic consumers	100%	***252,738,237***	3,705,564	22,293,751	30,284,404	32,928,728	32,188,536	35,074,363	14,819,874	14,819,874	14,819,874	14,819,874	7,396,679	7,396,679	7,396,679	7,396,679	7,396,679	0	0	0	0	0
130,987,974	(NPV)																					
Water production & delivery savings (domestic water 85%)					0	2,951,004	4,481,192	5,417,478	5,482,952	5,547,032	5,609,759	5,671,168	5,731,297	5,747,905	5,764,509	5,781,107	5,797,702	5,814,291	5,830,878	5,847,460	5,864,040	5,880,616
Water production & delivery savings per m3 (years 1-20)			0	0	0	0.15897188	0.24236363	0.2941748	0.298929	0.30364828	0.30833444	0.3129893	0.31761451	0.319859458	0.322125973	0.324414425	0.3267252	0.32905863	0.3314151	0.33379514	0.336199	0.33862714
Quantity of water involved			*18,782,594*	*18,709,586*	*18,636,407*	*18,563,058*	*18,489,538*	*18,415,848*	*18,341,986*	*18,267,953*	*18,193,747*	*18,119,370*	*18,044,819*	*17,970,097*	*17,895,200*	*17,820,131*	*17,744,887*	*17,669,470*	*17,593,878*	*17,518,111*	*17,442,169*	*17,366,051*
32,949,351	(NPV)																					
Opportunity cost to WAJ for not investing in rehabilitation & restructuring			0	0	0	4,089,497	8,247,995	12,475,505	12,858,546	13,246,163	13,638,334	14,035,035	14,436,240	14,550,899	14,665,419	14,779,773	14,893,934	15,007,875	15,121,565	15,234,975	15,348,073	15,460,825
61,210,626	(NPV)																					
Total savings from switching from shop and tanker water			0	0	0	3,880,910	8,018,100	12,424,264	13,119,701	13,847,516	14,609,091	15,405,861	16,239,319	16,775,510	17,329,406	17,901,590	18,492,666	19,103,259	19,734,012	20,385,592	21,058,685	21,754,003
(domestic water). Not possible to make calculations for non-domestic consumers.																						
68,395,263	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcd			0	0	0	0	0	6,710,568	6,928,615	7,153,747	7,386,194	7,626,194	7,873,993	8,129,843	8,394,007	8,666,754	8,948,364	9,239,124	9,539,332	9,849,294	10,169,328	10,499,761
30,670,859	(NPV)																					
Net benefit stream (excluding costs without project)			**-3,705,564**	**-22,293,751**	**-30,284,404**	**-22,007,316**	**-11,441,249**	**1,953,452**	**23,569,939**	**24,974,584**	**26,423,504**	**27,918,385**	**36,884,169**	**37,807,479**	**38,756,662**	**39,732,545**	**40,735,987**	**49,164,549**	**50,225,786**	**51,317,320**	**52,440,125**	**53,595,205**
	(ERR)		**20%**	This is an underestimation as benefits to non-domestic consumers could not be calculated in the absence of data on the consumption of shop and tanker water by non-domestic consumers.																			
Net benefit stream (including costs without project)			**140,590**	**-18,447,597**	**-26,438,250**	**-18,161,162**	**-7,595,095**	**5,799,606**	**27,416,093**	**28,820,738**	**30,269,658**	**31,764,538**	**40,730,323**	**41,653,633**	**42,602,815**	**39,732,545**	**40,735,987**	**49,164,549**	**50,225,786**	**51,317,320**	**52,440,125**	**53,595,205**
	(ERR)		**26%**																			
Sensititivy analysis (excluding costs without project)																						
Net benefit stream with 10% increase in costs			-4,076,120	-24,523,126	-33,312,844	-25,300,189	-14,660,102	-1,553,984	22,087,952	23,492,597	24,941,517	26,436,397	36,144,501	37,067,811	38,016,994	38,992,877	39,996,319	49,164,549	50,225,786	51,317,320	52,440,125	53,595,205
	(ERR)		**18%**																			
Net benefit streamt with 10% reduction in benefits			-3,705,564	-22,293,751	-30,284,404	-23,099,457	-13,515,977	-1,749,329	19,730,958	20,995,138	22,299,166	23,644,559	32,456,084	33,287,063	34,141,327	35,019,623	35,922,720	44,248,094	45,203,208	46,185,588	47,196,113	48,235,685
	(ERR)		**17%**																			
Net benefit stream with 10% increase in costs and 10% reduction in benefits			-4,076,120	-24,523,126	-33,312,844	-26,392,330	-16,734,831	-5,256,765	18,248,970	19,513,151	20,817,179	22,162,571	31,716,416	32,547,395	33,401,660	34,279,955	35,183,052	44,248,094	45,203,208	46,185,588	47,196,113	48,235,685
	(ERR)		**15%**																			
Sensitivity analysis (including costs without project)																						
Net benefit stream with 10% increase in costs			-229,966	-20,676,972	-29,466,690	-21,454,035	-10,813,948	2,292,170	25,934,106	27,338,751	28,787,670	30,282,551	39,990,655	40,913,965	41,863,147	38,992,877	39,996,319	49,164,549	50,225,786	51,317,320	52,440,125	53,595,205
	(ERR)		**22%**																			
Net benefit stream with 10% reduction in benefits			140,590	-18,447,597	-26,438,250	-19,253,304	-9,669,824	2,096,825	23,577,112	24,841,292	26,145,320	27,490,713	36,302,238	37,133,217	37,987,481	35,019,623	35,922,720	44,248,094	45,203,208	46,185,588	47,196,113	48,235,685
ERR	(ERR)		**23%**																			
Net benefit stream with 10% increase in costs and 10% reduction in benefits			-229,966	-20,676,972	-29,466,690	-22,546,176	-12,888,677	-1,410,611	22,095,124	23,359,305	24,663,333	26,008,725	35,562,570	36,393,549	37,247,813	34,279,955	35,183,052	44,248,094	45,203,208	46,185,588	47,196,113	48,235,685
	(ERR)		**20%**																			

Table 7 Beneficiary Analysis

Poor and medium poor socio-economic categories.																						
Total savings from switching from shop and tanker water (both socio-economic categories combined)			0	0	0	907,405	1,874,732	2,904,949	3,067,550	3,237,723	3,415,788	3,602,083	3,796,956	3,922,324	4,051,832	4,185,616	4,323,817	4,466,581	4,614,059	4,766,406	4,923,784	5,086,358
15,991,669	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcd			0	0	0	0	0	2,581,302	2,665,176	2,751,776	2,841,189	2,933,509	3,028,827	3,127,243	3,228,857	3,333,773	3,442,097	3,553,942	3,669,420	3,788,651	3,911,756	4,038,861
11,797,919	(NPV)																					
For each JD invested, how much will the two poorest groups benefit	0.21		(JD)																			
Richer socio-economic category																						
Total savings from switching from shop and tanker water (richer socio-economic category)			0	0	0	2,973,505	6,143,368	9,519,316	10,052,150	10,609,794	11,193,303	11,803,777	12,442,363	12,853,186	13,277,574	13,715,974	14,168,849	14,636,678	15,119,953	15,619,185	16,134,901	16,667,644
52,403,594	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcd			0	0	0	0	0	4,129,266	4,263,439	4,401,971	4,545,005	4,692,686	4,845,166	5,002,600	5,165,150	5,332,982	5,506,267	5,685,182	5,869,912	6,060,643	6,257,572	6,460,900
18,872,939	(NPV)																					
For each JD invested, how much will the richer socio-economic group benefit	0.54		(JD)																			
WAJ																						
Total benefits (savings and opportunity gains)			0	0	0	7,040,502	12,729,187	17,892,983	18,341,498	18,793,195	19,248,093	19,706,204	20,167,536	20,298,805	20,429,928	20,560,881	20,691,636	20,822,166	20,952,442	21,082,435	21,212,112	21,341,442
87,477,647	(NPV)																					
For each JD invested, how much will WAJ benefit	0.67		(JD)																			

CBA sum: M O'Leary 11.11.09

Zarqa Water Supply Feasibility Study. Selected List of PIP MCC Priority Projects. Work-sheet "Socecon"

Step 1
Step 1 ascertains the percentage of households that belong to the key socio-economic groupings of the TOR, namely, <$ 2, $2 - $4, and >$4.
PPP exchange rates for the USA $1 (2005) are used (see the Global Purchasing Power Parities and Real Expenditure: 2005 International Comparison Program, IBRD World Bank 2008)

Income per capita per day ($)	**Income per capita per day (JOD)**		**Annual income per capita (JOD)**	**Mean nr per household**	**Annual income per household (JOD)**	**Monthly income per household (JOD)**
2	0.7600	365	277	6	1,664	139
4	1.5200	365	555	6	3,329	277
PPP exchange rate			1			
US$ 1= .38 JOD	0.38					

			Zarqa sub-district……		Ruseifa sub-district……		Berein sub-district……		Hashameer sub-district		Dhilail sub-district……		Ashraq sub-district……	
Income per capita per day ($)	**Annual income per household (JOD)**	% of households	% of households (cumulative)	% of households	% of households (cumulative)	% of households	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)	% of house	% of households (cumulative)
< 2	<1664	6.2%	6.2%	5.1%	5.1%	7.9%	7.9%	3.8%	3.8%	4.1%	4.1%	8.0%	8.0%	14.7%	14.7%
Between 2-4	Between 1664-3329	32.3%	38.5%	27.0%	32.1%	40.6%	48.5%	37.2%	41.0%	22.4%	26.5%	39.3%	47.3%	38.0%	52.7%
> 4	>3329	61.5%	100.0%	67.9%	100.0%	51.5%	100.0%	59.0%	100.0%	73.5%	100.0%	52.7%	100.0%	47.3%	100.0%
		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%	

Income Groups 2006 (JOD per annum)				Zarqa sub-district……			Ruseifa sub-district……			Berein sub-district……			Hashameer sub-district…….			Dhilail sub-district……			Ashraq sub-district……		
			Nr households	% of households	% of households (cumulative)	% of households	% of households (cumulative)		% of households	% of households (cumulative)		% of house	% of households (cumulative)		Nr household	% of households (cumulative)		Nr household	% of households (cumulative)		Nr household	% of households (cumulative)	
Low income group	<	1,800	9,786	6.7%	6.7%	4,208	5.5%	5.5%	4,492	8.5%	8.5%	88	4.1%	4.1%	382	4.4%	4.4%	382	8.6%	8.6%	235	15.9%	15.9%
64.4%	1,800	2,400	14,742	10.1%	16.8%	5,749	7.5%	12.9%	7,563	14.3%	22.8%	280	13.0%	17.1%	545	6.3%	10.7%	383	8.6%	17.3%	236	15.9%	31.8%
	2,400	3,000	21,634	14.8%	31.5%	9,281	12.1%	25.0%	9,865	18.7%	41.5%	281	13.0%	30.1%	1168	13.5%	24.3%	822	18.5%	35.8%	238	16.1%	47.9%
	3,000	3,600	18,549	12.7%	44.2%	9,942	12.9%	37.9%	6,770	12.8%	54.3%	427	19.8%	49.9%	352	4.1%	28.3%	927	20.9%	56.7%	130	8.8%	56.7%
	3,600	4,200	16,389	11.2%	55.4%	8,276	10.8%	48.7%	6,572	12.4%	66.7%	426	19.8%	69.7%	541	6.3%	34.6%	475	10.7%	67.4%	98	6.6%	63.3%
	4,200	4,800	13,228	9.0%	64.4%	7,566	9.8%	58.5%	3,863	7.3%	74.0%	238	11.0%	80.7%	1177	13.6%	48.2%	278	6.3%	73.7%	93	6.3%	69.6%
Midde income group	4,800	5,400	11,578	7.9%	72.3%	6,900	9.0%	67.5%	3,265	6.2%	80.2%	139	6.5%	87.2%	741	8.6%	56.8%	463	10.4%	84.1%	58	3.9%	73.5%
28.4%	5,400	6,000	7,386	5.0%	77.4%	4,306	5.6%	73.1%	2,083	3.9%	84.2%	44	2.0%	89.2%	569	6.6%	63.4%	288	6.5%	90.6%	96	6.5%	80.0%
	6,000	7,000	11,141	7.6%	85.0%	6,272	8.2%	81.3%	3,220	6.1%	90.3%	0	0.0%	89.2%	1315	15.2%	78.6%	201	4.5%	95.2%	134	9.1%	89.1%
	7,000	8,000	6,365	4.3%	89.3%	4,265	5.5%	86.8%	1,674	3.2%	93.4%	45	2.1%	91.3%	178	2.1%	80.7%	108	2.4%	97.6%	95	6.4%	95.5%
	8,000	9,000	5,140	3.5%	92.8%	3,691	4.8%	91.6%	771	1.5%	94.9%	46	2.1%	93.5%	565	6.5%	87.2%	0	0.0%	97.6%	67	4.5%	100.0%
High income group	9,000	10,000	3,025	2.1%	94.9%	1,755	2.3%	93.9%	1,116	2.1%	97.0%	51	2.4%	95.8%	0	0.0%	87.2%	106	2.4%	100.0%	0	0.0%	100.0%
7.2%	10,000	12,000	3,007	2.1%	97.0%	1,431	1.9%	95.8%	965	1.8%	98.8%	45	2.1%	97.9%	565	6.5%	93.7%	0	0.0%	100.0%	0	0.0%	100.0%
	12,000	14,000	2,093	1.4%	98.4%	1,614	2.1%	97.9%	299	0.6%	99.4%	0	0.0%	97.9%	180	2.1%	95.8%	0	0.0%	100.0%	0	0.0%	100.0%
	>14000		2,369	1.6%	100.0%	1,642	2.1%	100.0%	322	0.6%	100.0%	45	2.1%	100.0%	360	4.2%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%
			146,432	100.0%		76,898			52,840			2,155			8,638			4,433			1,480		

Source: HEIS 2006, Department of Statistics

Adjustments at the income boundaries			Zarqa sub-district……		Ruseifa sub-district……		Berein sub-district……		Hashameer sub-district…….		Dhilail sub-district……		Ashraq sub-district……	
			Nr households	% of households	Nr households	% of households	Nr households	% of households	Nr household	% of households	Nr household	% of households	Nr household	% of households
<	1,800	9,786	6.7%	4,208	5.5%	4,492	8.5%	88	4.1%	382	4.4%	382	8.6%	235	15.9%
<	1,664	9,049	6.2%	3,891	5.1%	4,154	7.9%	81	3.8%	353	4.1%	353	8.0%	217	14.7%
1,664	1,800	737	0.5%	317	0.4%	338	0.6%	7	0.3%	29	0.3%	29	0.6%	18	1.2%
3,000	3,600	18,549	12.7%	9,942	12.9%	6,770	12.8%	427	19.8%	352	4.1%	927	20.9%	130	8.8%
3,000	3,329	10,165	6.9%	5,448	7.1%	3,710	7.0%	234	10.9%	193	2.2%	508	11.5%	71	4.8%
3,329	3,600	8,384	5.7%	4,494	5.8%	3,060	5.8%	193	9.0%	159	1.8%	419	9.5%	59	4.0%

Analysis of socio-economic breakdown of population of MCC priority areas

WSA	Population connected (NOD/ACEPO)	Population (host)	Zarqa sub-district (host) population	Zarqa sub-district <$2	Zarqa sub-district between $2-$4	Zarqa sub-district >$4	Russaifah (host population)	Russaifah <$2	Russaifah between $2-$4	Russaifah >$4	Host Population of MCC priority areas <$2	$2-$4	>$4	
Tatweer	8,501	8,673	8,673	439	2,345	5,889								
Zarqa	226,821	231,407	231,407	11,709	62,579	157,120								
Awajan	149,171	152,187	152,187	7,701	41,155	103,331								
Russaifah	91,034	92,875					92,875	7,301	37,748	47,826				
Total	475,527	485,142	392,268	19,849	106,079	266,340	92,875	7,301	37,748	47,826	27,149	143,828	314,166	in real numbers
											5.60%	29.65%	64.76%	percentage terms
Connection rate	98.02%													

Please note Tatweer, Zarqa and Awajan WSA lie within the Zarqa sub-district and obviously Russaifa WSA lies within Russaifa sub-district
The North WSA belongs to Hashmeer sub-district and West-NW WSA lies within Berein sub-district

Zarqa Water Supply Feasibility Study. Selected List of PIP MCC Priority Projects. Work-sheet "Wcon"

Step 2 is to assess the structure of water distribution across the three socio-economic groups outlined in the TOR

From the analysis conducted in step 1 it is shown that the percentage of the population in each socio-economic group in the MCC priority areas is as follows:

<$2	**5.6%**
$2-$4	**29.6%**
>$4	**64.8%**

(for details of the analysis see worksheet "Socecon")

Proportionate shares across socio-economic categores (assumptions)

	<$2	$2 - $4	>$4
Shop water shares	1	1.5	3
Tanker water	1	1	2

Percentage water shares across water type and socio-economic category

	network water (percentage)	tanker water (share)	tanker water (percentage)	shop water (share)	shop water (percentage)
<$2	5.6%	1	3.4%	1	2.3%
$2-$4	29.6%	7	18.0%	8	18.2%
>$4	**64.8%**	32	78.6%	35	79.5%
	100%		100%		100%

These figures represent the distribution of network water across the three main socio-economic groupings based on the 2008 billing data. The ECO Consult draft report indicates that there is no relationship between income and the quanitity of network water received. However, the distribution of shop and tanker water across socio-economic categories remains unknown. In the absence of data assumptions are made; and these assumptions apply only to the beneficiary analysis

Values of key independent (or input) variables are outlined here, appropriately referenced:

Average annual tanker water consumption per household (m3/hse/a)	13.535	(ECO Consult 2010:calculated from raw data and adjusted to HH size)
		This is an under-estimate as ECO Consult figures are based on one quarter.
Average annual shop water consumption per household (m3/hse/a)	1.521	(GFA Aug 2008 raw data analysed)
Price of shop water (JOD/m3)	52.826	NOD/ACEPO engineers
Price of tanker water (JOD/m3) (conservative)	4	(GFA Aug 2008:107)
Average size of household (HH)	7.083	Based on DOS Zarqa population 2008, 98.02% connection rate.

N.B. HH size in demographic data refers to person sharing the same roof. Here in the context of the water sector, HH refers to multiple HHs that share the same water meter.

	lcd	m³/HH / annum
The model below (table 1:last row) shows average consumption of all types of water is	62	161
The model also shows (table 1:first row) average consumption of network water only is	56	146

The findings are only shown here but the analysis is conducted on the excel file of the 2008 billing data and based on the certain assumptions which were necessary as the 2008 billing data (in contrast to the 2006 billing data) does not distinguish between domestic and non-domestic consumers.

Hence, in order to distinguish between domestic and non-dometic consumption the following assumptions were used:

<i> the quantities of water consumed by domestic HHs and non-domestic units are based on the 2006 billing data as 85% and 15% respectively;

<ii> units that did not consume any water in 2008 are excluded from the analysis. Some of them were only registered in 2009.

<iii> units that consume quantities >265 lcd are assumed to be non-domestic.

The relevant conclusions of the analysis is outline in Table 1 below under network water in terms of HHs and quantities of water consumed.

The breakdown of domestic consumers in terms of eleven consumption bands is shown in worksheet "Heli". More specifically 51.44% of HHs consume less than 50 lcd which is a figure close to the findings of the EC Consult survey of 49.5%.

Soc econ cat (HEIS 06)	Annual water consumption (total) (m3)	Annual water consumption per HH (average) (m3)	lcd	Nr HH	Water revenue (total) (JOD)	Water expenditure per HH (JOD)	Price/ m3 /socio-econ cat (JOD)
Table 1: Supplies of water to households in Zarqa Governorate: network, shop and tanker water (based on 2008 billing data)							
	Network water						
Total	**17,600,328**	**146**	**56**	**120,611**	**3,874,082**	**32**	0.22
<$2	**0**	**0**	**0**	**0**	0	**0**	0.00
$2-$4	**0**	**0**	**0**	**0**	0	**0**	0.00
>$4	**0**	**0**	**0**	**0**	0	**0**	0.00
	Shop water						
Total	183,471	2	1	120,611	9,692,035	80	53
<$2							
$2-$4							
>$4							
	Tanker water						
Total	1,632,498	14	5	120,611	2,483,321	21	1.5
<$2							
$2-$4							
>$4							
	Shop & tanker water						
Total	1,815,969	15	6	120,611	12,175,356	101	
<$2							
$2-$4							
>$4							
	Network, shop & tanker water						
Total	19,416,297	161	62	120,611	16,049,438	133	
<$2							
$2-$4							
>$4							

Step 3																		
A baseline (2010) model of water consumption based on table 1 above is generated. The 2010 population that is connected to the WAJ network is:																		
507,454	This figure refers to HHs with consumption <265 lcd, as the analysis assumes no HHs consume >265 lcd.						For details see											
see worksheet "Heli" section (a). The 2010 population including those not connected is:					517,189	(for details see "Heli" section (d))												
Table 2 Supplies of water to targeted households: network, bottled and tanker water (without project)							BASELINE											
network	**target pop**	**current pop**	**hse incr**	**incr water**	**current water demand**		2010											
10,454,745	**507,454**	**507,454**	**0**	**0**	11,533,446	0												
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3											
Total	10,454,745	146	56	71,644	2,301,238	32	0.22											
<$2	585,060	0	0	4,009	0	0	0.00											
$2-$4	3,099,461	0	0	21,240	0	0	0.00											
>$4	6,770,224	0	0	46,395	0	0	0.00											
	Shop water																	
Total	108,983	2	1	71,644	5,757,151	80.35780185	53											
<$2																		
$2-$4																		
>$4																		
	Tanker water																	
Total	969,718	14	5	71,644	3,878,871	54	4.0											
<$2																		
$2-$4																		
>$4																		
	Network, shop & tanker water																	
Total	11,533,446	161	62	71,644	11,937,260	167												
<$2																		
$2-$4																		
>$4																		

Step 4							
Step 4 consists in assessing annual models of water consumption over the 20 years of the life of the project (2010-2029) taking into account population growth and "without project" and "with project" scenarios.							
The following additional assumptions are made:							
Population and connectivity parameters							
Annual population growth rate:	3.25%		Generated by the masterplan CBA model				
Population (2008)	485,142		Source: NOD/ ACEPO engineers				
Population (2029)	949,643		Source: NOD/ ACEPO engineers				
Baseline data (2010)	517,189		Generated by the CBA model				
Percentage of population connected (2008)	98.02%		Source: NOD/ ACEPO engineers				
Percentage of population connected (2029)	99.07%		Source: NOD/ ACEPO engineers				
Average annual increase in population connected	0.05%		Generated by the CBA model				
Percentage of population connected (2010)	98.12%		Generated by the CBA model				
UFW parameters							
UFW physical as % of total system input, without project (2008)	63.60%	70hrs/wk	Source: NOD/ ACEPO engineers				
UFW physical as % of total system input, without project (2010)	63.9%	70hrs/wk	Generated by the CBA model				
UFW physical as % of total system input,without project (2029)	66.4%	70hrs/wk	Source: NOD/ ACEPO engineers				
Average annual % change to UFW physical without project (2010-2029)	0.2%	70hrs/wk	Generated by the CBA model				
UFW administrative as % of total system input, without project (2008)	5.2%	70hrs/wk	Source: NOD/ ACEPO engineers				
UFW administrative as % of total system input, without project (2010)	5.2%	70hrs/wk	Generated by the CBA model				
UFW administrative as % of total system input, without project (2029)	5.0%	70hrs/wk	Source: NOD/ ACEPO engineers				
Average annual % change to UFW administrative without project (2010 -	-0.2%	70hrs/wk	Generated by the CBA model				
UFW physical as % of total system input, with project (2008)	13.8%	70hrs/wk	Source: NOD/ ACEPO engineers	The 2008 & 2010 UFW figures with project			
UFW physical as % of total system input, with project (2010)	13.7%	70hrs/wk	Generated by the CBA model	are hypothetical for the sake of the			
UFW physical as % of total system input,with project (2029)	12.4%	70hrs/wk	Source: NOD/ ACEPO engineers	engineering calculations. In reality UFW			
Average annual % change to UFW physical with project (2010-2030)	-0.5%	70hrs/wk	Generated by the CBA model	with project is only realised in year 3 of the			
UFW administrative as % of total system input, with project (2008)	6.7%	70hrs/wk	Source: NOD/ ACEPO engineers	life of the project.			
UFW administrative as % of total system input, with project (2010)	6.7%	70hrs/wk	Generated by the CBA model				
UFW administrative as % of total system input, with project (2029)	6.9%	70hrs/wk	Source: NOD/ ACEPO engineers				
Average annual % change to UFW administrative with project	0.1%	70hrs/wk	Generated by the CBA model				
Percentage of HHs affected adversely by UFW administrative	89.0%		Source: NOD/ ACEPO engineers				
Consumption of shop water is reduced "with project" by 50%	50%	(Conjecture that can be modified with evidence					
(Currently, this is conjecture. But it is not foreseen that all HHs particulary the richer ones will not totally give up the use of shop water as it is used for drinking and cooking. However, the quality of the additional network water would be significant in this decision.							
On the other hand, tanker water will be easily subsituted for additional network water on a one to one basis when available, as it is mainly relied upon when network water is not available and usually not for drinking and cooking (unless treated) but for more general domestic uses. This has been borne out by the ECO Consult draft report.							
The model assumes that benefits of the proposed project only are realised in year 3 of the life of the project. Up till then the network operates in accordance with UFW figures "without project" as outlined above.							

Table 3: Supplies of water to targeted households: network, shop and tanker water							**2010**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**1**
10,454,745	0	**517,189**	**507,454**	**11,533,446**	0		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,454,745	146	56	71,644	2,301,238	32	0.22
<$2	585,060	146	56	4,009	0	0	0.00
$2-$4	3,099,461	146	56	21,240	0	0	0.00
>$4	6,770,224	146	56	46,395	0	0	0.00
	Shop water						
Total	108,983	2	1	71,644	5,757,151	80	53
<$2	2,496						
$2-$4	19,835						
>$4	86,652						
	Tanker water						
Total	969,718	14	5	71,644	3,878,871	54	4
<$2	32,937						
$2-$4	174,491						
>$4	762,289						
	Network, shop & tanker water						
Total	11,533,446	161	62	71,644	11,937,260	167	
<$2							
$2-$4							
>$4							

Given the variety of variables it was thought necessary to devote separate "without project" and "with project" tables for each of the 20 years of the life of the project. However, the 40 tables feed off variables that are identified at the top of the worksheet, such as the size of population, population growth years, quanities of water used, water prices etc. These can be changed at the top of the worksheet, and the changes will be fed electronically and automatically to all the 40 tables for those who wish to explore different scenarii, and onward to the summary CBA worksheet where the ERR is decided.

The data generated by these 40 tables is fed into the more traditional worksheets "hsehold", "prod" and "CBA".

Supplies of water to targeted households: network, shop and tanker water							**2010**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**1**
10,454,745	0	**517,189**	**507,454**	**11,533,446**	0		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,454,745	146	56	71,644	2,301,238	32	0.22
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$2-$4	3,099,461	146	56	21,240	0	0	0.00
>$4	6,770,224	146	56	46,395	0	0	0.00
	Shop water						
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>$4	86,652						
	Tanker water						
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<$2	32,937						
$2-$4	174,491						
>$4	762,289						
	Network, shop & tanker water						
Total	11,533,446	161	62	71,644	11,937,260	167	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2011**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**2**
10,414,107	385,906	**517,189**	**524,213**	**11,914,338**	1		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	10,414,107	141	54	74,010	2,292,293	31	0.22
<$2	582,786	141	54	4,142	0	0	0.00
$2-$4	3,087,413	141	54	21,941	0	0	0.00
>$4	6,743,908	141	54	47,927	0	0	0.00
	Shop water						
Total	112,582	2	1	74,010	5,947,281	80	53
<$2	2,578						
$2-$4	20,490						
>$4	89,514						
	Tanker water						
Total	1,001,743	14	5	74,010	4,006,970	54	4
<$2	34,025						
$2-$4	180,254						
>$4	787,464						
	Network, shop & tanker water						
Total	11,914,338	161	62	74,010	12,246,545	165	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2011**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**2**
10,414,107	385,906	**517,189**	**524,213**	**11,914,338**	1		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	10,414,107	141	54	74,010	2,292,293	31	0.22
<$2	582,786	141	54	4,142	0	0	0.00
$2-$4	3,087,413	141	54	21,941	0	0	0.00
>$4	6,743,908	141	54	47,927	0	0	0.00
	Shop water						
Total	112,582	2	1	74,010	5,947,281	80	53
<$2	2,578						
$2-$4	20,490						
>$4	89,514						
	Tanker water						
Total	1,001,743	14	5	74,010	4,006,970	54	4
<$2	34,025						
$2-$4	180,254						
>$4	787,464						
	Network, shop & tanker water						
Total	11,914,338	161	62	74,010	12,246,545	165	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2012**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**3**
10,373,375	783,309	**517,189**	**541,525**	**12,307,809**	2		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	10,373,375	136	52	76,454	2,283,327	30	0.22
<$2	580,507	136	52	4,278	0	0	0.00
$2-$4	3,075,337	136	52	22,666	0	0	0.00
>$4	6,717,531	136	52	49,510	0	0	0.00
	Shop water						
Total	116,301	2	1	76,454	6,143,690	80	53
<$2	2,664						
$2-$4	21,167						
>$4	92,470						
	Tanker water						
Total	1,034,825	14	5	76,454	4,139,301	54	4
<$2	35,149						
$2-$4	186,206						
>$4	813,470						
	Network, shop & tanker water						
Total	12,307,809	161	62	76,454	12,566,318	164	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2012**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**3**
10,373,375	783,309	**517,189**	**541,525**	**12,307,809**	2		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenu	water revenue / hse	water prices/ m3
Total	10,373,375	136	52	76,454	2,283,327	30	0.22
<$2	580,507	136	52	4,278	0	0	0.00
$2-$4	3,075,337	136	52	22,666	0	0	0.00
>$4	6,717,531	136	52	49,510	0	0	0.00
	Shop water						
Total	116,301	2	1	76,454	6,143,690	80	53
<$2	2,664						
$2-$4	21,167						
>$4	92,470						
	Tanker water						
Total	1,034,825	14	5	76,454	4,139,301	54	4
<$2	35,149						
$2-$4	186,206						
>$4	813,470						
	Network, shop & tanker water						
Total	12,307,809	161	62	76,454	12,566,318	164	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2013**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**4**
10,332,547	1,192,586	**517,189**	**559,409**	**12,714,275**	3		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,332,547	131	51	78,979	2,274,340	29	0.22
<$2	578,222	131	51	4,420	0	0	0.00
$2-$4	3,063,234	131	51	23,414	0	0	0.00
>$4	6,691,092	131	51	51,145	0	0	0.00
	Shop water						
Total	120,141	2	1	78,979	6,346,586	80	53
<$2	2,752						
$2-$4	21,866						
>$4	95,524						
	Tanker water						
Total	1,069,000	14	5	78,979	4,276,001	54	4
<$2	36,309						
$2-$4	192,356						
>$4	840,335						
	Network, shop & tanker water						
Total	12,714,275	161	62	78,979	12,896,927	163	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2013**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**4**
15,339,982	-3,476,128	**517,189**	**559,409**	**12,714,275**	30%	3	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	15,339,982	194	75	78,979	3,376,548	43	0.22
<$2	858,444	194	75	4,420	0	0	0.00
$2-$4	4,547,760	194	75	23,414	0	0	0.00
>$4	9,933,778	194	75	51,145	0	0	0.00
	Shop water						
Total	102,120	1	1	78,979	5,394,598	68	53
<$2	2,339						
$2-$4	18,586						
>$4	81,195						
	Tanker water						
Total	748,300	9	4	78,979	2,993,201	38	4
<$2	25,417						
$2-$4	134,649						
>$4	588,234						
	Network, shop & tanker water						
Total	16,190,403	205	79	78,979	11,764,347	149	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2014**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**5**
10,291,625	1,614,126	**517,189**	**577,883**	**13,134,164**	4		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,291,625	126	49	81,587	2,265,333	28	0.22
<$2	575,932	126	49	4,566	0	0	0.00
$2-$4	3,051,102	126	49	24,188	0	0	0.00
>$4	6,664,592	126	49	52,834	0	0	0.00
	Shop water						
Total	124,109	2	1	81,587	6,556,182	80	53
<$2	2,842						
$2-$4	22,588						
>$4	98,679						
	Tanker water						
Total	1,104,304	14	5	81,587	4,417,216	54	4
<$2	37,509						
$2-$4	198,708						
>$4	868,087						
	Network, shop & tanker water						
Total	13,134,164	161	62	81,587	13,238,731	162	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2014**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**5**
20,407,636	-7,802,070	**517,189**	**577,883**	**13,134,164**	60%	4	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	20,407,636	250	97	81,587	4,492,010	55	0.22
<$2	1,142,036	250	97	4,566	0	0	0.00
$2-$4	6,050,140	250	97	24,188	0	0	0.00
>$4	13,215,460	250	97	52,834	0	0	0.00
	Shop water						
Total	86,876	1	0	81,587	4,589,327	56	53
<$2	1,990						
$2-$4	15,812						
>$4	69,075						
	Tanker water						
Total	441,722	5	2	81,587	1,766,886	22	4
<$2	15,003						
$2-$4	79,483						
>$4	347,235						
	Network, shop & tanker water						
Total	20,936,234	257	99	81,587	10,848,224	133	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2015**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**6**
10,250,607	2,048,331	**517,189**	**596,968**	**13,567,920**	5		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,250,607	122	47	84,282	2,256,304	27	0.22
<$2	573,636	122	47	4,717	0	0	0.00
$2-$4	3,038,941	122	47	24,987	0	0	0.00
>$4	6,638,030	122	47	54,579	0	0	0.00
	Shop water						
Total	128,208	2	1	84,282	6,772,700	80	53
<$2	2,936						
$2-$4	23,334						
>$4	101,937						
	Tanker water						
Total	1,140,774	14	5	84,282	4,563,095	54	4
<$2	38,747						
$2-$4	205,271						
>$4	896,756						
	Network, shop & tanker water						
Total	13,567,920	161	62	84,282	13,592,099	161	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2015**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**6**
25,577,456	-12,194,128	**517,189**	**596,968**	**13,567,920**	90%	5	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	25,577,456	303	117	84,282	5,629,961	67	0.22
<$2	1,431,345	303	117	4,717	0	0	0.00
$2-$4	7,582,808	303	117	24,987	0	0	0.00
>$4	16,563,303	303	117	54,579	0	0	0.00
	Shop water						
Total	70,514	1	0	84,282	3,724,985	44	53
<$2	1,615						
$2-$4	12,834						
>$4	56,066						
	Tanker water						
Total	114,077	1	1	84,282	456,309	5	4
<$2	3,875						
$2-$4	20,527						
>$4	89,676						
	Network, shop & tanker water						
Total	25,762,048	306	118	84,282	9,811,256	116	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2016**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**7**
10,209,494	2,495,617	**517,189**	**616,683**	**14,016,000**	6		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,209,494	117	45	87,065	2,247,255	26	0.22
<$2	571,336	117	45	4,872	0	0	0.00
$2-$4	3,026,753	117	45	25,812	0	0	0.00
>$4	6,611,406	117	45	56,381	0	0	0.00
	Shop water						
Total	132,442	2	1	87,065	6,996,368	80	53
<$2	3,033						
$2-$4	24,104						
>$4	105,304						
	Tanker water						
Total	1,178,448	14	5	87,065	4,713,791	54	4
<$2	40,027						
$2-$4	212,050						
>$4	926,371						
	Network, shop & tanker water						
Total	14,016,000	161	62	87,065	13,957,414	160	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2016**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**7**
26,034,332	-12,184,126	**517,189**	**616,683**	**14,016,000**	92%	6	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	26,034,332	299	116	87,065	5,730,526	66	0.22
<$2	1,456,913	299	116	4,872	0	0	0.00
$2-$4	7,718,256	299	116	25,812	0	0	0.00
>$4	16,859,164	299	116	56,381	0	0	0.00
	Shop water						
Total	71,519	1	0	87,065	3,778,039	43	53
<$2	1,638						
$2-$4	13,016						
>$4	56,864						
	Tanker water						
Total	94,276	1	0	87,065	377,103	4	4
<$2	3,202						
$2-$4	16,964						
>$4	74,110						
	Network, shop & tanker water						
Total	26,200,127	301	116	87,065	9,885,668	114	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2017**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**8**
10,168,286	2,956,411	**517,189**	**637,049**	**14,478,879**	7		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,168,286	113	44	89,941	2,238,184	25	0.22
<$2	569,030	113	44	5,033	0	0	0.00
$2-$4	3,014,536	113	44	26,664	0	0	0.00
>$4	6,584,721	113	44	58,243	0	0	0.00
	Shop water						
Total	136,816	2	1	89,941	7,227,423	80	53
<$2	3,134						
$2-$4	24,901						
>$4	108,782						
	Tanker water						
Total	1,217,366	14	5	89,941	4,869,464	54	4
<$2	41,349						
$2-$4	219,053						
>$4	956,964						
	Network, shop & tanker water						
Total	14,478,879	161	62	89,941	14,335,071	159	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2017**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**8**
26,499,163	-12,165,838	**517,189**	**637,049**	**14,478,879**	94%	7	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	26,499,163	295	114	89,941	5,832,842	65	0.22
<$2	1,482,925	295	114	5,033	0	0	0.00
$2-$4	7,856,061	295	114	26,664	0	0	0.00
>$4	17,160,177	295	114	58,243	0	0	0.00
	Shop water						
Total	72,512	1	0	89,941	3,830,534	43	53
<$2	1,661						
$2-$4	13,197						
>$4	57,654						
	Tanker water						
Total	73,042	1	0	89,941	292,168	3	4
<$2	2,481						
$2-$4	13,143						
>$4	57,418						
	Network, shop & tanker water						
Total	26,644,717	296	115	89,941	9,955,544	111	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2018**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**9**
10,126,982	3,431,159	**517,189**	**658,087**	**14,957,044**	8		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,126,982	109	42	92,911	2,229,092	24	0.22
<$2	566,718	109	42	5,199	0	0	0.00
$2-$4	3,002,291	109	42	27,545	0	0	0.00
>$4	6,557,973	109	42	60,167	0	0	0.00
	Shop water						
Total	141,334	2	1	92,911	7,466,109	80	53
<$2	3,237						
$2-$4	25,723						
>$4	112,374						
	Tanker water						
Total	1,257,569	14	5	92,911	5,030,278	54	4
<$2	42,714						
$2-$4	226,287						
>$4	988,568						
	Network, shop & tanker water						
Total	14,957,044	161	62	92,911	14,725,480	158	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2018**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**9**
26,972,044	-12,138,796	**517,189**	**658,087**	**14,957,044**	96%	8	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	26,972,044	290	112	92,911	5,936,930	64	0.22
<$2	1,509,388	290	112	5,199	0	0	0.00
$2-$4	7,996,254	290	112	27,545	0	0	0.00
>$4	17,466,402	290	112	60,167	0	0	0.00
	Shop water						
Total	73,494	1	0	92,911	3,882,377	42	53
<$2	1,683						
$2-$4	13,376						
>$4	58,435						
	Tanker water						
Total	50,303	1	0	92,911	201,211	2	4
<$2	1,709						
$2-$4	9,051						
>$4	39,543						
	Network, shop & tanker water						
Total	27,095,841	292	113	92,911	10,020,518	108	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2019**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**10**
10,085,582	3,920,316	**517,189**	**679,821**	**15,451,001**	9		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,085,582	105	41	95,979	2,219,980	23	0.22
<$2	564,401	105	41	5,371	0	0	0.00
$2-$4	2,990,017	105	41	28,454	0	0	0.00
>$4	6,531,163	105	41	62,154	0	0	0.00
	Shop water						
Total	146,002	2	1	95,979	7,712,678	80	53
<$2	3,344						
$2-$4	26,572						
>$4	116,085						
	Tanker water						
Total	1,299,101	14	5	95,979	5,196,403	54	4
<$2	44,125						
$2-$4	233,760						
>$4	1,021,216						
	Network, shop & tanker water						
Total	15,451,001	161	62	95,979	15,129,060	158	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2019**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**10**
27,453,073	-12,102,515	**517,189**	**679,821**	**15,451,001**	98%	9	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	27,453,073	286	111	95,979	6,042,811	63	0.22
<$2	1,536,307	286	111	5,371	0	0	0.00
$2-$4	8,138,862	286	111	28,454	0	0	0.00
>$4	17,777,904	286	111	62,154	0	0	0.00
	Shop water						
Total	74,461	1	0	95,979	3,933,466	41	53
<$2	1,705						
$2-$4	13,552						
>$4	59,203						
	Tanker water						
Total	25,982	0	0	95,979	103,928	1	4
<$2	883						
$2-$4	4,675						
>$4	20,424						
	Network, shop & tanker water						
Total	27,553,515	287	111	95,979	10,080,205	105	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2020**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**11**
10,044,086	4,424,357	**517,189**	**702,272**	**15,961,270**	10		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,044,086	101	39	99,149	2,210,846	22	0.22
<$2	562,079	101	39	5,548	0	0	0.00
$2-$4	2,977,715	101	39	29,394	0	0	0.00
>$4	6,504,292	101	39	64,206	0	0	0.00
	Shop water						
Total	150,823	2	1	99,149	7,967,389	80	53
<$2	3,454						
$2-$4	27,450						
>$4	119,919						
	Tanker water						
Total	1,342,004	14	5	99,149	5,368,014	54	4
<$2	45,582						
$2-$4	241,480						
>$4	1,054,941						
	Network, shop & tanker water						
Total	15,961,270	161	62	99,149	15,546,249	157	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2020**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**	**% HHs reached**	**Year**	**11**
27,942,348	-12,056,490	**517,189**	**702,272**	**15,961,270**	100%	10	**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	27,942,348	282	109	99,149	6,150,507	62	0.22
<$2	1,563,687	282	109	5,548	0	0	0.00
$2-$4	8,283,915	282	109	29,394	0	0	0.00
>$4	18,094,746	282	109	64,206	0	0	0.00
	Shop water						
Total	75,412	1	0	99,149	3,983,694	40	53
<$2	1,727						
$2-$4	13,725						
>$4	59,959						
	Tanker water						
Total	0	0	0	99,149	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,017,760	283	109	99,149	10,134,202	102	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2021**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**12**
10,002,494	4,943,770	**517,189**	**725,464**	**16,488,391**	11		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	10,002,494	98	38	102,423	2,201,691	21	0.22
<$2	559,752	98	38	5,732	0	0	0.00
$2-$4	2,965,384	98	38	30,365	0	0	0.00
>$4	6,477,358	98	38	66,327	0	0	0.00
	Shop water						
Total	155,804	2	1	102,423	8,230,512	80	53
<$2	3,568						
$2-$4	28,356						
>$4	123,879						
	Tanker water						
Total	1,386,323	14	5	102,423	5,545,293	54	4
<$2	47,088						
$2-$4	249,455						
>$4	1,089,781						
	Network, shop & tanker water						
Total	16,488,391	161	62	102,423	15,977,496	156	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2021**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**12**
28,078,453	-11,667,964	**517,189**	**725,464**	**16,488,391**	11		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,078,453	274	106	102,423	6,180,466	60	0.22
<$2	1,571,304	274	106	5,732	0	0	0.00
$2-$4	8,324,265	274	106	30,365	0	0	0.00
>$4	18,182,884	274	106	66,327	0	0	0.00
	Shop water						
Total	77,902	1	0	102,423	4,115,256	40	53
<$2	1,784						
$2-$4	14,178						
>$4	61,940						
	Tanker water						
Total	0	0	0	102,423	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,156,355	275	106	102,423	10,295,722	101	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2022**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**13**
9,960,805	5,479,059	**517,189**	**749,423**	**17,032,920**	12		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,960,805	94	36	105,806	2,192,515	21	0.22
<$2	557,419	94	36	5,921	0	0	0.00
$2-$4	2,953,025	94	36	31,368	0	0	0.00
>$4	6,450,361	94	36	68,517	0	0	0.00
	Shop water						
Total	160,950	2	1	105,806	8,502,325	80	53
<$2	3,686						
$2-$4	29,293						
>$4	127,970						
	Tanker water						
Total	1,432,107	14	5	105,806	5,728,426	54	4
<$2	48,643						
$2-$4	257,693						
>$4	1,125,771						
	Network, shop & tanker water						
Total	17,032,920	161	62	105,806	16,423,265	155	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2022**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**13**
28,215,847	-11,263,401	**517,189**	**749,423**	**17,032,920**	12		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,215,847	267	103	105,806	6,210,708	59	0.22
<$2	1,578,993	267	103	5,921	0	0	0.00
$2-$4	8,364,997	267	103	31,368	0	0	0.00
>$4	18,271,857	267	103	68,517	0	0	0.00
	Shop water						
Total	80,475	1	0	105,806	4,251,162	40	53
<$2	1,843						
$2-$4	14,646						
>$4	63,985						
	Tanker water						
Total	0	0	0	105,806	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,296,322	267	103	105,806	10,461,871	99	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2023**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**14**
9,919,020	6,030,746	**517,189**	**774,172**	**17,595,433**	13		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,919,020	91	35	109,300	2,183,317	20	0.22
<$2	555,080	91	35	6,117	0	0	0.00
$2-$4	2,940,637	91	35	32,404	0	0	0.00
>$4	6,423,302	91	35	70,780	0	0	0.00
	Shop water						
Total	166,265	2	1	109,300	8,783,114	80	53
<$2	3,808						
$2-$4	30,260						
>$4	132,197						
	Tanker water						
Total	1,479,402	14	5	109,300	5,917,608	54	4
<$2	50,249						
$2-$4	266,204						
>$4	1,162,949						
	Network, shop & tanker water						
Total	17,595,433	161	62	109,300	16,884,038	154	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2023**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**14**
28,354,551	-10,842,251	**517,189**	**774,172**	**17,595,433**	13		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,354,551	259	100	109,300	6,241,239	57	0.22
<$2	1,586,755	259	100	6,117	0	0	0.00
$2-$4	8,406,118	259	100	32,404	0	0	0.00
>$4	18,361,678	259	100	70,780	0	0	0.00
	Shop water						
Total	83,132	1	0	109,300	4,391,557	40	53
<$2	1,904						
$2-$4	15,130						
>$4	66,098						
	Tanker water						
Total	0	0	0	109,300	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,437,683	260	101	109,300	10,632,796	97	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2024**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**15**
9,877,138	6,599,369	**517,189**	**799,739**	**18,176,522**	14		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,877,138	87	34	112,910	2,174,098	19	0.22
<$2	552,737	87	34	6,319	0	0	0.00
$2-$4	2,928,221	87	34	33,474	0	0	0.00
>$4	6,396,181	87	34	73,117	0	0	0.00
	Shop water						
Total	171,756	2	1	112,910	9,073,176	80	53
<$2	3,934						
$2-$4	31,260						
>$4	136,562						
	Tanker water						
Total	1,528,259	14	5	112,910	6,113,037	54	4
<$2	51,909						
$2-$4	274,995						
>$4	1,201,356						
	Network, shop & tanker water						
Total	18,176,522	161	62	112,910	17,360,311	154	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2024**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**15**
28,494,587	-10,403,943	**517,189**	**799,739**	**18,176,522**	14		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,494,587	252	98	112,910	6,272,063	56	0.22
<$2	1,594,591	252	98	6,319	0	0	0.00
$2-$4	8,447,634	252	98	33,474	0	0	0.00
>$4	18,452,362	252	98	73,117	0	0	0.00
	Shop water						
Total	85,878	1	0	112,910	4,536,588	40	53
<$2	1,967						
$2-$4	15,630						
>$4	68,281						
	Tanker water						
Total	0	0	0	112,910	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,580,465	253	98	112,910	10,808,651	96	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2025**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**16**
9,835,159	7,185,484	**517,189**	**826,151**	**18,776,802**	15		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,835,159	84	33	116,639	2,164,858	19	0.22
<$2	550,387	84	33	6,527	0	0	0.00
$2-$4	2,915,776	84	33	34,579	0	0	0.00
>$4	6,368,996	84	33	75,532	0	0	0.00
	Shop water						
Total	177,428	2	1	116,639	9,372,818	80	53
<$2	4,064						
$2-$4	32,292						
>$4	141,072						
	Tanker water						
Total	1,578,730	14	5	116,639	6,314,920	54	4
<$2	53,623						
$2-$4	284,077						
>$4	1,241,030						
	Network, shop & tanker water						
Total	18,776,802	161	62	116,639	17,852,596	153	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2025**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**16**
28,635,977	-9,947,890	**517,189**	**826,151**	**18,776,802**	15		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,635,977	246	95	116,639	6,303,185	54	0.22
<$2	1,602,504	246	95	6,527	0	0	0.00
$2-$4	8,489,551	246	95	34,579	0	0	0.00
>$4	18,543,922	246	95	75,532	0	0	0.00
	Shop water						
Total	88,714	1	0	116,639	4,686,409	40	53
<$2	2,032						
$2-$4	16,146						
>$4	70,536						
	Tanker water						
Total	0	0	0	116,639	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,724,691	246	95	116,639	10,989,594	94	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2026**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**17**
9,793,083	7,789,667	**517,189**	**853,435**	**19,396,906**	16		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,793,083	81	31	120,491	2,155,597	18	0.22
<$2	548,033	81	31	6,743	0	0	0.00
$2-$4	2,903,302	81	31	35,721	0	0	0.00
>$4	6,341,749	81	31	78,027	0	0	0.00
	Shop water						
Total	183,288	2	1	120,491	9,682,355	80	53
<$2	4,198						
$2-$4	33,358						
>$4	145,731						
	Tanker water						
Total	1,630,867	14	5	120,491	6,523,470	54	4
<$2	55,394						
$2-$4	293,458						
>$4	1,282,015						
	Network, shop & tanker water						
Total	19,396,906	161	62	120,491	18,361,422	152	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2026**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**17**
28,778,745	-9,473,483	**517,189**	**853,435**	**19,396,906**	16		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,778,745	239	92	120,491	6,334,610	53	0.22
<$2	1,610,493	239	92	6,743	0	0	0.00
$2-$4	8,531,876	239	92	35,721	0	0	0.00
>$4	18,636,375	239	92	78,027	0	0	0.00
	Shop water						
Total	91,644	1	0	120,491	4,841,178	40	53
<$2	2,099						
$2-$4	16,679						
>$4	72,866						
	Tanker water						
Total	0	0	0	120,491	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	28,870,388	240	93	120,491	11,175,788	93	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2027**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**18**
9,750,910	8,412,511	**517,189**	**881,619**	**20,037,489**	17		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,750,910	78	30	124,470	2,146,314	17	0.22
<$2	545,673	78	30	6,965	0	0	0.00
$2-$4	2,890,799	78	30	36,901	0	0	0.00
>$4	6,314,439	78	30	80,603	0	0	0.00
	Shop water						
Total	189,341	2	1	124,470	10,002,115	80	53
<$2	4,337						
$2-$4	34,460						
>$4	150,544						
	Tanker water						
Total	1,684,727	14	5	124,470	6,738,908	54	4
<$2	57,223						
$2-$4	303,150						
>$4	1,324,354						
	Network, shop & tanker water						
Total	20,037,489	161	62	124,470	18,887,336	152	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2027**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**18**
28,922,912	-8,980,094	**517,189**	**881,619**	**20,037,489**	17		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	28,922,912	232	90	124,470	6,366,343	51	0.22
<$2	1,618,561	232	90	6,965	0	0	0.00
$2-$4	8,574,617	232	90	36,901	0	0	0.00
>$4	18,729,734	232	90	80,603	0	0	0.00
	Shop water						
Total	94,670	1	0	124,470	5,001,058	40	53
<$2	2,168						
$2-$4	17,230						
>$4	75,272						
	Tanker water						
Total	0	0	0	124,470	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	29,017,582	233	90	124,470	11,367,401	91	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2028**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**19**
9,708,639	9,054,629	**517,189**	**910,735**	**20,699,227**	18		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,708,639	76	29	128,580	2,137,009	17	0.22
<$2	543,307	76	29	7,196	0	0	0.00
$2-$4	2,878,267	76	29	38,120	0	0	0.00
>$4	6,287,065	76	29	83,265	0	0	0.00
	Shop water						
Total	195,594	2	1	128,580	10,332,435	80	53
<$2	4,480						
$2-$4	35,598						
>$4	155,516						
	Tanker water						
Total	1,740,365	14	5	128,580	6,961,460	54	4
<$2	59,113						
$2-$4	313,161						
>$4	1,368,091						
	Network, shop & tanker water						
Total	20,699,227	161	62	128,580	19,430,904	151	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2028**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**19**
29,068,504	-8,467,074	**517,189**	**910,735**	**20,699,227**	18		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	29,068,504	226	87	128,580	6,398,390	50	0.22
<$2	1,626,708	226	87	7,196	0	0	0.00
$2-$4	8,617,780	226	87	38,120	0	0	0.00
>$4	18,824,015	226	87	83,265	0	0	0.00
	Shop water						
Total	97,797	1	0	128,580	5,166,218	40	53
<$2	2,240						
$2-$4	17,799						
>$4	77,758						
	Tanker water						
Total	0	0	0	128,580	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	29,166,301	227	88	128,580	11,564,608	90	
<$2							
$2-$4							
>$4							

Supplies of water to targeted households: network, shop and tanker water							**2029**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**20**
9,666,271	9,716,654	**517,189**	**940,812**	**21,382,819**	19		**without project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	9,666,271	73	28	132,827	2,127,683	16	0.22
<$2	540,936	73	28	7,433	0	0	0.00
$2-$4	2,865,706	73	28	39,378	0	0	0.00
>$4	6,259,628	73	28	86,015	0	0	0.00
	Shop water						
Total	202,053	2	1	132,827	10,673,664	80	53
<$2	4,628						
$2-$4	36,774						
>$4	160,652						
	Tanker water						
Total	1,797,841	14	5	132,827	7,191,362	54	4
<$2	61,065						
$2-$4	323,503						
>$4	1,413,272						
	Network, shop & tanker water						
Total	21,382,819	161	62	132,827	19,992,710	151	
<$2							
$2-$4							
>$4							
Supplies of water to targeted households: network, shop and tanker water							**2029**
network water (m3)	**Deficit (m³)**	**baseline pop**	**pop connect**	**water demand (m3)**		**Year**	**20**
29,215,543	-7,933,751	**517,189**	**940,812**	**21,382,819**	19		**with project**
	Network water	m3/hse/a	lcd	nr hse	water revenue	water revenue/hse	water prices/ m3
Total	29,215,543	220	85	132,827	6,430,756	48	0.22
<$2	1,634,937	220	85	7,433	0	0	0.00
$2-$4	8,661,372	220	85	39,378	0	0	0.00
>$4	18,919,235	220	85	86,015	0	0	0.00
	Shop water						
Total	101,027	1	0	132,827	5,336,832	40	53
<$2	2,314						
$2-$4	18,387						
>$4	80,326						
	Tanker water						
Total	0	0	0	132,827	0	0	4
<$2	0						
$2-$4	0						
>$4	0						
	Network, shop & tanker water						
Total	29,316,570	221	85	132,827	11,767,588	89	
<$2							
$2-$4							
>$4							

Zarga Water Supply Feasibility Study. Selected List of PIP MCC Priority Projects. Work-sheet "Hsehold"

Table 4: Household water consumption analysis across 20 years						pop growth:	3.25%		annual connectivity growth:		0.05%									
	water prioces per m³:		network	0.22	shop	52.826	tanker	4												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
	Year	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**	**Year**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	19	20
Target population (all HHs)	**517,189**	**533,998**	**551,353**	**569,272**	**587,773**	**606,876**	**626,599**	**646,964**	**667,990**	**689,700**	**712,115**	**735,259**	**759,154**	**783,827**	**809,301**	**835,604**	**862,761**	**890,800**	**919,751**	**949,643**
Target population (connected HHs)	**507,454**	**524,213**	**541,525**	**559,409**	**577,883**	**596,968**	**616,683**	**637,049**	**658,087**	**679,821**	**702,272**	**725,464**	**749,423**	**774,172**	**799,739**	**826,151**	**853,435**	**881,619**	**910,735**	**940,812**
Without project																				
Total network water consumed	***10,454,745***	***10,414,107***	***10,373,375***	***10,332,547***	***10,291,625***	***10,250,607***	***10,209,494***	***10,168,286***	***10,126,982***	***10,085,582***	***10,044,086***	***10,002,494***	***9,960,805***	***9,919,020***	***9,877,138***	***9,835,159***	***9,793,083***	***9,750,910***	***9,708,639***	***9,666,271***
Total shop water consumed	***108,983***	***112,582***	***116,301***	***120,141***	***124,109***	***128,208***	***132,442***	***136,816***	***141,334***	***146,002***	***150,823***	***155,804***	***160,950***	***166,265***	***171,756***	***177,428***	***183,288***	***189,341***	***195,594***	***202,053***
Total tanker water consumed	***969,718***	***1,001,743***	***1,034,825***	***1,069,000***	***1,104,304***	***1,140,774***	***1,178,448***	***1,217,366***	***1,257,569***	***1,299,101***	***1,342,004***	***1,386,323***	***1,432,107***	***1,479,402***	***1,528,259***	***1,578,730***	***1,630,867***	***1,684,727***	***1,740,365***	***1,797,841***
With project																				
Total network water consumed	***10,454,745***	***10,414,107***	***10,373,375***	***15,339,982***	***20,407,636***	***25,577,456***	***26,034,332***	***26,499,163***	***26,972,044***	***27,453,073***	***27,942,348***	***28,078,453***	***28,215,847***	***28,354,551***	***28,494,587***	***28,635,977***	***28,778,745***	***28,922,912***	***29,068,504***	***29,215,543***
Total shop water consumed	***108,983***	***112,582***	***116,301***	***102,120***	***86,876***	***70,514***	***71,519***	***72,512***	***73,494***	***74,461***	***75,412***	***77,902***	***80,475***	***83,132***	***85,878***	***88,714***	***91,644***	***94,670***	***97,797***	***101,027***
Total tanker water consumed	***969,718***	***1,001,743***	***1,034,825***	***748,300***	***441,722***	***114,077***	***94,276***	***73,042***	***50,303***	***25,982***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**948,021**	**1,958,659**	**3,035,016**	**3,204,919**	**3,382,735**	**3,568,800**	**3,763,465**	**3,967,095**	**4,098,109**	**4,233,449**	**4,373,258**	**4,517,685**	**4,666,882**	**4,821,006**	**4,980,219**	**5,144,691**	**5,314,595**
Savings from switching from tanker water to network water			**0**	**1,212,210**	**2,504,486**	**3,880,795**	**4,098,046**	**4,325,414**	**4,563,330**	**4,812,243**	**5,072,620**	**5,240,143**	**5,413,199**	**5,591,970**	**5,776,645**	**5,967,419**	**6,164,493**	**6,368,075**	**6,578,381**	**6,795,632**
Total savings from switching from shop and tanker water			**0**	**2,160,231**	**4,463,145**	**6,915,811**	**7,302,965**	**7,708,149**	**8,132,130**	**8,575,708**	**9,039,715**	**9,338,252**	**9,646,648**	**9,965,228**	**10,294,330**	**10,634,301**	**10,985,498**	**11,348,295**	**11,723,072**	**12,110,227**
Poorest socio-economic group (<$2 per person per day)																				
Target population (all HHs)	**28,943**	**29,883**	**30,854**	**31,857**	**32,892**	**33,961**	**35,065**	**36,205**	**37,382**	**38,596**	**39,851**	**41,146**	**42,483**	**43,864**	**45,289**	**46,761**	**48,281**	**49,850**	**51,470**	**53,143**
Target population (connected HHs)	**28,398**	**29,336**	**30,304**	**31,305**	**32,339**	**33,407**	**34,510**	**35,650**	**36,827**	**38,044**	**39,300**	**40,598**	**41,939**	**43,324**	**44,754**	**46,232**	**47,759**	**49,336**	**50,966**	**52,649**
Without project																				
Total network water consumed	***585,060***	***582,786***	***580,507***	***578,222***	***575,932***	***573,636***	***571,336***	***569,030***	***566,718***	***564,401***	***562,079***	***559,752***	***557,419***	***555,080***	***552,737***	***550,387***	***548,033***	***545,673***	***543,307***	***540,936***
Total shop water consumed	***2,496***	***2,578***	***2,664***	***2,752***	***2,842***	***2,936***	***3,033***	***3,134***	***3,237***	***3,344***	***3,454***	***3,568***	***3,686***	***3,808***	***3,934***	***4,064***	***4,198***	***4,337***	***4,480***	***4,628***
Total tanker water consumed	***32,937***	***34,025***	***35,149***	***36,309***	***37,509***	***38,747***	***40,027***	***41,349***	***42,714***	***44,125***	***45,582***	***47,088***	***48,643***	***50,249***	***51,909***	***53,623***	***55,394***	***57,223***	***59,113***	***61,065***
With project																				
Total network water consumed	***585,060***	***582,786***	***580,507***	***858,444***	***1,142,036***	***1,431,345***	***1,456,913***	***1,482,925***	***1,509,388***	***1,536,307***	***1,563,687***	***1,571,304***	***1,578,993***	***1,586,755***	***1,594,591***	***1,602,504***	***1,610,493***	***1,618,561***	***1,626,708***	***1,634,937***
Total shop water consumed	***2,496***	***2,578***	***2,664***	***2,339***	***1,990***	***1,615***	***1,638***	***1,661***	***1,683***	***1,705***	***1,727***	***1,784***	***1,843***	***1,904***	***1,967***	***2,032***	***2,099***	***2,168***	***2,240***	***2,314***
Total tanker water consumed	***32,937***	***34,025***	***35,149***	***25,417***	***15,003***	***3,875***	***3,202***	***2,481***	***1,709***	***883***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**21,713**	**44,860**	**69,512**	**73,403**	**77,475**	**81,737**	**86,195**	**90,859**	**93,860**	**96,959**	**100,162**	**103,469**	**106,886**	**110,416**	**114,063**	**117,830**	**121,721**
Savings from switching from tanker water to network water			**0**	**41,174**	**85,067**	**131,814**	**139,193**	**146,916**	**154,997**	**163,452**	**172,296**	**177,986**	**183,864**	**189,936**	**196,208**	**202,688**	**209,382**	**216,297**	**223,440**	**230,819**
Total savings from switching from shop and tanker water			**0**	**62,886**	**129,926**	**201,326**	**212,596**	**224,392**	**236,734**	**249,647**	**263,155**	**271,845**	**280,823**	**290,097**	**299,678**	**309,575**	**319,798**	**330,360**	**341,270**	**352,540**
Medium poor socio-economic group ($2 - $4 per person per day)																				
Target population (all HHs)	**153,328**	**158,311**	**163,457**	**168,769**	**174,254**	**179,917**	**185,764**	**191,802**	**198,035**	**204,471**	**211,117**	**217,978**	**225,062**	**232,377**	**239,929**	**247,727**	**255,778**	**264,091**	**272,674**	**281,536**
Target population (connected HHs)	**150,442**	**155,411**	**160,543**	**165,845**	**171,322**	**176,980**	**182,825**	**188,862**	**195,100**	**201,543**	**208,199**	**215,074**	**222,177**	**229,515**	**237,094**	**244,924**	**253,013**	**261,369**	**270,001**	**278,917**
Without project																				
Total network water consumed	***3,099,461***	***3,087,413***	***3,075,337***	***3,063,234***	***3,051,102***	***3,038,941***	***3,026,753***	***3,014,536***	***3,002,291***	***2,990,017***	***2,977,715***	***2,965,384***	***2,953,025***	***2,940,637***	***2,928,221***	***2,915,776***	***2,903,302***	***2,890,799***	***2,878,267***	***2,865,706***
Total shop water consumed	***19,835***	***20,490***	***21,167***	***21,866***	***22,588***	***23,334***	***24,104***	***24,901***	***25,723***	***26,572***	***27,450***	***28,356***	***29,293***	***30,260***	***31,260***	***32,292***	***33,358***	***34,460***	***35,598***	***36,774***
Total tanker water consumed	***174,491***	***180,254***	***186,206***	***192,356***	***198,708***	***205,271***	***212,050***	***219,053***	***226,287***	***233,760***	***241,480***	***249,455***	***257,693***	***266,204***	***274,995***	***284,077***	***293,458***	***303,150***	***313,161***	***323,503***
With project																				
Total network water consumed	***3,099,461***	***3,087,413***	***3,075,337***	***4,547,760***	***6,050,140***	***7,582,808***	***7,718,256***	***7,856,061***	***7,996,254***	***8,138,862***	***8,283,915***	***8,324,265***	***8,364,997***	***8,406,118***	***8,447,634***	***8,489,551***	***8,531,876***	***8,574,617***	***8,617,780***	***8,661,372***
Total shop water consumed	***19,835***	***20,490***	***21,167***	***18,586***	***15,812***	***12,834***	***13,016***	***13,197***	***13,376***	***13,552***	***13,725***	***14,178***	***14,646***	***15,130***	***15,630***	***16,146***	***16,679***	***17,230***	***17,799***	***18,387***
Total tanker water consumed	***174,491***	***180,254***	***186,206***	***134,649***	***79,483***	***20,527***	***16,964***	***13,143***	***9,051***	***4,675***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Savings from switching from shop water to network water			**0**	**172,540**	**356,477**	**552,375**	**583,297**	**615,660**	**649,524**	**684,953**	**722,014**	**745,858**	**770,490**	**795,936**	**822,221**	**849,375**	**877,426**	**906,403**	**936,337**	**967,259**
Savings from switching from tanker water to network water			**0**	**218,125**	**450,657**	**698,310**	**737,402**	**778,315**	**821,126**	**865,915**	**912,767**	**942,911**	**974,051**	**1,006,219**	**1,039,449**	**1,073,777**	**1,109,239**	**1,145,871**	**1,183,714**	**1,222,806**
Total savings from switching from shop and tanker water			**0**	**390,665**	**807,134**	**1,250,685**	**1,320,700**	**1,393,975**	**1,470,649**	**1,550,868**	**1,634,781**	**1,688,770**	**1,744,541**	**1,802,155**	**1,861,671**	**1,923,153**	**1,986,665**	**2,052,274**	**2,120,051**	**2,190,065**
Total savings from switching from shop and tanker water (both socio-economic categories)			**0**	**453,552**	**937,061**	**1,452,011**	**1,533,296**	**1,618,366**	**1,707,383**	**1,800,515**	**1,897,936**	**1,960,615**	**2,025,364**	**2,092,252**	**2,161,349**	**2,232,727**	**2,306,463**	**2,382,634**	**2,461,321**	**2,542,606**
Target Population (all HHs) of both socio-economic categories	**182,271**	**188,195**	**194,311**	**200,626**	**207,146**	**213,879**	**220,830**	**228,007**	**235,417**	**243,068**	**250,968**	**259,124**	**267,546**	**276,241**	**285,219**	**294,488**	**304,059**	**313,941**	**324,144**	**334,679**
	Table 4 feeds off the worksheet "Wcon" electronically.																			
Health benefits for those consuming < 50 lcd																				
Disability Adjusted Life Years (DALY)	The health impact of the proposed project is analysed in section (d),of the worksheet "Heli"																			
Avoided health-related costs																				

Zarqa Water Supply Feasibility Study. Selected List of PIP MCC Priority Projects. Work-sheet "Heli"

(a) Analysing the 2008 billing data: a story of inequality in distribution between network water-poor and network water-rich HHs

Tables 1 & 3 are derived from the 2008 billing data and provide the following findings:
<i> total quanities of network water and nr HHs across 11 different consumption bands (table H1)
<ii> average annual consumption per HH, average HH bill and total revenue across consumption bands (table H3)

Table H1: Water consumption across consumption ranges

Consumption bands (con band)		Water quantities per con band (m³)	Water quantities per con band in % terms	Cumulative in % terms increasing	Cumulative in % terms declining	nr HHs per con band	nr HHs per con range in % terms	Cumulative in % terms increasing	Cumulative in % terms declining
<50lcd		4,635,648	26.34%	26.34%	100.00%	62,044	51.44%	51.44%	100.00%
50lcd-	65lcd	2,709,956	15.40%	41.74%	73.66%	18,291	15.17%	66.61%	48.56%
65lcd-	80lcd	2,522,226	14.33%	56.07%	58.26%	13,528	11.22%	77.82%	33.39%
80lcd-	120lcd	4,793,678	27.24%	83.30%	43.93%	19,259	15.97%	93.79%	22.18%
120lcd-	145lcd	1,389,365	7.89%	91.20%	16.70%	4,104	3.40%	97.19%	6.21%
145lcd-	165lcd	624,570	3.55%	94.75%	8.80%	1,570	1.30%	98.49%	2.81%
165lcd-	185lcd	349,621	1.99%	96.73%	5.25%	777	0.64%	99.14%	1.51%
185lcd	205lcd	230,410	1.31%	98.04%	3.27%	460	0.38%	99.52%	0.86%
205lcd	225lcd	136,962	0.78%	98.82%	1.96%	248	0.21%	99.72%	0.48%
225lcd	245lcd	125,671	0.71%	99.53%	1.18%	207	0.17%	99.90%	0.28%
245lcd	265lcd	82,220	0.47%	100.00%	0.47%	125	0.10%	100.00%	0.10%
Total water consumption (2008)		17,600,327				120,613			

The above table speaks for itself with respect to the unequal distribution of network water. This is indicated by a number of observations:
62,044 HHs or in % terms 51.44% of all Zarqa HHs consume <50lcd of network water and 26.34% of Zarqa network water
58,569 HHs or in % terms 48.56% of all Zarqa HHs consume between 50-265 lcd of water and 73.66% of Zarqa network water

Since the ECO Consult report indicates no correlation between income and water consumption levels, the inequality is based on unequal distribution generated by poor quality piping in certain areas which disadvantages households across all income groups.

The HELI (2005) report highlights the health benefit accruing from raising network water consumption from <50 lcd to 60 lcd and higher.
In the context of Zarqa Governorate the following statistics are of interest in the HELI framework:

Table H2: Water consumption across groups 1 (HHs consuming <50 lcd) & 2 (HHs consuming between 50 - 265 lcd) with project

Year	Total water	Group 1 water	Group 2 water	Total HHS connect	Group 1 HHs	Group 2 HHs	Group 1 m³/HH/annum	Group 2 m³/HH/annum	Group 1 lcd	Group 2 lcd	Group 1 =>60lcd (m³)	Group 2 after transf to Group 1 (m³)	Group 2 after transf to Group 1 (lcd)
2,010	10,454,745	2,753,615	7,701,131	71,644	36,854	34,790	75	221	29	86			
2,011	10,414,107	2,742,911	7,671,196	74,010	38,071	35,939	72	213	28	83			
2,012	10,373,375	2,732,183	7,641,192	76,454	39,328	37,126	69	206	27	80			
2,013	15,339,982	4,040,309	11,299,673	78,979	40,627	38,352	99	295	38	114			
2,014	20,407,636	5,375,049	15,032,587	81,587	41,969	39,618	128	379	50	147			
2,015	25,577,456	6,736,698	18,840,758	84,282	43,355	40,927	155	460	60	178			
2,016	26,034,332	6,857,032	19,177,301	87,065	44,787	42,278	153	454	59	175	6,947,229	19,087,103	175
2,017	26,499,163	6,979,461	19,519,702	89,941	46,266	43,675	151	447	58	173	7,176,662	19,322,501	171
2,018	26,972,044	7,104,010	19,868,034	92,911	47,794	45,117	149	440	57	170	7,413,671	19,558,373	168
2,019	27,453,073	7,230,705	20,222,367	95,979	49,372	46,607	146	434	57	168	7,658,508	19,794,565	164
2,020	27,942,348	7,359,573	20,582,775	99,149	51,003	48,146	144	428	56	165	7,911,430	20,030,918	161
2,021	28,078,453	7,395,421	20,683,032	102,423	52,687	49,736	140	416	54	161	8,172,705	19,905,748	155
2,022	28,215,847	7,431,608	20,784,239	105,806	54,427	51,379	137	405	53	156	8,442,609	19,773,238	149
2,023	28,354,551	7,468,141	20,886,410	109,300	56,225	53,076	133	394	51	152	8,721,426	19,633,125	143
2,024	28,494,587	7,505,024	20,989,563	112,910	58,081	54,828	129	383	50	148	9,009,451	19,485,136	137
2,025	28,635,977	7,542,264	21,093,713	116,639	60,000	56,639	126	372	49	144	9,306,988	19,328,989	132
2,026	28,778,745	7,579,867	21,198,878	120,491	61,981	58,510	122	362	47	140	9,614,352	19,164,393	127
2,027	28,922,912	7,617,838	21,305,074	124,470	64,028	60,442	119	352	46	136	9,931,866	18,991,047	122
2,028	29,068,504	7,656,185	21,412,319	128,580	66,142	62,438	116	343	45	133	10,259,865	18,808,638	117
2,029	29,215,543	7,694,912	21,520,631	132,827	68,327	64,500	113	334	44	129	10,598,698	18,616,846	112

This table shows that in year 6 group 1 achieves average consumption level of 60 lcd. However to maintain this beyond year 6 redistribution of water from group 2 to group 1 is necessary. It is doable as it only requires modest reduction in the average water consumption level of group 2. In year 7 there is no reduction involved but in year 8 there is a reduction from 173 lcd to 171 lcd and in year 20 from 129 lcd to 119 lcd.

There are a number of reasons why network water poor HHs receive inadequate supplies. These include the following:
<i> unequal storage capacity
GFA 2008: 100 show that 1% of HHs have no storage; 13% have 1 m³ storage capacity, 48% have 2 m³ and 38% have more than 2.7 m³ (mean size) storage capacity.

Impact of storage capacity on benefiting from network water	storage:1m³	storage:2m³	storage:2.73m³
Where tanks are only filled once a week this would generate the following consumption rates (lcd):-	20	40	55
It means that those HHs with the smaller tanks obtain <50 lcd			
The situation can be improved with 3 fillings per week giving the following lcd:-	61	121	165

<ii> Altitude
Where the household lives in high altitude areas pressure is weak and supply erratic as others at lower altitudes are at the front of the queue and hence supplied first.

<iii> Tariff structure
Given the large gap between the m³ price of network water (varying between Jd 0.18 - JD 0.64),and that of tanker water (JD 4) and shop water (JD 52.83)
(in the context of water scarcity) those who have the influence, storage capacity and appropriate altitude are able to harvest a disproportionate share
of the network water as illustrated by table H1 above. In addition, EC Consult points out that the sharing of meters by poor HHs pushes up the price of network water for the poor.
One resolution is to ensure that poor HHs have access to one meter per HH as recommended by ECO Consult.
Another resolution to this situation is to raise tariff rates much closer to commercial rates of tanker water, so that when HHs consume more than 165 lcd,
the price of network water is > JD 4, so that the network water-rich HHs are forced to purchase tanker water when their consumption is >165 lcd.
Network water-poor HHs are willing to pay higher tariffs at the lower consumption band rates (see GFA 2008:163-173)
In summary, constraints <i> and <ii> require an engineering resolution, while constraint <iii> faces the challenge of reform of the tariff structure.
Both sets of resolutions will be required to address the plight of network water-poor HHs, of which there are 62,044 HHs representing
51.44% of all HHs of Zarqa.

<c> Economic and financial analysis of the 2008 billing data
Table H 3 below analyses annual HH expenditure on water, average prices per m³ and revenue across the consumption bands

Table H3: HH network water consumption, water bills and revenue

Consumption bands (con band)		av HH con/annum per con band (m³)	av HH con/quart per con band (m³)	tariff (JD)	av HH annual bill (JD)	av price per m³ per con band (JD)	revenue created per con band (JD)		Cumulative in % terms increasing	Cumulative in % terms declining
<50lcd		75	19	3.750	15	0.20	930,660	22.32%	22.32%	100.00%
50lcd-	65lcd	148	37	6.450	26	0.17	471,908	11.32%	33.64%	77.68%
65lcd-	80lcd	186	47	9.341	37	0.20	505,460	12.12%	45.76%	66.36%
80lcd-	120lcd	249	62	14.870	59	0.24	1,145,525	27.47%	73.24%	54.24%
120lcd-	145lcd	339	85	26.657	107	0.31	437,601	10.50%	83.73%	26.76%
145lcd-	165lcd	398	99	36.483	146	0.37	229,113	5.50%	89.23%	16.27%
165lcd-	185lcd	450	112	47.097	188	0.42	146,377	3.51%	92.74%	10.77%
185lcd	205lcd	501	125	58.296	233	0.47	107,265	2.57%	95.31%	7.26%
205lcd	225lcd	552	138	71.896	288	0.52	71,321	1.71%	97.02%	4.69%
225lcd	245lcd	607	152	88.250	353	0.58	73,071	1.75%	98.77%	2.98%
245lcd	265lcd	658	164	102.341	409	0.62	51,171	1.23%	100.00%	1.23%
							4,169,472			

There are some minor inequalities in billing before average price per m³ begins to rise from 80 lcd onwards.

(d) Planning and implementing the HELI-desired outcome
It is now assumed that engineering and policy steps relating to tariff reform will take place so that the necessary quantities of additional water created by the proposed projec will be channelled to HHs with <50 lcd so that their consumption rate is raised to 60 lcd; and this continues even in the face of population growth from year 9 onwards.
The details of the re-distribution of water between groups 1 & 2 in order to lift HHs of group 1 to 60 lcd and to maintain these HHs at this level are worked out above (table H2).

Hence, I move on to calculate the health benefits. I assume that the diarrhoea incidence/ person / year for those consuming < 50 lcd is .61
This is a conservative figure given Figure 6, HELI (2005) report, page 40. I also assume that the diarrhoea incidence/person/year is .27 for those consuming 60 lcd (ibid.)
Appling Table 10 (HELI 2005:43) to the metered population the health gains for raising consumption of group 1 to 60 lcd, health gains are estimated in Table H4 below.

Table H4 Estimating the health benefits in lifting group 1 to consumption level of 60 lcd

Diarrhoea incidence	Total health cost (JD)	population size	
0.61	56,323,128	5,100,396	(HELI 2005:43)
0.27	24,929,909	5,100,396	(HELI 2005:43)
Health gain (JD)	31,393,219	5,100,396	

	All socio-economic categories		Socio-economic categories (poor & medium poor)	
Year of the project	Target population	Heath gain (JD)	Target population	Heath gain (JD)
1	517,189	0	182,271	0
2	533,998	0	188,195	0
3	551,353	0	194,311	0
4	569,272	0	200,626	0
5	587,773	0	207,146	0
6	606,876	3,735,353	213,879	1,316,434
7	626,599	3,856,752	220,830	1,359,219
8	646,964	3,982,097	228,007	1,403,393
9	667,990	4,111,515	235,417	1,449,003
10	689,700	4,245,139	243,068	1,496,096
11	712,115	4,383,106	250,968	1,544,719
12	735,259	4,525,557	259,124	1,594,923
13	759,154	4,672,637	267,546	1,646,758
14	783,827	4,824,498	276,241	1,700,277
15	809,301	4,981,294	285,219	1,755,536
16	835,604	5,143,186	294,488	1,812,591
17	862,761	5,310,340	304,059	1,871,500
18	890,800	5,482,926	313,941	1,932,324
19	919,751	5,661,121	324,144	1,995,125
20	949,643	5,845,108	334,679	2,059,966

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Step 5

Step 5 consists of an analysis of production costs in order to ascertain costs per m3 of water produced and water delivered to consumers

This analysis is based on WAJ 2009, Zarqa Water Administration Profit and Loss Statement for 2008

	Years																			
Table 5a: Water production analysis Zarqa Governorate (2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Without project																				
Water production	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**	**52,134,804**
Internal water sources (wells and springs)	*39,074,642*																			
Water imports	*13,060,162*																			
Authorised consumptior	**25,606,380**	25,506,847	25,407,082	25,307,086	25,206,856	25,106,393	25,005,697	24,904,767	24,803,603	24,702,204	24,600,569	24,498,699	24,396,593	24,294,250	24,191,670	24,088,853	23,985,798	23,882,505	23,778,973	23,675,202
Billed metered consumption (billing system, tankers, exports)	*24,184,161*																			
Unbilled metered consumption (free water in arid areas)	*490,706*																			
Flushing of network	*931,513*																			
Water production costs	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700
Salaries and wages (minus Sewerage Directorate & Irrigation Division)	1,743,119																			
Electricity expenses (Water Directorate total minus water treatement)	4,973,336																			
Spare parts and maintenance (Water Directorate & Desert Wells)	803,256																			
Vehicle expenses (Water Directorate/ water tankers/ desert wells)	306,998																			
General and Admin Expenses devoted to water-related staff & activities	358,614																			
Fuel expenses (minus Sewarage Directory but plus 81% of Admin Dir)	212,854																			
Water imports	4,086,524																			
***Water related salaries & wages as percentage of total salary and wage bill (JOD 2,156,313)*	81%																			
Average cost per m3 of water produced (internal plus imports	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239
Average cost per m3 of water delivered to consumer: (authorised consumption	0.488	0.489	0.491	0.493	0.495	0.497	0.499	0.501	0.503	0.505	0.507	0.510	0.512	0.514	0.516	0.518	0.521	0.523	0.525	0.527
Step 6																				
Step 6 ascertains what happens production costs (with project) given																				
percentage UFW "without project"……..	68.5%	68.6%	68.7%	68.8%	69.0%	69.1%	69.2%	69.3%	69.5%	69.6%	69.7%	69.8%	70.0%	70.1%	70.2%	70.3%	70.5%	70.6%	70.7%	70.8%
but percentage UFW "with project" ……..	68.5%	68.6%	68.7%	19.5%	19.4%	19.3%	19.3%	19.2%	19.2%	19.1%	19.0%	19.0%	18.9%	18.9%	18.8%	18.8%	18.7%	18.7%	18.6%	18.5%
For the sake of the calculations it is assumed that the whole Zarqa water system is being rehabilitated and restructured. The key factors between the "without project" and "with project" scenarii is the the difference between the UFW of without & with project																				
Making this wider assumption does not alter the calculation of unit costs of water production & delivery																				
With project																				
Percentage of connected consumers reached				30%	60%	90%	92%	94%	96%	98%	100%									
Water production	**52,134,804**	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804	52,134,804
Internal water sources (wells and springs)	*39,074,642*																			
Water imports	*13,060,162*																			
Authorised consumptior	**25,606,380**	**25,506,847**	**25,407,082**	**37,339,502**	**49,361,034**	**61,471,626**	**62,315,937**	**63,165,915**	**64,021,556**	**64,882,860**	**65,749,825**	**65,796,493**	**65,842,879**	**65,888,985**	**65,934,811**	**65,980,360**	**66,025,632**	**66,070,630**	**66,115,353**	**66,159,804**
The quanity of water delivered to consumers with project																				

We do not expect any energy saving of note due to the project works. At present the water is pumped from low-level pumping stations up to high-level reservoirs, and from there by gravity into the distribution network for customers' supply. There will in fact be more water pumped to higher elevations than at present, but there will be a trade-off in that the pumping to a reservoir can be done with steady state pumping which is more energy efficient. In overall terms no energy saving of note is envisaged. (NOD/ACEPO engineers 2010)

Water production costs	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700	12,484,700
Salaries and wages (minus Sewerage Directorate & Irrigation Division)	1,743,119																			
Electricity expenses (Water Directorate total minus water treatement)	4,973,336																			
Spare parts and maintenance (Water Directorate & Desert Wells)	803,256																			
Vehicle expenses (Water Directorate/ water tankers/ desert wells)	306,998																			
General and Admin Expenses devoted to water-related staff & activities	358,614																			
Fuel expenses (minus Sewarage Directory but plus 81% of Admin Dir)	212,854																			
Water imports	4,086,524																			
***Water related salaries & wages as percentage of total salary and wage bill (JOD 2,156,313)*	81%																			
Average cost per m3 of water produced (internal plus imports	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239	0.239
Average cost per m3 of water delivered to consumer: (authorised consumption	0.488	0.489	0.491	0.334	0.253	0.203	0.200	0.198	0.195	0.192	0.190	0.190	0.190	0.189	0.189	0.189	0.189	0.189	0.189	0.189
Water production & delivery savings per m3 (years 1-20	0.000000	0.000000	0.000000	0.158972	0.242364	0.294175	0.298929	0.303648	0.308334	0.312989	0.317615	0.319859	0.322126	0.324414	0.326725	0.329059	0.331415	0.333795	0.336199	0.338627
(Year 3)																				

Table 5b Opportunity cost to WAJ for not investing: cost of	**Years**																			
additional water required (without project)and loss of surpluse (with project)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Without project																				
Quantities of water (m³)	0	385,906	783,309	1,192,586	1,614,126	2,048,331	2,495,617	2,956,411	3,431,159	3,920,316	4,424,357	4,943,770	5,479,059	6,030,746	6,599,369	7,185,484	7,789,667	8,412,511	9,054,629	9,716,654
Cost (JD)	0	188,153	381,912	581,460	786,987	998,689	1,216,768	1,441,434	1,672,903	1,911,398	2,157,149	2,410,395	2,671,381	2,940,363	3,217,602	3,503,370	3,797,946	4,101,621	4,414,694	4,737,472
With project																				
Quantities of water (m³)	0	385,906	783,309	-3,476,128	-7,802,070	-12,194,128	-12,184,126	-12,165,838	-12,138,796	-12,102,515	-12,056,490	-11,667,964	-11,263,401	-10,842,251	-10,403,943	-9,947,890	-9,473,483	-8,980,094	-8,467,074	-7,933,751
Cost (JD)	0	188,153	381,912	-1,694,828	-3,803,993	-5,945,394	-5,940,518	-5,931,602	-5,918,417	-5,900,727	-5,878,287	-5,688,857	-5,491,607	-5,286,270	-5,072,568	-4,850,214	-4,618,911	-4,378,353	-4,128,224	-3,868,196
Opportunity cost to WAJ for not investing	0	0	0	2,276,288	4,590,980	6,944,083	7,157,286	7,373,036	7,591,320	7,812,125	8,035,436	8,099,252	8,162,989	8,226,633	8,290,170	8,353,584	8,416,858	8,479,975	8,542,918	8,605,669

The analysis only includes costs relating to the provision of network water both for residents and non-residents. Hence it excludes costs relating to the sewerage directorate, and waste water treatment. The figures for cost reduction "with project" are provisional and will be updated by data from the work of the engineers.

The analysis in this worksheet is conducted for the Zarqa Governorate as a whole, since the data provided (WAJ 2009) are governorate-wide and for that reason it is assumed for the sake of the analysis that the reduction in water leakage "with project" is applicable to the whole governorate.

The ultimate goal of the analysis is to ascertain savings in the production & delivery of network water "with project" for the whole governorate (see cell b 80 below).

The findings of this work sheet feed into the "CBA" worksheet.

There is an adjustment for the fact that pumping at wells is subsidized at JD0.043 per Kw instead of the industrial rate of JD0.050

Source: NOD/ACEPO engineers

Source: NOD/ACEPO engineers

Zarqa Water Supply Feasibility Study. Selected List of PIP MCC Priority Projects. Work-sheet "CBA"

Table 6 Cost benefit analysis summary		***Cost***	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
		Totals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Across	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
		20 years																				
Investment costs without project			2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541	2,173,541							
(Natural development of network to connect new HHs)																						
Percentage of infrastructure & without project costs devoted to MCC	**56.5%**																					
priority areas																						
Investment costs with project		***128,584,133***	803,006	9,286,676	17,049,348	19,693,672	18,953,480	17,004,823	6,676,626	6,676,626	6,676,626	6,676,626	3,817,324	3,817,324	3,817,324	3,817,324	3,817,324	0	0	0	0	0
Phase 1 (MCC) direct investment in MCC priority areas	**ok**	***73,496,192***	0	7,471,495	17,049,348	19,693,672	18,953,480	10,328,197														
Phase 1 strategic infrastructure (% devoted to MCC priority areas)	**ok**	***731,130***	224,240	506,890																		
Phase (TBD) direct investment in MCC priority areas	**x**																					
Phase (TBD) strategic infrastructure (% devoted to MCC priority areas	**ok**	***1,887,056***	578,766	1,308,290																		
Phase 2 direct investment in the MCC priority areas)	**(ok)**	***16,536,030***						3,307,206	3,307,206	3,307,206	3,307,206	3,307,206										
Phase 2: strategtic infrastructure (% devoted to MCC priority areas)	**ok**	***16,847,102***						3,369,420	3,369,420	3,369,420	3,369,420	3,369,420										
Phase 3: direct investment in the MCC priority areas	**(ok)**	***592,522***											118,504	118,504	118,504	118,504	118,504					
Phase 3: strategic infrastructure (% devoted to priority MCC areas)	**ok**	***18,494,100***											3,698,820	3,698,820	3,698,820	3,698,820	3,698,820					
NOD/ACEPO engineers have provided these costings and																						
are responsible for the details. The costs are inclusive of																						
construction and ancillary costs including management costs																						
Percentage of costs assigned in the CBA to domestic consumers	100%	***128,584,133***	803,006	9,286,676	17,049,348	19,693,672	18,953,480	17,004,823	6,676,626	6,676,626	6,676,626	6,676,626	3,817,324	3,817,324	3,817,324	3,817,324	3,817,324	0	0	0	0	0
66,845,853	(NPV)																					
Investment benefits																						
Water production & delivery savings (domestic water 85%)					0	1,642,584	2,494,316	3,015,470	3,051,914	3,087,583	3,122,497	3,156,679	3,190,147	3,199,392	3,208,634	3,217,873	3,227,110	3,236,344	3,245,576	3,254,806	3,264,035	3,273,262
Water production & delivery savings per m3 (years 1-20)			0	0	0	0.15897188	0.24236363	0.2941748	0.298929	0.30364828	0.30833444	0.31298928	0.31761451	0.319859458	0.322125973	0.3244144	0.3267252	0.32905863	0.3314151	0.33379514	0.336199	0.33862714
Quantity of water involved			*10,454,745*	*10,414,107*	*10,373,375*	*10,332,547*	*10,291,625*	*10,250,607*	*10,209,494*	*10,168,286*	*10,126,982*	*10,085,582*	*10,044,086*	*10,002,494*	*9,960,805*	*9,919,020*	*9,877,138*	*9,835,159*	*9,793,083*	*9,750,910*	*9,708,639*	*9,666,271*
18,340,228	(NPV)																					
Opportunity cost to WAJ for not investing in rehabilitation & restructuring			0	0	0	2,276,288	4,590,980	6,944,083	7,157,286	7,373,036	7,591,320	7,812,125	8,035,436	8,099,252	8,162,989	8,226,633	8,290,170	8,353,584	8,416,858	8,479,975	8,542,918	8,605,669
34,070,792	(NPV)																					
Total savings from switching from shop and tanker water *(domestic water). Not possible to make calculations for non-domestic consumers.*			0	0	0	2,160,231	4,463,145	6,915,811	7,302,965	7,708,149	8,132,130	8,575,708	9,039,715	9,338,252	9,646,648	9,965,228	10,294,330	10,634,301	10,985,498	11,348,295	11,723,072	12,110,227
38,072,622	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcc			0	0	0	0	0	3,735,353	3,856,752	3,982,097	4,111,515	4,245,139	4,383,106	4,525,557	4,672,637	4,824,498	4,981,294	5,143,186	5,310,340	5,482,926	5,661,121	5,845,108
17,073,178	(NPV)																					
Net benefit stream (excluding costs without project)			**-803,006**	**-9,286,676**	**-17,049,348**	**-13,614,569**	**-7,405,039**	**3,605,894**	**14,692,291**	**15,474,237**	**16,280,835**	**17,113,025**	**20,831,081**	**21,345,128**	**21,873,584**	**22,416,909**	**22,975,580**	**27,367,415**	**27,958,272**	**28,566,002**	**29,191,146**	**29,834,264**
	(ERR)		**22%**	This is an underestimation as benefits to non-domestic consumers could not be calculated in the absence of data on the consumption of shop and tanker water by non-domestic consumers.																			
Net benefit stream (including costs without project)			**1,370,535**	**-7,113,135**	**-14,875,807**	**-11,441,028**	**-5,231,498**	**5,779,435**	**16,865,832**	**17,647,778**	**18,454,377**	**19,286,566**	**23,004,622**	**23,518,669**	**24,047,125**	**22,416,909**	**22,975,580**	**27,367,415**	**27,958,272**	**28,566,002**	**29,191,146**	**29,834,264**
	(ERR)		**29%**																			
Sensititivy analysis (excluding costs without project)																						
Net benefit stream with 10% increase in costs			-883,306	-10,215,343	-18,754,283	-15,583,936	-9,300,387	1,905,411	14,024,628	14,806,575	15,613,173	16,445,362	20,449,348	20,963,396	21,491,851	22,035,176	22,593,848	27,367,415	27,958,272	28,566,002	29,191,146	29,834,264
	(ERR)		**20%**																			
Net benefit streamt with 10% reduction in benefits			-803,006	-9,286,676	-17,049,348	-14,222,479	-8,559,883	1,544,822	12,555,399	13,259,151	13,985,089	14,734,060	18,366,240	18,828,883	19,304,493	19,793,485	20,296,290	24,630,673	25,162,445	25,709,402	26,272,031	26,850,838
	(ERR)		**20%**																			
Net benefit stream with 10% increase in costs and 10% reduction in benefits			-883,306	-10,215,343	-18,754,283	-16,191,846	-10,455,231	-155,661	11,887,737	12,591,488	13,317,427	14,066,397	17,984,508	18,447,151	18,922,761	19,411,753	19,914,557	24,630,673	25,162,445	25,709,402	26,272,031	26,850,838
	(ERR)		**17%**																			
Sensititivy analysis (including costs without project)																						
Net benefit stream with 10% increase in costs			1,290,235	-8,041,802	-16,580,742	-13,410,395	-7,126,846	4,078,952	16,198,169	16,980,116	17,786,714	18,618,903	22,622,889	23,136,937	23,665,392	22,035,176	22,593,848	27,367,415	27,958,272	28,566,002	29,191,146	29,834,264
	(ERR)		**25%**																			
Net benefit stream with 10% reduction in benefits			1,370,535	-7,113,135	-14,875,807	-12,048,938	-6,386,342	3,718,363	14,728,940	15,432,692	16,158,630	16,907,601	20,539,781	21,002,424	21,478,034	19,793,485	20,296,290	24,630,673	25,162,445	25,709,402	26,272,031	26,850,838
ERR	(ERR)		**26%**																			
Net benefit stream with 10% increase in costs and 10% reduction in benefits			1,290,235	-8,041,802	-16,580,742	-14,018,305	-8,281,690	2,017,881	14,061,278	14,765,029	15,490,968	16,239,938	20,158,049	20,620,692	21,096,302	19,411,753	19,914,557	24,630,673	25,162,445	25,709,402	26,272,031	26,850,838
	(ERR)		**22%**																			
Table 7 Beneficiary Analysis																						
Poor and medium poor socio-economic categories.																						
Total savings from switching from shop and tanker water (both socio-economic categories combined)			0	0	0	453,552	937,061	1,452,011	1,533,296	1,618,366	1,707,383	1,800,515	1,897,936	1,960,615	2,025,364	2,092,252	2,161,349	2,232,727	2,306,463	2,382,634	2,461,321	2,542,606
7,993,547	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcd			0	0	0	0	0	1,316,434	1,359,219	1,403,393	1,449,003	1,496,096	1,544,719	1,594,923	1,646,758	1,700,277	1,755,536	1,812,591	1,871,500	1,932,324	1,995,125	2,059,966
6,017,027	(NPV)																					
For each JD invested, how much will the two poorest groups benefit	0.21		(JD)																			
Richer socio-economic category																						
Total savings from switching from shop and tanker water (richer socio-economic category)			0	0	0	1,706,679	3,526,084	5,463,800	5,769,669	6,089,783	6,424,747	6,775,193	7,141,780	7,377,637	7,621,283	7,872,976	8,132,981	8,401,573	8,679,035	8,965,660	9,261,751	9,567,621
30,079,075	(NPV)																					
Health gains in raising consumption of those <50 lcd to 60 lcd			0	0	0	0	0	2,418,919	2,497,533	2,578,703	2,662,511	2,749,043	2,838,387	2,930,634	3,025,880	3,124,221	3,225,758	3,330,595	3,438,840	3,550,602	3,665,996	3,785,141
11,056,151	(NPV)																					
For each JD invested, how much will the richer socio-economic group benefit	0.62		(JD)																			
WAJ																						
Total benefits (savings and opportunity costs)			0	0	0	3,918,872	7,085,296	9,959,553	10,209,200	10,460,618	10,713,817	10,968,804	11,225,584	11,298,644	11,371,623	11,444,507	11,517,280	11,589,928	11,662,434	11,734,781	11,806,953	11,878,930
48,691,510	(NPV)																					
For each JD invested, how much will WAJ benefit	0.73		(JD)																			